

Declaration of William R. Michalson in Support of
Petition for *Inter Partes* Review of
U.S. Patent No. 8,545,247 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NINTENDO CO., LTD., and
NINTENDO OF AMERICA INC.,
Petitioners

v.

MALIKIE INNOVATIONS LTD.,
Patent Owner

Case IPR2026-00005
U.S. Patent No. 8,545,247 B2
Issue Date: October 1, 2013

Title: DEVICE FOR A PORTABLE ELECTRONIC DEVICE

DECLARATION OF WILLIAM R. MICHALSON, PH.D.

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I, William R. Michalson, Ph.D., declare as follows:

I. INTRODUCTION AND QUALIFICATIONS

1. I have been retained by counsel for Nintendo Co., Ltd. and Nintendo of America Inc. (together “Petitioner”) to provide my expert opinion in connection with the above-captioned proceeding as set forth herein. I am being compensated for my time working on this matter at my standard hourly rate plus expenses. I do not have any personal or financial stake or interest in the outcome of the present proceeding, and my compensation is not dependent on the outcome of this IPR and in no way affects the substance of my statements in this Declaration.

A. Qualifications and Experience

2. I earned a B.S. in Electrical Engineering from Syracuse University in 1981, and an M.S. and a Ph.D. in Electrical Engineering from the Worcester Polytechnic Institute (WPI) in 1985 and 1989, respectively.

3. I am currently a tenured Professor in Robotics Engineering in the Robotics Engineering Department of WPI. I also hold appointments as a Professor of Computer Science, a Professor of Electrical and Computer Engineering, and as a Professor of Mechanical Engineering. At WPI, I perform research and teach in the areas of navigation, communications, and computer system design. I supervised the WPI Center for Advanced Integrated Radio Navigation (CAIRN), where I was

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developing a Public Safety Integration Center focused on the integration of communications, navigation, and information technologies for public safety applications. Currently I direct the Robot Communication and Navigation Laboratory where my research focuses on the development, testing, and evaluation of systems for both civilian and military applications with a special emphasis on techniques focused on indoor, underground, or otherwise GPS-denied situations. My interests in communication, navigation, and computing have led me to play an active role in the development of the Robotics Program at WPI, where I teach robotics courses at the graduate and undergraduate level.

4. Prior to joining the faculty of WPI, I worked at the Raytheon Company from 1981-1991, with a leave of absence between 1985-1988 to complete my Doctoral Degree (Ph.D.) in Electrical Engineering from the Worcester Polytechnic Institute. Prior to my leave of absence, I worked as an Engineer in the Cursive Displays Department and the VLSI Design Department of the Computer and Displays Laboratory within Raytheon's Equipment Division. After receiving my Ph.D., I returned to the Equipment Division of the Raytheon Company where I was promoted to the title of Engineer, Design and Development. I was subsequently selected to sit on the engineering staff of the newly-formed System Engineering Department of the Division's Computer and Displays Laboratory. In this capacity,

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I acted primarily as a consultant to other departments within the laboratory, and my responsibilities ranged from leading the hardware and software development of supercomputer-class computer systems to performing applied research into the exploitation of new technology. As the technical lead on various programs, I was involved in all aspects of managing the electrical, mechanical, and software design of large computer systems. Thus, I worked closely with electrical designers on electrical design issues including high-speed logic design and layout, with software designers on issues including the exploitation of parallelism and multiprocessor synchronization, and with mechanical designers on issues including thermal management, structure, and packaging concepts.

5. I have more than 40 years of experience in the field of computer technology, specifically in the design of signal and data processing systems for communications and navigation. Since joining the faculty at WPI in 1991, I have been involved with over 100 student projects involving the design, implementation, and packaging of electronic systems. Additionally, as a consultant I have been involved with the design, prototyping, and packaging of numerous electrical and mechanical systems. I have consulted and served, including being qualified by courts, as an expert for numerous patent cases, including in patent cases involving motion sensing, positioning, wireless communications, and computer system design

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and organization, a listing of which is set forth in my current curriculum vitae which is attached to this Declaration as **Appendix A**.

6. I have received numerous awards and recognition for my work, including becoming a Senior Member of the IEEE. In addition, I was awarded the Joseph Samuel Satin Distinguished Fellowship for the 1994-1995 academic year, and the Aldo Miccioli Fellowship from the Raytheon Company's Equipment Division. I am also a member of the Institute of Navigation, the Royal Institute of Navigation, the American Society of Engineering Educators, the Society of Automotive Engineers, the Academy of Model Aeronautics, and the National Academy of Inventors.

7. My curriculum vitae, attached as **Appendix A**, includes a list of publications on which I am a named author. It contains further details regarding my experience, education, publications, and other qualifications to provide an expert opinion in connection with this proceeding.

B. Materials Considered

8. The analysis that I provide in this Declaration is based on my education, research, and experience, as well as the documents I have considered. In forming my opinions, I have reviewed the following documents, and any other documents cited in this Declaration:

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Exhibit No.	Description of Document
EX1001	U.S. Patent No. 8,545,247 B2 to Leonardo Aldana et al. (filed February 15, 2012, issued October 1, 2013) (“’247” or “’247 patent”)
EX1003	Japanese Laid-Open Patent Application No. JP2005085593A to Noritaka Tsutsui (filed on September 9, 2003 and published on March 31, 2005) (“Tsutsui”)
EX1004	Certified Japanese translation of Tsutsui (EX1003)
EX1005	Prosecution File History of 8,545,247 B2
EX1006	Claim Construction Report of Gavin T. Gardner, PhD, August 6, 2025, provided in <i>Malikie Innovations Ltd. et al. v. Nintendo Co., Ltd.</i> , No. 2:24-cv-01490-JLR (W.D. Wash.) (“Gardner Report”)

II. PERSON OF ORDINARY SKILL IN THE ART

9. I understand that, under the patent laws in effect before the America Invents Act (“AIA”), an assessment of claims of a patent filed before the AIA took effect—such as U.S. Patent No. 8,545,247 (the “’247 patent”)—should be undertaken from the perspective of a person of ordinary skill in the art as of the earliest claimed priority date (i.e., the “time the invention was made”). For purposes of my Declaration, I have been asked by counsel to assume that date to be June 30, 2011, the filing date of the earliest application to which the ’247 patent claims

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priority (provisional application no. 61/503,451).¹

10. I have also been advised that to determine the appropriate level of a person having ordinary skill in the art, the following factors may be considered: (1) the types of problems encountered by those working in the field and prior art solutions thereto; (2) the sophistication of the technology in question, and the rapidity with which innovations occur in the field; (3) the educational level of active workers in the field; and (4) the educational level of the inventor.

11. The '247 patent states that it “relates to charging and/or data transfer docks for portable electronic devices.” ('247, 1:14-15.) The “Background Discussion” in the patent acknowledges that it was known that “[p]ortable electronic devices are often placed in docks for charging or data transfer including transfer of information in any form optically or electrically from dock to portable electronic

¹ I express no opinion on whether the '247 patent is actually entitled to the benefit of the June 30, 2011 provisional application to which it claims priority (61/503,451). This issue is not relevant here because all of the prior art references relied upon predate that date. In the event entitlement to the provisional filing date may later become relevant, for example based on arguments later presented by Patent Owner, I reserve my right to provide opinions on that issue at that time.

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device and vice versa.” (*Id.*, 1:32-36.) Each independent claim recites, among other things, “[a] dock for receiving a portable electronic device” or “[a] connector assembly for a dock.” (*Id.*, 9:32-32 (claim 1), 10:8-19 (claim 12), 10:26-27 (claim 13), 10:40-41 (claim 14), 10:56-57 (claim 15).)

12. In my opinion, a person of ordinary skill in the art would have possessed a bachelor’s degree in electrical engineering, mechanical engineering, or similar field, with two years of experience in the design, implementation, and packaging of electronic devices. A person with this level of experience would have had an understanding of the design of physical enclosures or housings, the placement and wiring of electrical connectors, and the use of fasteners, mounts and other physical components for securing electrical components. A person could also have qualified as a person of ordinary skill in the art with some combination of (1) more formal education (such as a master’s of science degree) and less technical experience, or (2) less formal education and more technical or professional experience. I understand that in the district court litigation, Patent Owner has taken the position that a person of ordinary skill in the art would have been someone with a bachelor’s degree in mechanical engineering or mechanical arts with one year of relevant experience or the equivalent. In contrast, my definition includes persons with a degree in electrical engineering and requires an additional year of experience.

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I do not view this difference in educational background as materially impacting my opinions, as both electrical and mechanical engineers would understand the use, specification, and mounting of electrical connectors. Regarding the difference in experience level, a person having two years of experience would certainly qualify as having at least one year of relevant experience. Therefore, my opinions about the obviousness of the challenged claims would be the same even if I adopted Patent Owner's definition.

13. My opinions regarding the level of ordinary skill in the art are based on, among other things, my more than 40 years of experience in the field of electrical and computer engineering, my understanding of the basic qualifications that would be relevant to an engineer or scientist tasked with investigating methods and systems in the relevant area, and my familiarity with the backgrounds of colleagues, co-workers, and employees, both past and present, as well as working with students who were tasked with developing electrical and mechanical systems.

14. Although my qualifications and experience exceed those of the hypothetical person having ordinary skill in the art defined above, my analysis and opinions regarding the '247 patent have been based on the perspective of a person of ordinary skill in the art as of June 2011.

III. STATEMENT OF LEGAL PRINCIPLES

A. Claim Construction

15. I understand that a purpose of claim construction is to determine what a person of ordinary skill in the art would have understood the claim terms to mean. Claim terms are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art in question as of the effective filing date.

16. I understand that the person of ordinary skill in the art is deemed to read a claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. I understand that the patent specification has been described as the single best guide to the meaning of a claim term, and is thus highly relevant to the interpretation of claim terms. And I understand for terms that do not have a customary meaning within the art, the specification usually supplies the best context for understanding the meaning of those terms.

17. I further understand that other claims of the patent in question, both asserted and unasserted, can be valuable sources of information as to the meaning of a claim term. Because the claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the

same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.

18. I understand that the prosecution history can further inform the meaning of the claim language by demonstrating how the inventors understood the invention and whether the inventors limited the invention during prosecution, making the claim scope narrower than it otherwise would be. Extrinsic evidence, such as dictionaries, may also be consulted in construing the claim terms.

19. I understand that, in *Inter Partes* Review (“IPR”) proceedings, a claim of a patent shall be construed using the same claim construction standard that would be used to construe the claim in a civil action filed in a U.S. district court (which I understand is called the “*Phillips*” claim construction standard), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

20. I have been instructed by counsel to apply the “*Phillips*” claim construction standard for purposes of interpreting the claims in this proceeding, to the extent they require an explicit construction. The description of the legal principles set forth above thus provides my understanding of the “*Phillips*” standard as provided to me by counsel.

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21. I understand that the parties dispute the meaning of certain claim terms in the challenged claims in the related pending litigation, as shown in the following table:

Claim Term	Defendants' (Petitioner) Proposed Construction	Plaintiffs' (Patent Owner) Proposed Construction
"support"	a structure that limits movement in a direction	<i>No construction required</i>
"inner wall"	internal upright or vertical structure enclosing a space	<i>No construction required</i>

I also understand that the parties have agreed to the following constructions:

Claim Term	Agreed Construction
"connector" (claim 13)	<i>The first instance of "<u>the connector</u>" should be construed as "<u>a connector</u>" and vice versa.</i>
"the housing" (claim 19)	<u>a</u> housing

22. For purposes of my analysis here, I do not believe express claim constructions are necessary because the prior art renders the claims obvious under any reasonable construction. In some instances below, I have referred to embodiments in the written description of the '247 patent to provide background or explanation regarding certain limitations in the claims, and/or to confirm that the prior art discloses those claim limitations by disclosing the same techniques used in the embodiments of the '247 patent. These references to the '247 patent written

description are not intended to suggest the need for any express claim construction, or any particular construction, but are merely intended to demonstrate that a person of ordinary skill in the art would have found that the prior art discloses and renders obvious the claim limitations, under any reasonable construction.

B. Obviousness (§ 103)

23. I understand that a patent claim is obvious if, as of the effective filing date, it would have been obvious to a person having ordinary skill in the field of the technology (the “art”) to which the claimed subject matter belongs.

24. I understand that the following factors should be considered in analyzing obviousness: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims; and (3) the level of ordinary skill in the pertinent art. I also understand that certain other facts known as “secondary considerations” such as commercial success, unexplained results, long felt but unsolved need, industry acclaim, simultaneous invention, copying by others, skepticism by experts in the field, and failure of others may be utilized as indicia of nonobviousness. I understand, however, that secondary considerations should be connected, or have a “nexus,” with the invention claimed in the patent at issue.

25. I understand that a reference qualifies as prior art for obviousness purposes when it is analogous to the claimed invention. The test for determining

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what art is analogous is: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

26. I understand that a person of ordinary skill in the art is assumed to have knowledge of all the relevant prior art. I understand that one skilled in the art can combine various prior art references based on the teachings of those prior art references, the general knowledge present in the art, or common sense. I understand that a motivation to combine references may be implicit in the prior art, and there is no requirement that there be an actual or explicit teaching to combine two references. Thus, one may take into account the inferences and creative steps that a person of ordinary skill in the art would employ to combine the known elements in the prior art in the manner claimed by the patent at issue. I understand that one should avoid "hindsight bias" and *ex post* reasoning in performing an obviousness analysis. But this does not mean that a person of ordinary skill in the art for purposes of the obviousness inquiry does not have recourse to common sense.

27. I understand that when determining whether a patent claim is obvious in light of the prior art, neither the particular motivation for the patent nor the stated purpose of the patentee is controlling. The primary inquiry has to do with the

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objective reach of the claims, and if those claims extend to something that is obvious, then the entire patent claim is invalid.

28. I understand one way that a patent can be found obvious is if there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I understand that a motivation to combine various prior art references to solve a particular problem may come from a variety of sources, including market demand or scientific literature. I understand that a need or problem known in the field at the time of the invention can also provide a reason to combine prior art references and render a patent claim invalid for obviousness. I understand that familiar items may have obvious uses beyond their primary purpose, and that a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like the pieces of a puzzle. I understand that a person of ordinary skill is also a person of at least ordinary creativity. I understand when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this finite number of predictable solutions leads to the anticipated success, I understand that the invention is likely the product of ordinary skill and common sense, and not of any sort of innovation. I understand that the fact that a

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combination was obvious to try might also show that it was obvious, and hence invalid, under the patent laws. I understand that if a patent claims a combination of familiar elements according to known methods, the combination is likely to be obvious when it does no more than yield predictable results. Thus, if a person of ordinary skill in the art can implement a predictable variation, an invention is likely obvious. I understand that combining embodiments disclosed near each other in a prior art reference would not ordinarily require a leap of inventiveness.

29. I understand that obviousness may be shown by demonstrating that it would have been obvious to modify what is taught in a single piece of prior art to create the patented invention. Obviousness may also be shown by demonstrating that it would have been obvious to combine the teachings of more than one item of prior art. I understand that a claimed invention may be obvious if some teaching, suggestion, or motivation exists that would have led a person of ordinary skill in the art to combine the invalidating references. I also understand that this suggestion or motivation may come from the knowledge of a person having ordinary skill in the art, or from sources such as explicit statements in the prior art. I understand that when there is a design need or market pressure, and there are a finite number of predictable solutions, a person of ordinary skill may be motivated to apply common sense and his skill to combine the known options in order to solve the problem.

30. I understand the following are examples of approaches and rationales that may be considered in determining whether a piece of prior art could have been combined with other prior art or with other information within the knowledge of a person having ordinary skill in the art:

- (1) Some teaching, motivation, or suggestion in the prior art that would have led a person of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention;
- (2) Known work in one field of endeavor may prompt variations of it for use in the same field or a different field based on design incentives or other market forces if the variations would have been predictable to a person of ordinary skill in the art;
- (3) Combining prior art elements according to known methods to yield predictable results;
- (4) Applying a known technique to a known device, method, or product ready for improvement to yield predictable results;
- (5) Applying a technique or approach that would have been “obvious to try” (choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success);

(6) Simple substitution of one known element for another to obtain predictable results; or

(7) Use of a known technique to improve similar products, devices, or methods in the same way.

31. I understand that, when determining whether a claimed combination is obvious, the correct analysis is not whether one of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I understand the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

32. I understand that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. The test for obviousness, in other words, is not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.

IV. THE '247 PATENT

A. Overview of the Specification

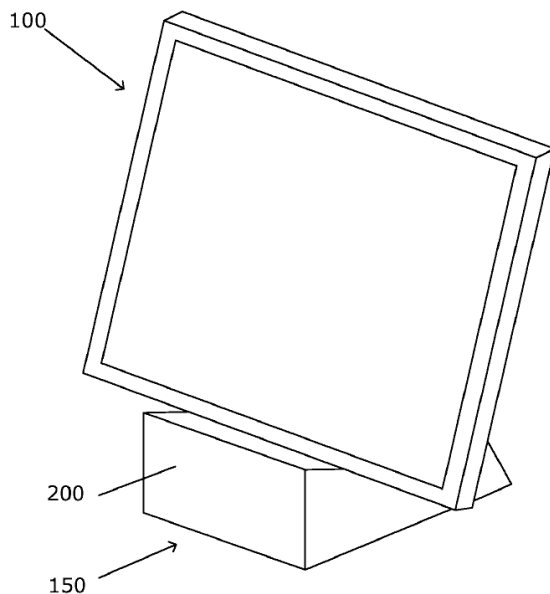
33. The '247 patent, entitled "Dock for a Portable Electronic Device," states that it "relates to charging and/or data transfer docks for portable electronic

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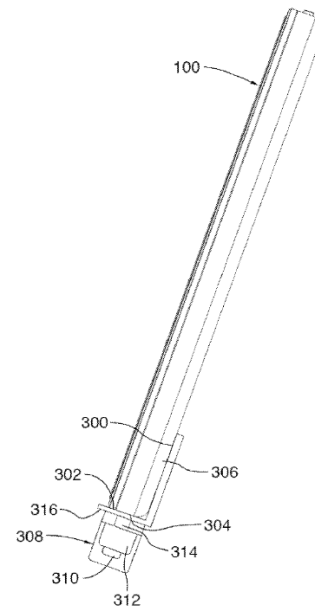
devices.” (’247, 1:14-15.) The patent acknowledges that docks for portable devices were well known as of the filing date, noting that “[p]ortable electronic devices are often placed in docks for charging or data transfer including transfer of information in any form optically or electrically from dock to portable electronic device and vice versa” and that “[s]ome docks are capable of both charging and data transfer.” (*Id.*, 1:32-36.) According to the patent, however, “[d]ocks and portable electronic devices are susceptible to damage due to connection attempts when the portable electronic device and the dock are not properly aligned.” (*Id.*, 1:36-39.) The ’247 patent thus purports to describe a “dock [that] includes a support for a connector including an elastically deformable portion for allowing movement of the connector relative to the dock when a force is applied.” (*Id.*, 2:14-18.)

34. Figures 2 and 3, reproduced below, depict “[a]n example dock **150** for receiving a portable electronic device **100**.” (’247, 3:64-65.)

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(*Id.*, Fig. 2.)

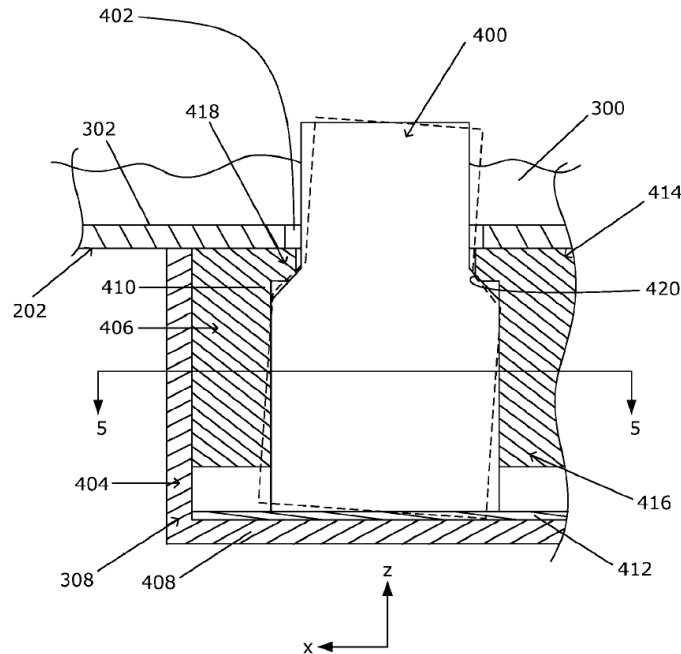


(*Id.*, Fig. 3.)

As shown in Figure 2 above, “[t]he dock **150** includes a housing **200** that is shaped to receive the portable electronic device **100**.” (*Id.*, 3:65-67.) “The housing may be a single part or may be an assembly of multiple parts.” (*Id.*, 4:16-17.) As shown in Figure 3, “[t]he dock **150** includes a connector support assembly **308** that is coupled to an inner surface of the housing **200**.” (*Id.*, 4:18-19.) “In one example, screws **310** couple lugs **312** of the support assembly **308** to screw-receiving components **314**, which extend from an underside surface **316** of the seat **302**, to couple the support assembly **308** to the housing **200**.” (*Id.*, 4:27-31.)

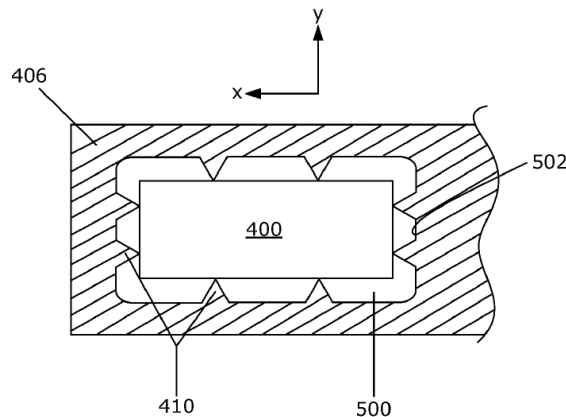
35. As shown in Figure 4, reproduced below, “the connector support assembly **308** receives a connector **400**.” (’247, 4:32-33.)

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(*Id.*, Fig. 4.) “The connector **400** may be a charging connector, a data connector or a connector capable of both charging and data transfer.” (*Id.*, 4:33-35.) “A connecting portion of the connector **400** extends through an aperture **402**, which is located in the seat **302**.” (*Id.*, 4:37-39.) “The connector support assembly **308** includes a support **404**, a spring component **406**, which is received in the support **404**, and a flexible pad **412**, which is located on a base **408** of the support **404**.” (*Id.*, 4:51-54.)

36. Referring to Figure 5, reproduced below, the patent further states that “[t]he spring component **406** includes a passage **500**... for receiving the connector **400**.” (’247, 4:60-61.)



(*Id.*, Fig. 5.) “The passage **500** extends between a top end **414** of the spring component **406** and a bottom end **416** of the spring component **406**.” (*Id.*, 4:61-64.) “A collar **418** is located at the top end **414** of the spring component **406** and ribs **410** extend from an inner wall **502** of the passage **500**.” (*Id.*, 4:64-66.) The collar **418** “includes a contact surface **420**, which abuts the connector **400** to limit translation of the connector **400** in the x and y directions” and “may fully or partially surround the connector **400**.” (*Id.*, 4:66-5:2.) “The spring component **406** is made from a flexible material such as silicone rubber, urethane rubber or cork, for example.” (*Id.*, 5:23-24.) “Although the collar **418** is shown as part of the spring component **406**, the collar **418** may alternatively form part of the seat **302**.” (*Id.*, 6:11-13.)

37. I discuss additional aspects of the '247 patent in my analysis of the claims below.

B. The Challenged Claims

38. This Declaration addresses claims 1-2, 6, 11, 13, 15-16 and 19 (the

“challenged claims”) of the ’247 patent. Independent claim 1 is representative and recites:

1. A dock for receiving a portable electronic device, comprising:
 - [a] a housing comprising an aperture;
 - [b] a support coupled to an inner wall of the housing, a portion of the support being elastically deformable;
 - [c] a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device; and
 - [d] a collar abutting the connector within the housing to limit translation of the connector, the connector being pivotable relative to the collar;
 - [e] wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.

(’247, 9:32-47 (Claim 1; bracketed notation (*e.g.*, [a]) added).)

39. I address the claims further in my detailed analysis in **Part V** below.

V. APPLICATION OF THE PRIOR ART TO CHALLENGED CLAIMS

40. I have reviewed and analyzed the prior art references and materials listed in **Part I.B** above. In my opinion the challenged claims of the ’247 patent would have been obvious to a person of ordinary skill in the art based on the

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following ground:

Ground	Claims	Basis for Challenge Under § 103
1	1-2, 6, 11, 13, 15-16 and 19	Tsutsui (EX1003/EX1004)

41. I am informed by counsel that the reference cited in the ground listed above qualifies as prior art to the challenged claims because it was published before the earliest filing date to which the '247 patent can claim priority (June 30, 2011).

A. Brief Summary and Overview of Prior Art

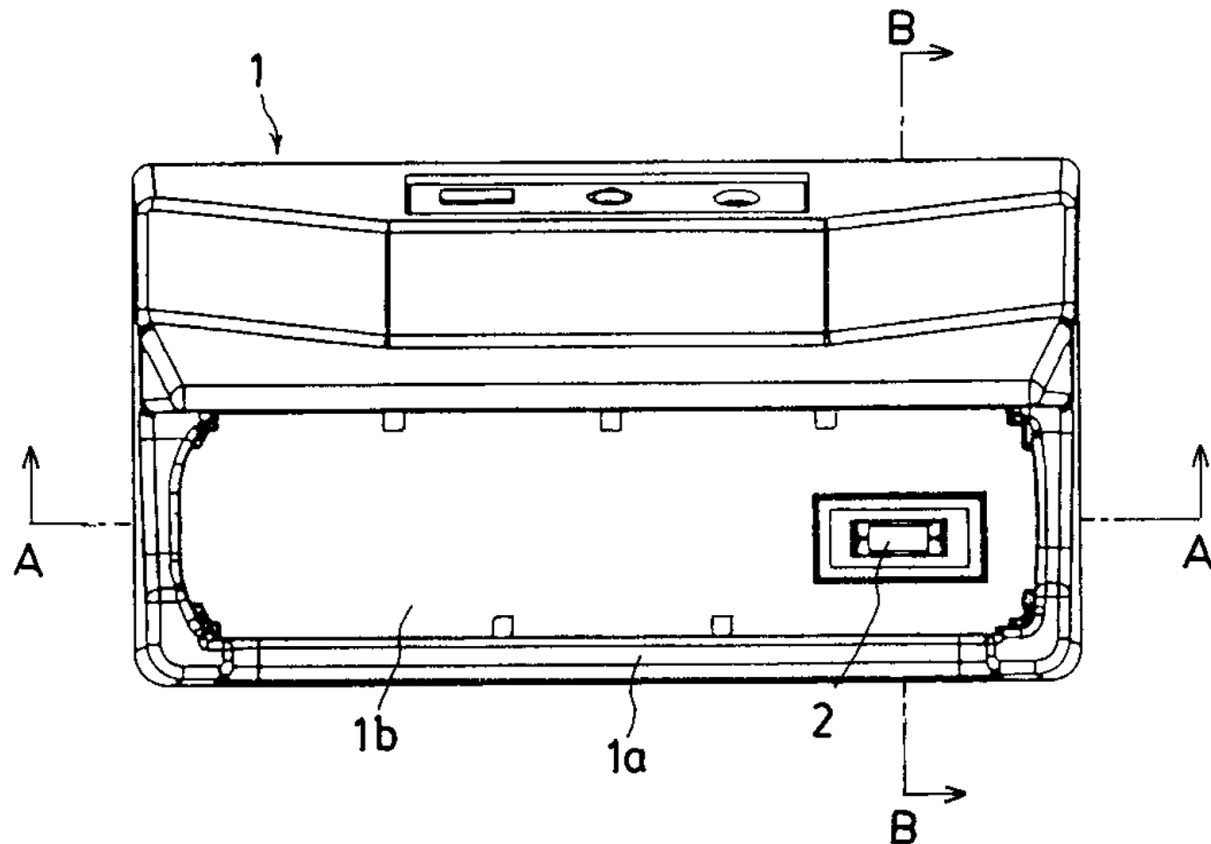
1. Tsutsui (EX1003/1004)

42. **Tsutsui**, Japanese Laid-Open Application No. JP2005085593A to Noritaka Tsutsui, discloses a cradle and connector system for mounting an electronic device. I am informed by counsel that Tsutsui qualifies as prior art to the challenged claims because it was published on March 31, 2005, several years before the priority date of the '247 patent. I have also been provided with a certified Japanese translation of Tsutsui (**Exhibit 1004**). My Declaration will therefore cite to the Japanese translation in my discussion below when quoting from the reference.

43. Tsutsui discloses aspects of a mounting system for a portable electronic device, such as a digital camera. (Tsutsui, Abstract.) Tsutsui explains that “[c]onventionally, cradles are known on which are mounted electronic devices such as a digital camera, which serve as stands for the electronic devices, and which are

provided with a connector to establish an electrical connection with the electronic device mounted thereon, enabling charging of the electronic device and data exchange with a computer, etc.” (*Id.*, [0002].) Tsutsui explains that, in the prior art, “even when the electronic device is mounted in the cradle while being positioned, misalignment may occur between the socket portion on the electronic device side and the connector on the cradle side during typical handling.” (Tsutsui, [0004].) Tsutsui states that “a technical problem to be solved arises in order to prevent damage to the connector while ensuring a reliable electrical connection, and an object of the present invention is to solve this problem.” (*Id.*, [0005].)

44. Tsutsui discloses a “connector float mechanism in a cradle [of] an electronic device,” in which “a flange portion is formed on the outer periphery of the connector, the flange portion is covered with a cushioning member, and the cushioning member is fixed to the cradle body.” (Tsutsui, [0006].) Figure 1 shows a top view of an embodiment of the disclosed electronic device cradle:

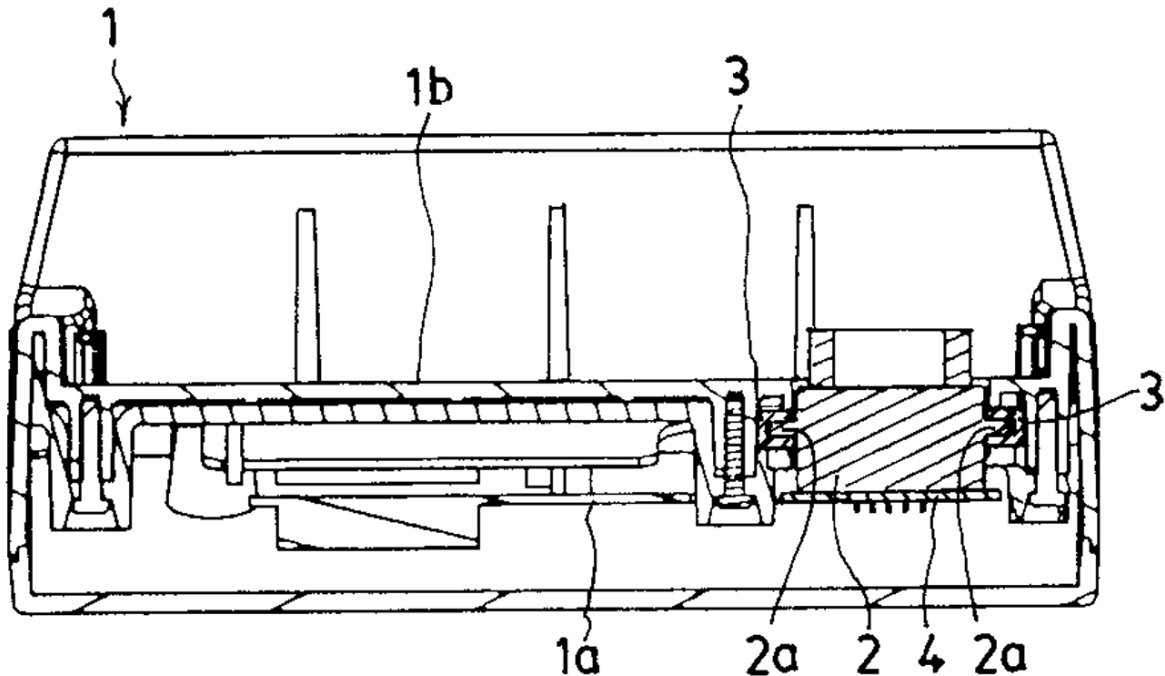


(*Id.*, Fig. 1.)

45. Figure 1 above shows cradle **1** that includes cradle body **1a**, which includes mounting platform **1b** for mounting an electronic device such as a digital camera. (Tsutsui, [0022]-[0023].) Connector **2** is provided in a particular position on mounting platform **1b**. (*Id.*) “The connector 2 has the function of a plug, and the electronic device mounted on the mounting platform 1b is provided with a socket portion (connection portion) into which the connector 2 fits.” (*Id.*, [0022].)

46. The “A” and “B” lines shown in Figure 1 are used to define cross-sectional views shown in Figures 2 and 3, respectively. (Tsutsui, [0022].) For

example, Figure 2 shows a cross-sectional view of Figure 1 along the “A-A” line:



(*Id.*, Fig. 2, [0022].)

47. Figure 2 shows a cross-sectional view of cradle 1 with connector 2 from Figure 1, but showing additional components. Connector 2 is connected to printed wiring board 4, which has conductors to connect to external devices such as a computer via a cable attached to cradle 1. (Tsutsui, [0025], [0022].) A key aspect of Tsutsui, and shown in Figure 2, is flange portion 2a of connector 2, which is covered by cushioning member 3. (*Id.*, [0022].)

48. The purpose of the flange and cushioning member, according to Tsutsui, is to absorb “any misalignment that occurs between the connection portion and the connector,” thus “preventing damage to the connector while ensuring a

reliable electrical connection.” (Tsutsui, [0016]; *see also id.*, [0027] (“Therefore, a smooth fitting between the socket portion of the electronic device and the connector 2 becomes possible, and damage to the connector 2 is prevented, thus ensuring a reliable electrical connection.”).) This is because the cushioning member may be made from a rubber- or urethane-based material, and “by using a rubber-based material or a urethane-based material with excellent elasticity as the cushioning member, when establishing an electrical connection between the electronic device and the connector in the cradle, the stress applied to the connector due to misalignment between the connection portion of the electronic device and the connector is adequately absorbed by the cushioning member.” (*Id.*, [0009] (emphasis added).)

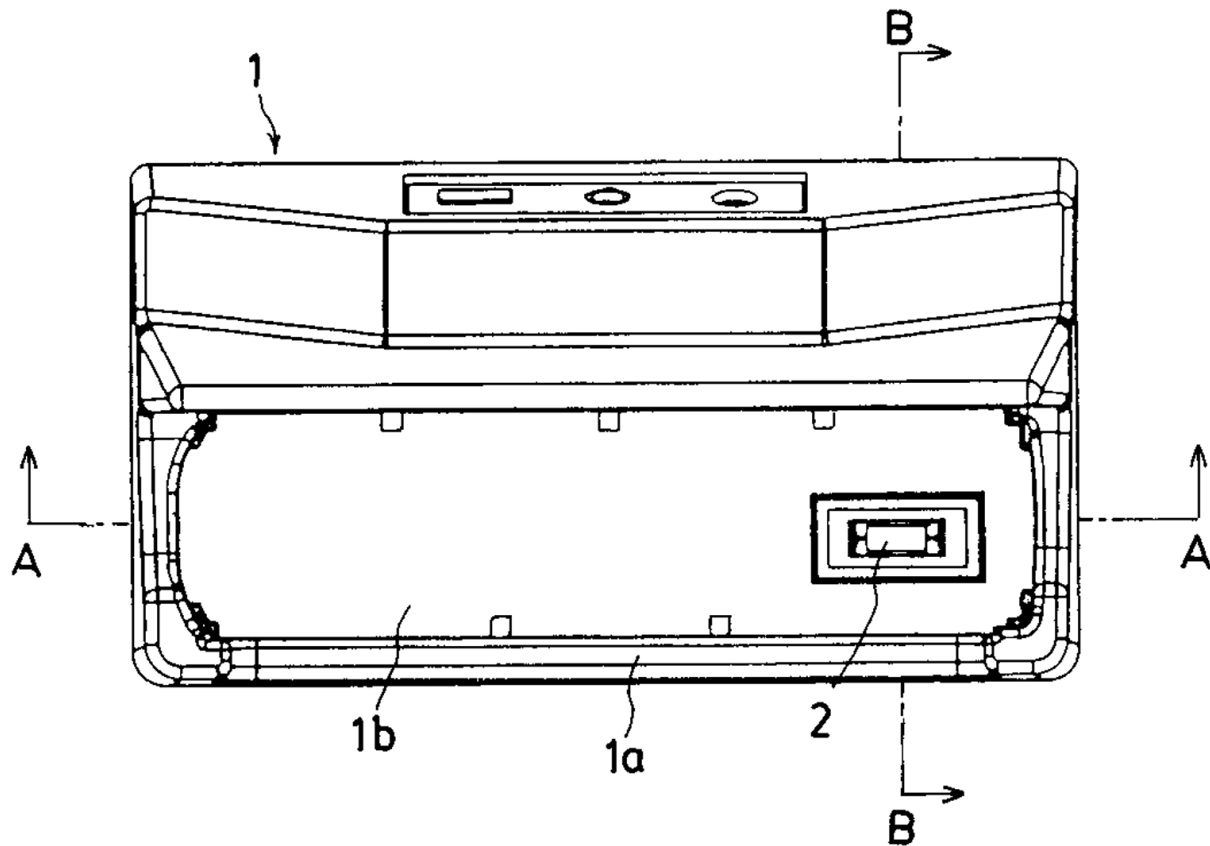
49. I will provide more details about Tsutsui in my discussion of the claim limitations below. In my opinion, Tsutsui provides a level of detail sufficient to have enabled a person of ordinary skill in the art to have practiced the techniques described therein and to construct the disclosed cradle, without undue experimentation, as of at least the priority date of the challenged claims. As noted above, Tsutsui confirms that as of its March 2005 publication date (several years before the ’247 patent filing date), docks or cradles for charging portable electronic devices were known in the art. (Tsutsui, [0002]-[0003].) A person of ordinary skill

in the art would have appreciated that the technical solution provided by Tsutsui would have been implemented using existing materials and components incorporated into a dock using conventional assembly techniques. A person of ordinary skill in the art would have had more than a reasonable expectation of success in using the disclosures in Tsutsui, cited and relied upon in my analysis below, to arrive at the claimed invention.

B. Ground 1: Claims 1-2, 6, 11, 13, 15-16 and 19 Are Obvious Over Tsutsui.

1. Independent Claim 1: “A dock for receiving a portable electronic device, comprising:” (1[pre])

50. I understand that, in patent law, there are instances when the preamble of a claim is not treated as a claim limitation. I need not address this issue because, even assuming the preamble is limiting, Tsutsui discloses a **“dock for receiving a portable electronic device,”** in the form of a cradle in which a portable electronic device such as a digital camera can be mounted. (Tsutsui, [0002] (“Conventionally, cradles are known on which are mounted electronic devices such as a digital camera, which serve as stands for the electronic devices, and which are provided with a connector to establish an electrical connection with the electronic device mounted thereon, enabling charging of the electronic device and data exchange with a computer, etc.”).) Figure 1 shows one embodiment of the disclosed cradle:



(*Id.*, Fig. 1.)

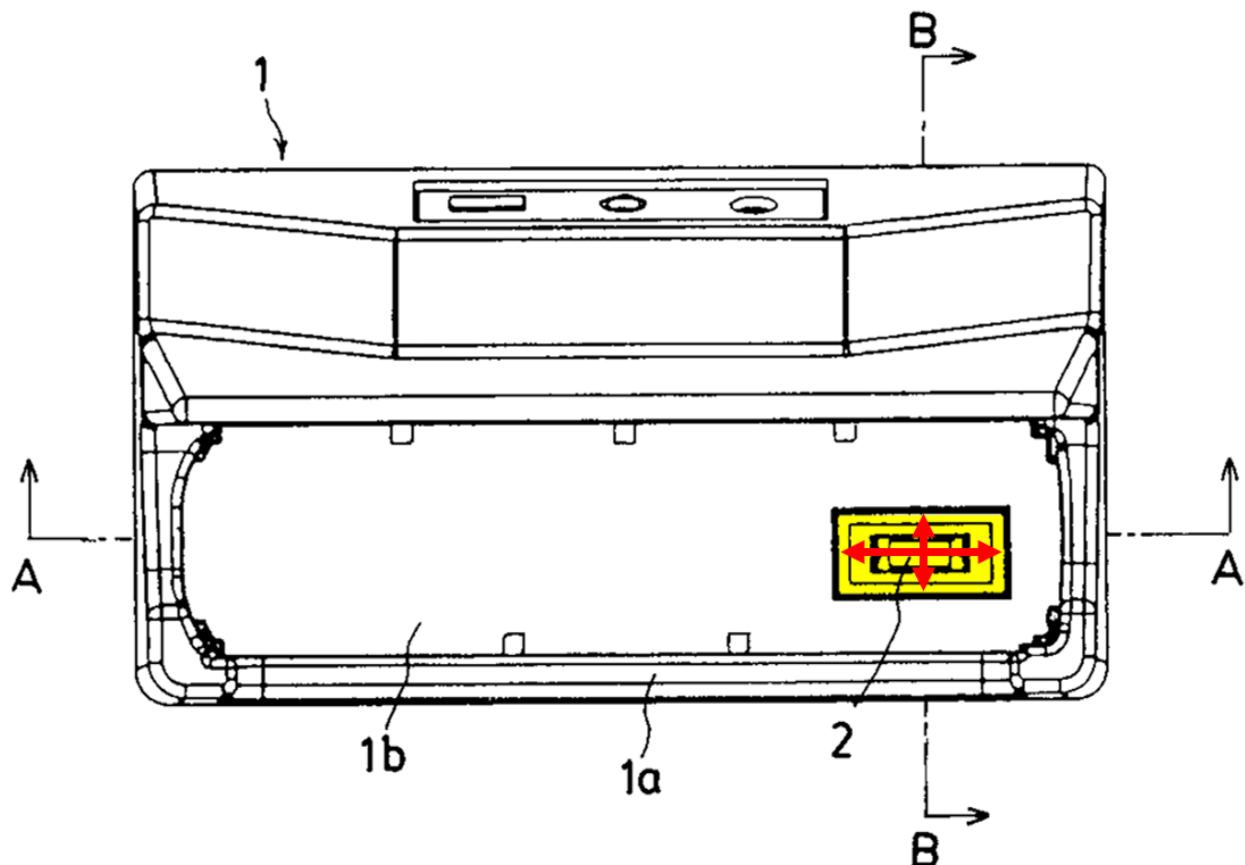
51. Figure 1 above shows cradle **1** that includes cradle body **1a** that, in turn, includes mounting platform **1b** for mounting an electronic device such as a digital camera. (Tsutsui, [0022]-[0023].) Mounting platform **1b**, as also shown, includes connector **2**. (*Id.*) “The connector 2 has the function of a plug, and the electronic device mounted on the mounting platform 1b is provided with a socket portion (connection portion) into which the connector 2 fits.” (*Id.*, [0022].) “When an electronic device such as a digital camera is mounted in the cradle 1 while being positioned by the outer shape thereof, and an electrical connection is established via

the connector 2[.]” (*Id.*, [0027] (emphasis added).) Tsutsui therefore discloses a “**dock for receiving**” an electronic device. The electrical connection described in the preceding sentence can provide charging capability and/or data exchange with a computer. (*Id.*, [0002]-[0003].)

52. Tsutsui also discloses, and it would have been obvious to a person of ordinary skill in the art, that the electronic device received in the cradle in Tsutsui would have been a “**portable**” electronic device. As noted above, Tsutsui discloses, for example, that the cradle can receive a “digital camera.” (Tsutsui, [0022]-[0023].) The ’247 patent expressly identifies a digital camera as an example of a portable electronic device, (’247, 2:56-60), and moreover, a skilled artisan would have immediately recognized a digital camera as a well-known example of a portable electronic device. Tsutsui also discloses that cradles are known for “enabling charging of the electronic device” and “data exchange with a computer,” (Tsutsui, [0002]), which indicate that the electronic device may be battery-powered and need not be connected to a computer system, properties commonly associated with “**portable**” electronic devices. For all of these reasons, therefore, Tsutsui discloses and renders obvious “[a] **dock for receiving a portable electronic device,**” as recited in the preamble.

(a) “a housing comprising an aperture;” (1[a])

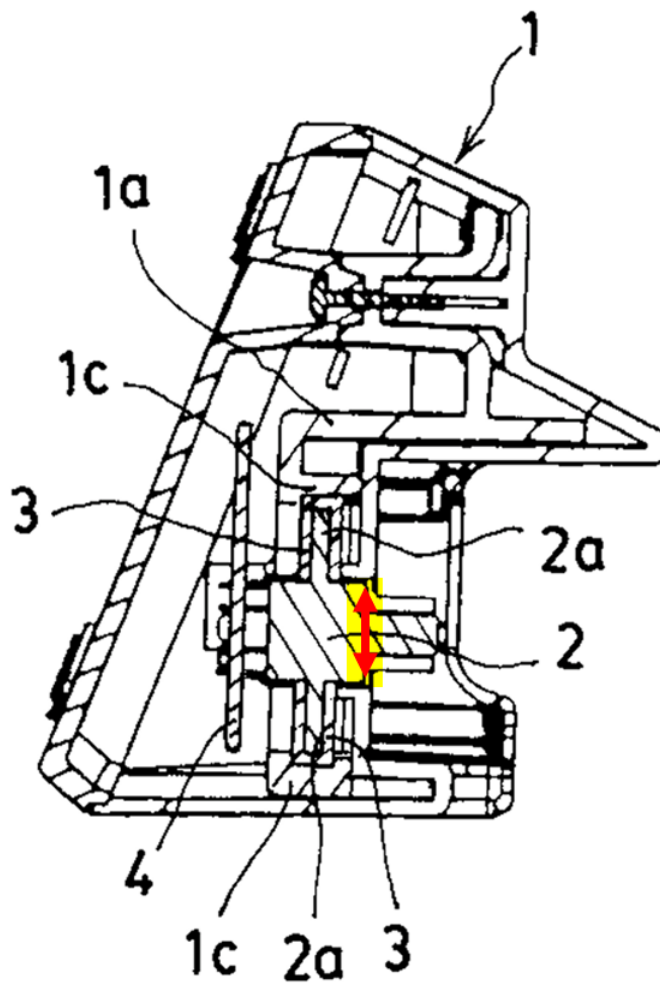
53. Tsutsui discloses a “housing” in the form of the cradle body **1a**, shown in Figure 1 reproduced below, which in turn includes mounting platform **1b**. Tsutsui further discloses that cradle body **1a** includes an “aperture,” *e.g.*, an opening in the housing that provides access to connector **2**. Referring again to Figure 1:



(Tsutsui, Fig. 1 (annotation added indicating extent of housing opening for connector 2).)

54. Figure 1 above shows cradle **1** that includes cradle body **1a** (“housing”) which, as explained, includes mounting platform **1b** that includes an opening for

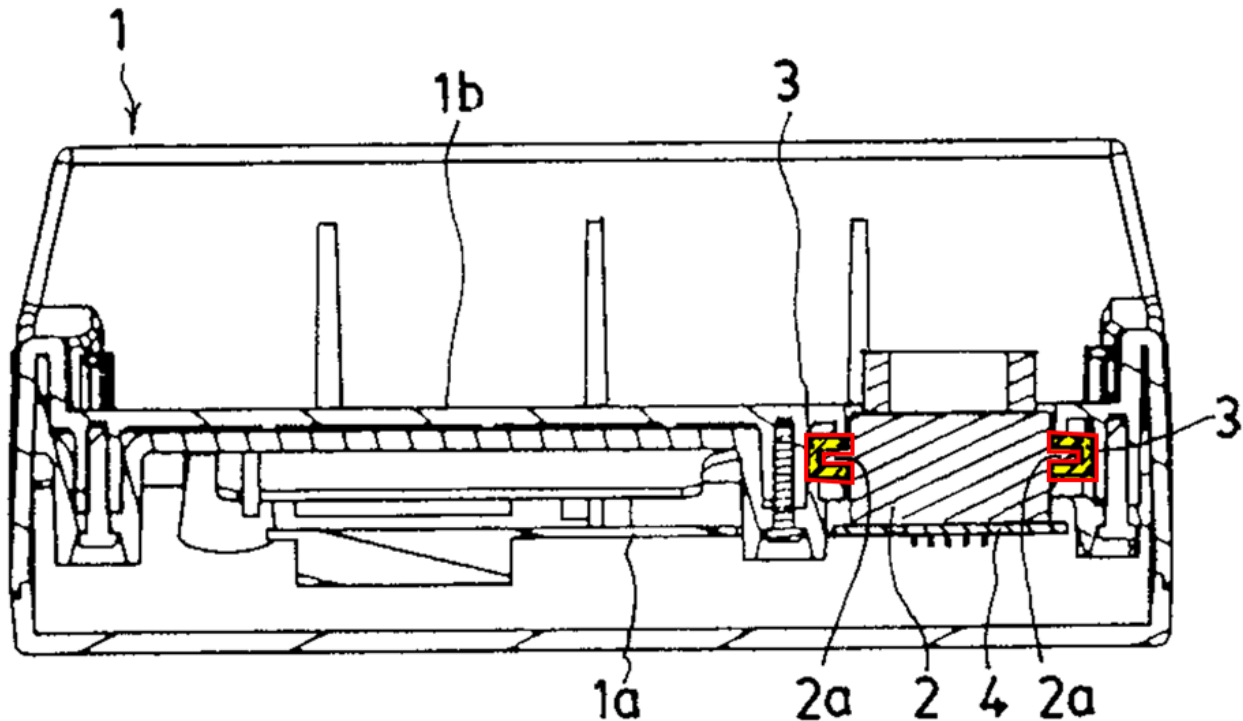
providing access to connector 2. (Tsutsui, [0022]-[0023].) “The connector 2 has the function of a plug, and the electronic device mounted on the mounting platform 1b is provided with a socket portion (connection portion) into which the connector 2 fits.” (*Id.*, [0022].) As noted, the connector **2** in Figure 1 is accessible through an opening (“**aperture**”) in the mounting platform **1b** of cradle body **1a**. This aperture and connector **2** are further shown in Figure 3, which shows a cross-sectional view of Figure 1 along the B-B line of Figure 1:



(*Id.*, Fig. 3 (annotation added indicating extent of housing opening for connector **2**), [0022].) Figure 3 shows cradle body **1a**, which also shows an opening for providing access to connector **2**. The connector body is oriented within the aperture by flanges on the connector body which are retained within an elastic medium which allows connector movement within the aperture. “Specifically, a flange portion 2a is formed on the outer periphery of the connector 2, and the entire flange portion 2a is covered with a cushioning member 3, with only the peripheral portion of the cushioning member 3 fixed to the cradle body 1a by a resin mold 1c (see Figure 3).” (*Id.*, [0022] (emphasis added).) Based on all of these disclosures, Tsutsui discloses cradle body **1a** (the “**housing**”) includes an “**aperture**” as claimed.

(b) “a support coupled to an inner wall of the housing, a portion of the support being elastically deformable;”
(1[b])

55. Tsutsui discloses a “**support**” in the form of cushioning member **3** discussed above, which is a rubber- or urethane-based material that is “**elastically deformable**,” as explained in more detail below. Referring to Figure 2, which shows a cross-sectional view of cradle **1** of Figure 1 along the “A-A” line:



(Tsutsui, Fig. 2, [0022] (annotation added to indicate cushioning member 3 (“a support”))).) As Tsutsui explains and as noted above, “a flange portion 2a is formed on the outer periphery of the connector 2, and the entire flange portion 2a is covered with a cushioning member 3, with only the peripheral portion of the cushioning member 3 fixed to the cradle body 1a by a resin mold 1c[.]” (*Id.*, [0022].) It is this assembly that allows movement of the connector 2 within the aperture, as explained below.

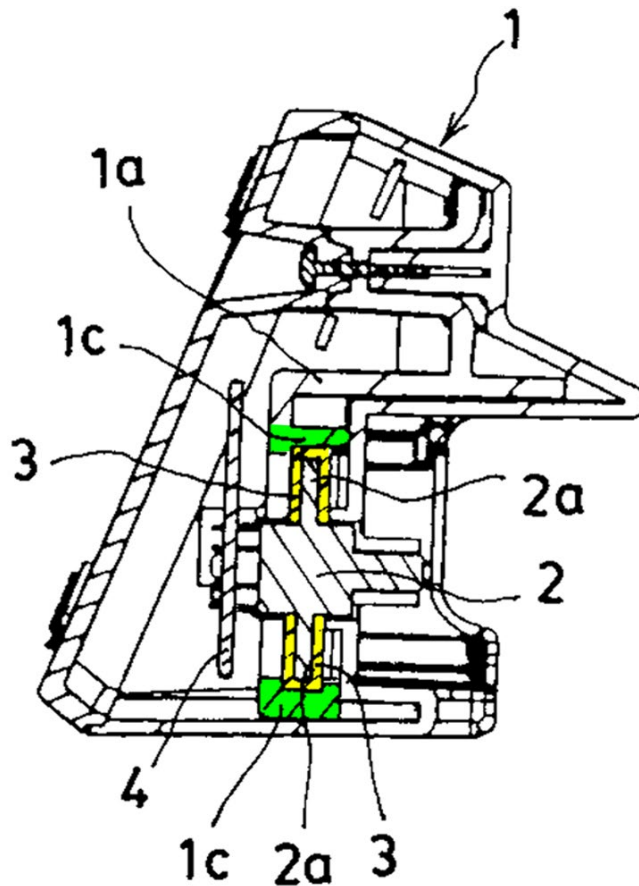
56. The cushioning member in Tsutsui provides a “**support**” as claimed. I am informed that in pending litigation, Petitioner has proposed that “**support**” be construed as “*a structure that limits movement in a direction,*” and that Patent Owner does not believe a construction is required. Patent Owner’s claim construction

expert in the pending litigation has stated that, in his opinion, a “**support**” is simply “a structure that helps to keep something (in this case, the connector) in some desired orientation, in other words something that ‘supports.’” (EX1006, ¶9.) The cushioning member **3** in Tsutsui satisfies these constructions, or any other reasonable construction, because it supports the connector and limits its movement in a direction, for example, by limiting movement when the connector is being fitted to the connection or socket portion of the electronic device when the electronic device is inserted into the cradle. This is because cushioning member is constructed of elastically deformable material (as discussed below), which will resist external forces and attempt to return to its original shape. For example, Tsutsui explains that the purpose of cushioning member **3** is to “absorb[]” any stress caused by misalignment between connector **2** and the connection or socket portion of the electronic device. (*E.g.*, Tsutsui, [0027], [0007].) “Therefore, a smooth fitting between the connection portion of the electronic device and the connector becomes possible, and a reliable electrical connection is achieved.” (*Id.*, [0007].)

57. Tsutsui further confirms that at least a portion of the cushioning member is “**elastically deformable**,” as claimed. This is because cushioning member **3** may be made from a rubber- or urethane-based material, and “by using a rubber-based material or a urethane-based material with excellent elasticity as the

cushioning member, when establishing an electrical connection between the electronic device and the connector in the cradle, the stress applied to the connector due to misalignment between the connection portion of the electronic device and the connector is adequately absorbed by the cushioning member.” (Tsutsui, [0009] (emphasis added).)

58. The cushioning member **3** is also “**coupled to an inner wall of the housing,**” as claimed. Referring again to Figure 3:



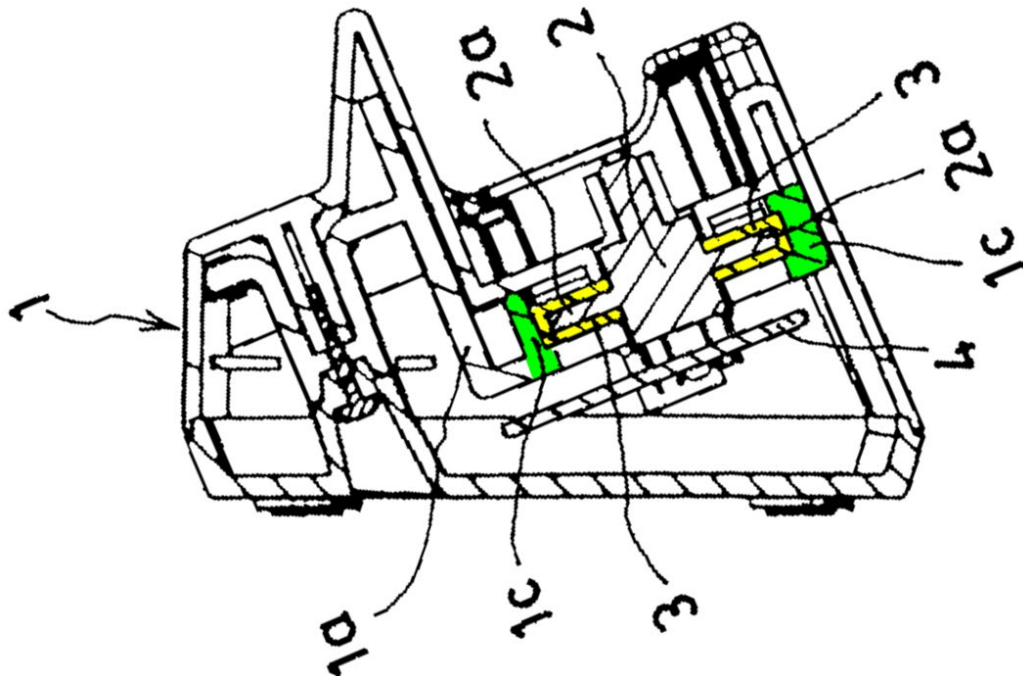
(Tsutsui, Fig. 3 (annotation added), [0022].) Figure 3 shows cradle body **1a**,

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connector **2**, flange portion **2a**, and cushioning member **3**. Tsutsui explains that “a flange portion 2a is formed on the outer periphery of the connector 2, and the entire flange portion 2a is covered with a cushioning member 3, with only the peripheral portion of the cushioning member 3 fixed to the cradle body 1a by a resin mold 1c (see Figure 3).” (*Id.*, [0022] (emphasis added).) In other words, as illustrated above, resin mold **1c** (in green) couples cushioning member **3** to an interior or inner wall in the cradle body **1a**. The cushioning member is therefore “**coupled to an inner wall**” of cradle body **1a**, as claimed.

59. I am informed that in pending litigation, Petitioner has proposed that this “**inner wall**” be construed as an “*internal upright or vertical structure enclosing a space*,” and that Patent Owner does not believe a construction is required. Patent Owner’s claim construction expert in the pending litigation has stated that, in his opinion, “**inner wall**” should have “its ordinary meaning of the wall of the housing to which a support is coupled.” (EX1006, ¶15.) Tsutsui satisfies these constructions, or any other reasonable construction, because it shows the cushioning member connected to a portion of cradle body **1a** that encloses the space that includes the connector. With respect to the “*internal upright or vertical structure*” requirement proposed by Petitioner, this is shown in Figure 3, which shows the cradle **1a** when flipped on its side. I have shown below Figure 3 rotated approximately 90 degrees

to show the cradle in a more natural position when used:

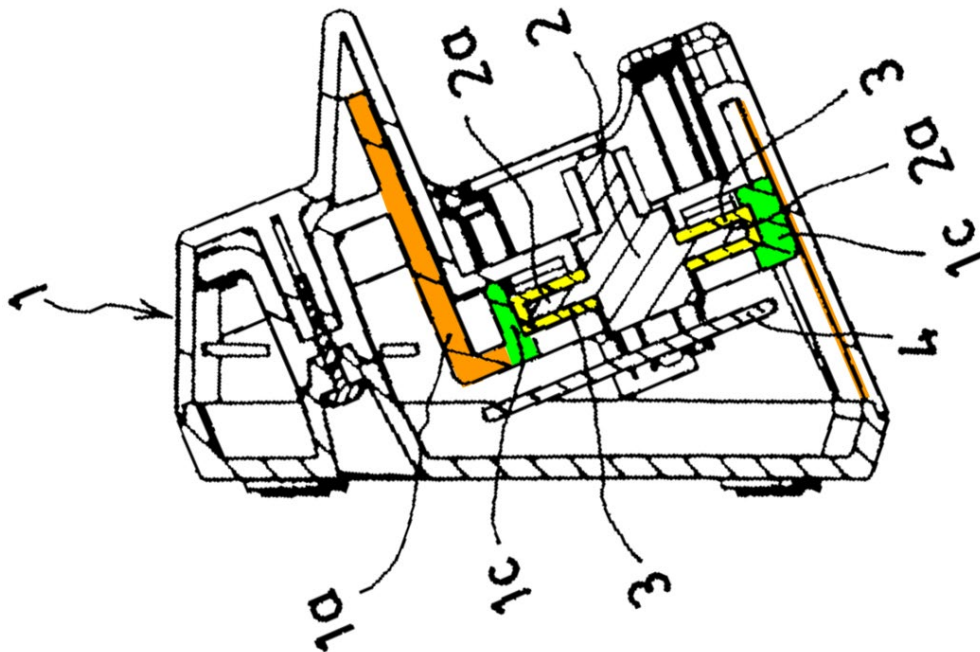


(Tsutsui, Fig. 3 (flipped approximately 90 degrees) (annotations added).) As shown, cushioning member 3 is coupled to the vertical or upright walls of cradle body 1a (via resin mold 1c), which surround and provide an enclosed space for connector 2 and cushioning member 3, thus disclosing coupling to “an inner wall” under Petitioner’s construction. (Tsutsui, [0022]; *see also id.*, [0026] (explaining that cushioning member 3 is “pre-formed as an easily assembled square annular member” whose peripheral portion is “fixed to the cradle body 1a by the resin mold 1c”).)

60. The cushioning member is coupled to an “**inner wall**” of cradle body 1a (“**the housing**”), under two separate and independent theories. First, the

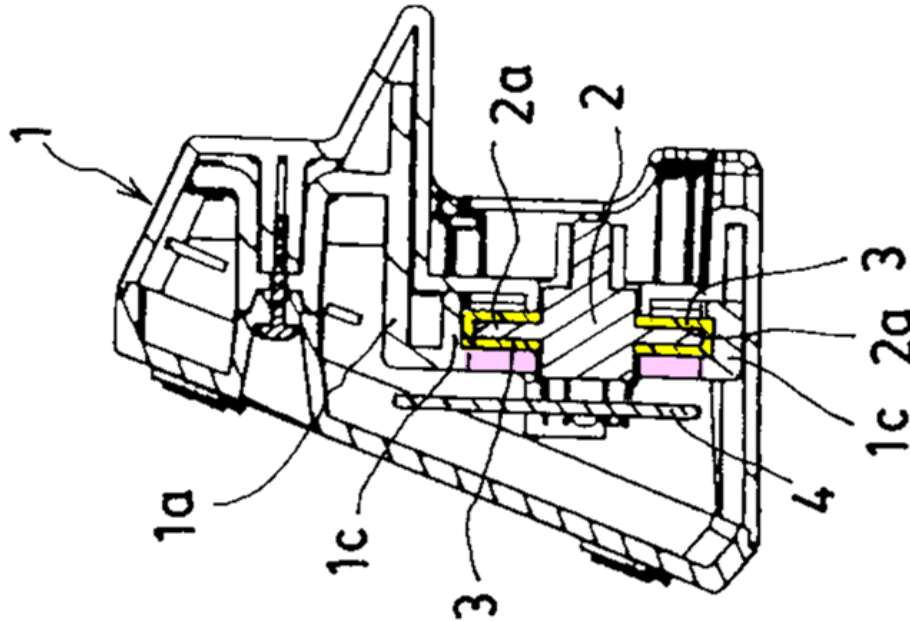
disclosures of Tsutsui quoted above suggest that resin mold **1c** (which makes physical contact with cushioning member **3**) is part of cradle body **1a** (“**the housing**”). Under this reading, resin mold **1c** forms an “**inner wall**” of cradle body **1a**, which is coupled to cushioning member **3**.

61. Second, even if a skilled artisan interprets resin mold **1c** as separate from cradle body **1a**, Tsutsui still discloses this limitation because resin mold **1c** (green) is coupled to cradle body **1a** (orange) as shown below, and thus, resin mold **1c** couples the cushioning member **3** to an “inner wall” of cradle body **1a**:



(Tsutsui, Fig. 3 (flipped approximately 90 degrees) (annotations added).) In either situation, Tsutsui discloses and renders obvious that cushioning member is coupled to an inner wall of cradle body **1a**.

62. Alternatively, the claimed “**support**” in Tsutsui can further include, in addition to cushioning member 3, the portion of cradle body 1a beneath cushioning member 3, as shown with pink highlighting in Figure 3 below:

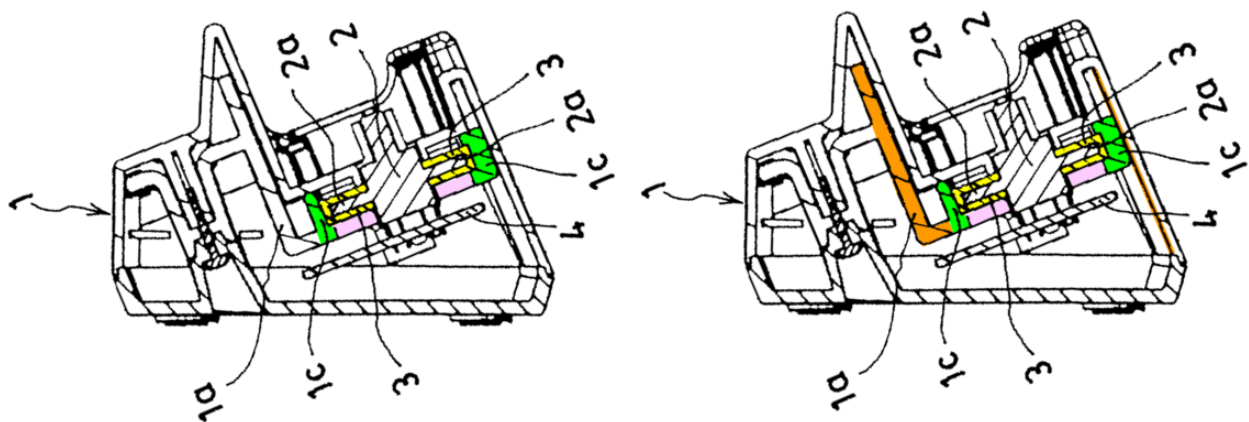


(Tsutsui, Fig. 3 (flipped 90 degrees) (annotations added).)

63. Under this second mapping, cushioning member 3 and portion of cradle body 1a beneath cushioning member 3 provide a “**support**” as claimed because, similar to cushioning member 3 alone under the first mapping, they support the connector and limit its movement in a direction—for example, by limiting movement when the connector is being fitted to the connection or socket portion of the electronic device when the electronic device is inserted into the cradle.

64. And because Tsutsui’s “**support**” under this second mapping also

includes cushioning member 3, Tsutsui discloses both a **“portion of the support being elastically deformable”** and that the support is **“coupled to an inner wall of the housing”** for the reasons discussed for the first mapping. As shown in the figures below, both of the alternative mappings discussed above for the support being **“coupled to an inner wall of the housing”** are consistent with this second mapping. In both cases, the cushioning member 3 is **“coupled to”** an inner wall, and in addition, the support-portion of cradle member 1a is also coupled to that inner wall:

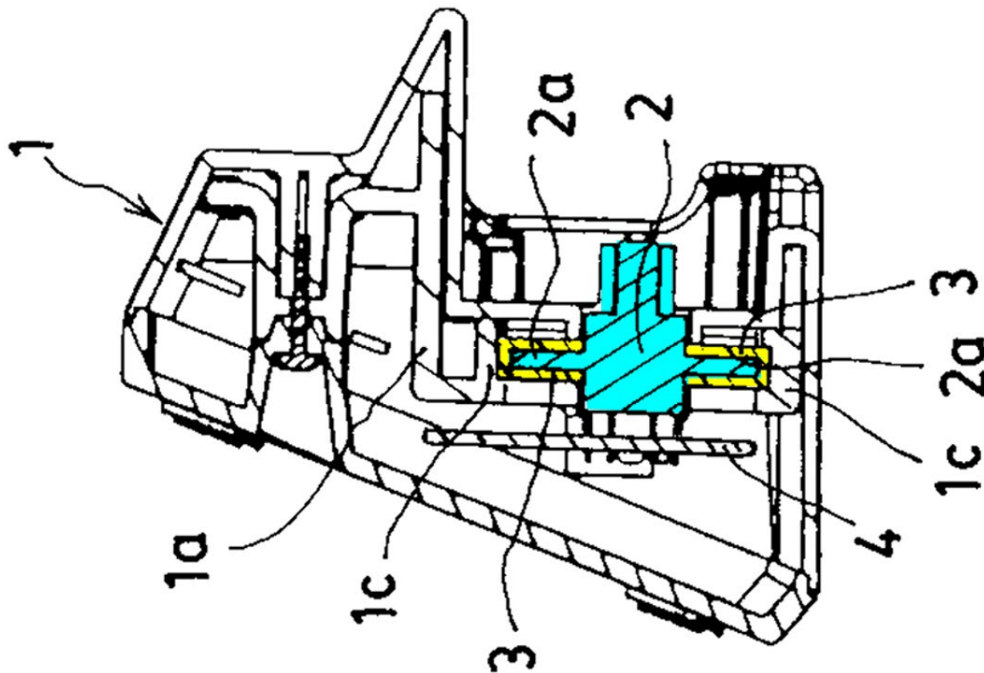


(Tsutsui, Fig. 3 (flipped approximately 90 degrees) (annotations added).)

- (c) **“a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device; and” (1[c])**

65. As explained extensively above, Tsutsui discloses connector 2 (**“a connector”**) received in cushioning member 3 and that extends through the aperture in cradle body 1a (**“received in the support through the aperture”**). Referring

again to Figure 3 of Tsutsui, connector 2 (including its flange portion 2a) is highlighted in blue below:



(Tsutsui, Fig. 3 (rotated; annotation added to indicate connector 2 (in blue) and cushioning member 3 (in yellow), [0022]).) Tsutsui also explains that connector 2 enables “**electrically communicating with the portable electronic device,**” as claimed. Tsutsui discloses, for example, that electronic device cradles are designed to “enable[e] charging of the electronic device and data exchange with a computer, etc.” (*Id.*, [0002].) It would have been obvious and apparent to a person of ordinary skill in the art that these activities involve electrical communication with the portable device.

66. The electrical communication to the portable electronic device occurs

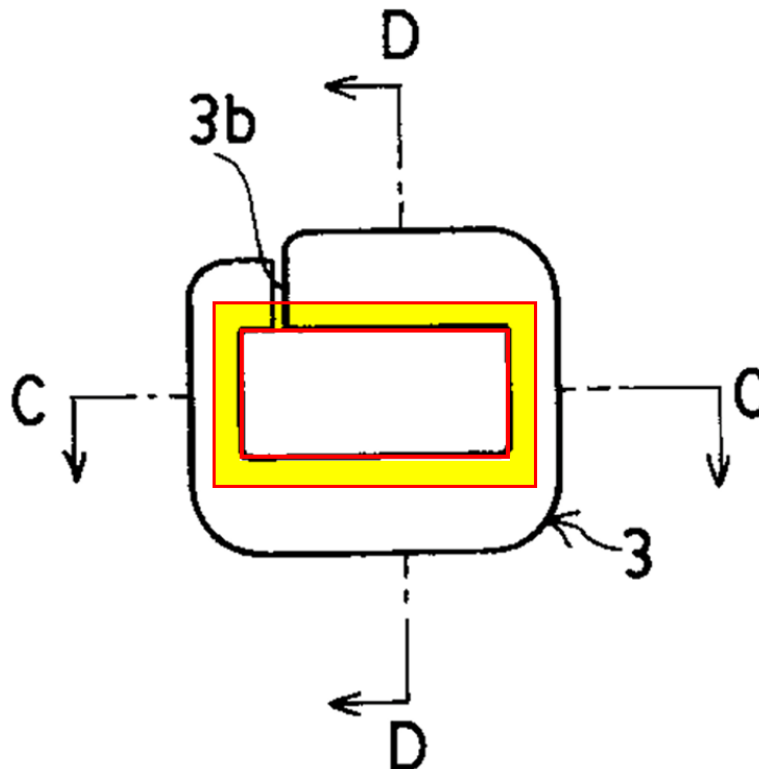
through connector 2, which in an embodiment “has the form of a printed board connector,” with connection terminals that “connect to external devices via printed conductors on the printed wiring board 4 and a cable... attached to the cradle 1.” (Tsutsui, [0025].) Tsutsui therefore discloses “**wiring of the connector for transferring data from the portable electronic device,**” because the wiring of connector 2 to the printed wiring board 4 facilitates communication between a portable electronic device such as a digital camera and an external device such as a computer. (*Id.*, [0003] (“A socket portion (connection portion) provided with terminals for charging and data exchange is provided on the bottom surface of the digital camera serving as the electronic device. At the same time, the cradle that supports this digital camera is provided with a connector that fits into the socket portion of the digital camera and a cable that connects wires connected to the connector to other devices.” (emphasis added)).)

67. It would have been apparent and obvious to a person of ordinary skill in the art that the phrase “data exchange” used in Tsutsui, in describing the communication between a portable electronic device such as a digital camera and a computer, would have included at least “**transferring data from the portable electronic device,**” as claimed. This would also have been plainly obvious to a person of ordinary skill in the art, or for that matter, anyone who had used digital

cameras (which were widely used prior to 2011) that the data exchange would have included transferring digital photos from a digital camera to a computer, as well as transferring settings or other information from a computer to a digital camera as such exchanges were commonly known between computers and portable electronic devices. This is also confirmed by the '247 patent itself, which expressly identifies a digital camera as one type portable electronic device that can be used with the described dock. ('247, 2:56-60.)

(d) **“a collar abutting the connector within the housing to limit translation of the connector, the connector being pivotable relative to the collar;” (1[d])**

68. Tsutsui discloses a **“collar”** in the form of an inner portion of cushioning member **3** bordering the connector **2**. Figure 7 shows a top view of the cushioning member **3** with an opening through which connector **2** extends:

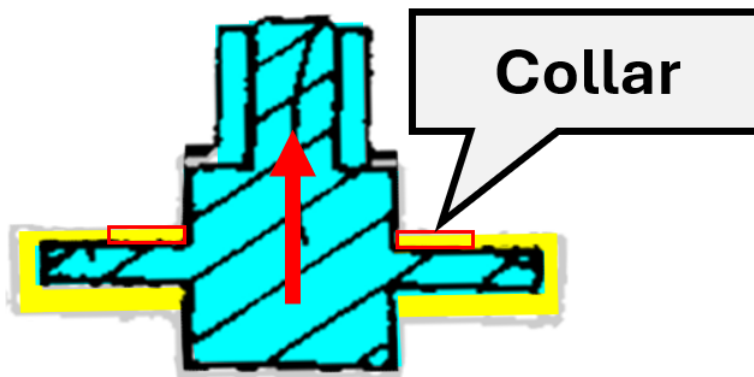


(Tsutsui, Fig. 7, [0023] (highlighting added to indicate collar portion of cushioning member **3**).)

69. Tsutsui therefore discloses “**a collar abutting the connector,**” as claimed, in the form of the inner portion of cushioning member **3** that borders connector **2**, including a portion of the flanges of connector **2**. The collar is “**within the housing**” because cushioning member **3**, as explained in detail above, is contained within cradle body **1a**. The collar also “**limit[s] translation of the connector.**” This is because the collar, as part of upper portion of cushioning member **3**, allows only limited upward translation (as well as sideways and rotational movement) of the connector as a result of its elastic properties, while helping prevent

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further translation, such as pulling the connector entirely out of the housing. For the convenience of the Board, I created the diagram below using Figure 3 of Tsutsui to illustrate how an axial force applied to the connector would compress the top portion of cushioning member **3**, including the collar, to allow only limited translation:

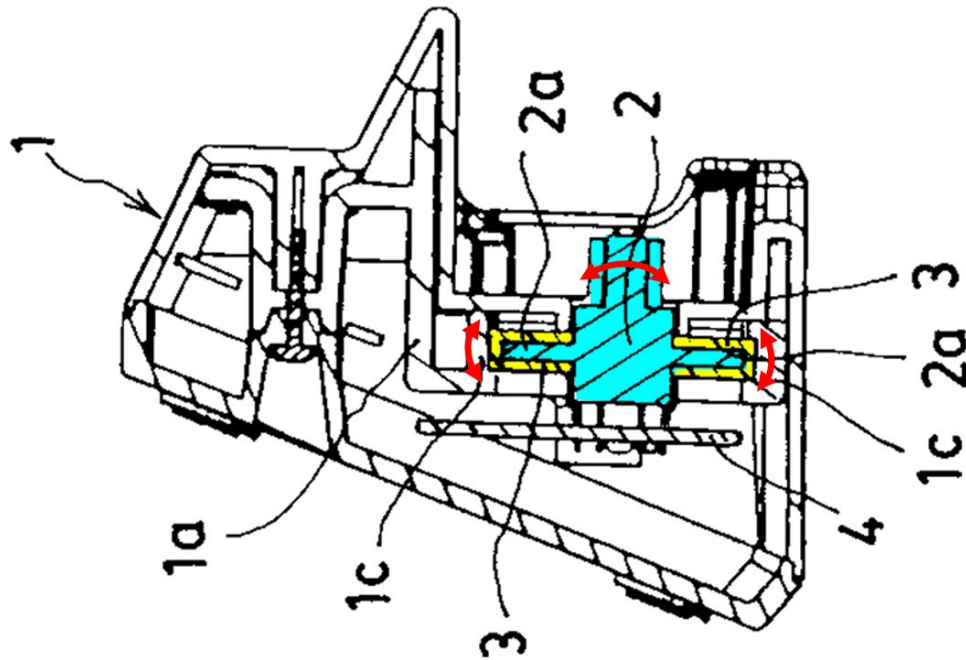


(Tsutsui, Fig. 3 (excerpt; annotation added, with red boxes indicating collar).)

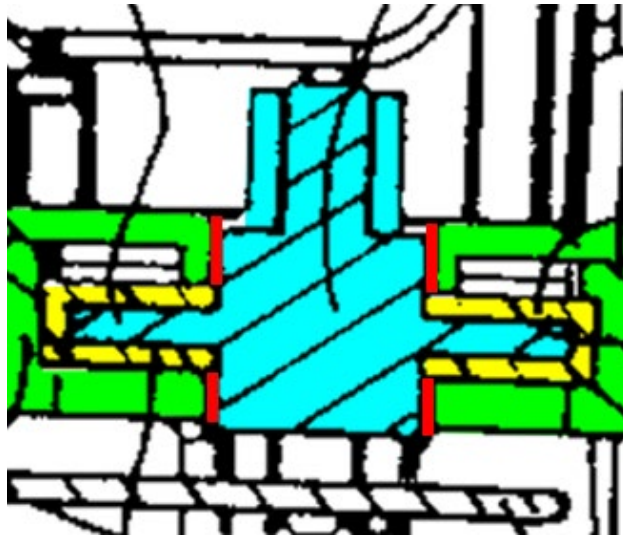
70. I note that my mapping of Tsutsui relies on the cushioning member **3** as the claimed “**support**,” and on a portion of cushioning member **3** for the claimed “**collar**.” This is consistent with the ’247 patent, which makes clear that the claimed collar may be part of the same structure as the claimed support. For example, independent claim 15 discussed below, which is similar to claim 1, expressly recites “**a support for coupling to an inner wall the dock, the support comprising a collar**.” (’247, 10:58-59 (emphasis added)).) Nor do the claims or specification of the ’247 patent require that these two claim elements be entirely separate structures.

71. Tsutsui also discloses and renders obvious that “**the connector** [is]

pivotable relative to the collar,” as claimed, as this would have been a property of the elastic deformability of cushioning member **3** and the fact that “only the peripheral portion of the cushioning member 3 fixed to the cradle body 1a by a resin mold 1c (see Figure 3).” (Tsutsui, [0022].) For example, when the user is connecting the portable electronic device to the cradle, it is possible that connector **2** may pivot slightly across the X, Y, and/or Z axes in the event of misalignment between the socket on the portable device and connector **2** on the cradle. As Tsutsui explains, “the stress applied to the connector 2 due to any misalignment that occurs between the socket portion of the electronic device and the connector 2, regardless of the direction of the misalignment, is effectively absorbed by the cushioning member 3.” (*Id.*, [0027].) As a result, it would have been apparent and obvious that connector 2 is “**pivotable relative to the collar,”** because connector **2** can pivot in the X, Y, and/or Z axes relative to cushioning member **3**. This is further shown in Figure 3, which I have annotated for explanation:

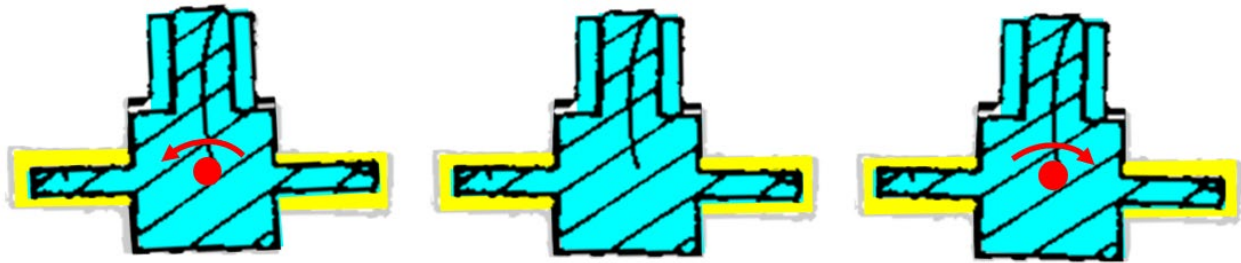


(*Id.*, Fig. 3 (annotation added; rotated 90 degrees).) As shown in Figure 3, a slight amount of space is provided around connector 2 in the cradle, which allows connector 2 to slightly pivot relative to cushioning member 3 in response to misalignment. This slight amount of space (indicated in red below) is reflected in cushioning member 3 (in yellow) extending slightly beyond the mounting platform and cradle structures (in green) adjacent to connector 2 (in blue):



(*Id.*, Fig. 3 (excerpt; annotation added).) It would have been apparent and obvious that the slight amount of space (in red) provided between connector **2** (in blue) and the cradle (in green) would have permitted connector **2** to pivot relative to cushioning member (in yellow). In fact, a person of ordinary skill in the art would have understood that a tightly-inserted connector, without at least slight surrounding space to allow movement of the connector, would have been inconsistent with the goal of Tsutsui and the purpose of cushioning member **3** – to absorb stress caused by misalignment, thereby preventing damage to the connector. (*Id.*, *e.g.*, [0007], [0013], [0016], [0017], [0027].) A person of ordinary skill in the art would have further found the presence of at least slight surrounding space to be expected in accordance with reasonable manufacturing tolerances. Using Figure 3, I have illustrated below the slight pivoting of the connector relative to the collar that could

take place as a result of the elastic deformability of cushioning member 3:



(*Id.*, Fig. 3 (excerpt; annotations added).) Because the peripheral portion of the cushioning member 3 is fixed to the cradle body by a resin mold, the connector pivots relative to, not with, the collar. Tsutsui thus discloses that the “**connector [is] pivotable relative to the collar.**”

- (e) “wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.” (1[e])

72. As just explained, cushioning member 3 elastically deforms in response to movement of at least a portion of the connector. The term “**non-axial movement**” as recited in this limitation is not defined in the ’247 patent, but the term generally refers to movement that does not occur along a particular axis, for example a rotation

about an axis.² The patent provides an example of “**axial**” movement as downward movement against the connector, *i.e.*, along the same axis in which the connector is designed to connect to the portable device. (’247, 7:59-60 (“... a downward, or axial, force on the connector **806, 808**”).) Examples of “**non-axial**” movement in this context would therefore include rotational movement of the connector such as tilting up, down, forward, or backward, within the claimed support.

73. Tsutsui confirms that, in response to non-axial movements of connector **2**, cushioning member **3** will elastically deform. As Tsutsui explains, by “using a rubber-based material or a urethane-based material with excellent elasticity as the cushioning member,” the “stress applied to the connector due to misalignment between the connection portion and the connector is adequately absorbed by the cushioning member, ensuring that damage to the connector is reliably prevented.” (Tsutsui, [0017].) For example, as explained fully for claim 1 **[d]** above, if connector **2** receives force attempting to move the connector to one side or another within cushioning member **3** (for example to the left or the right based on misalignment of

² A person of ordinary skill in the art would understand that orientation in three dimensions can be fully specified with six degrees of freedom: translation along an X, Y, or Z axes and rotation around the X, Y, or Z axes.

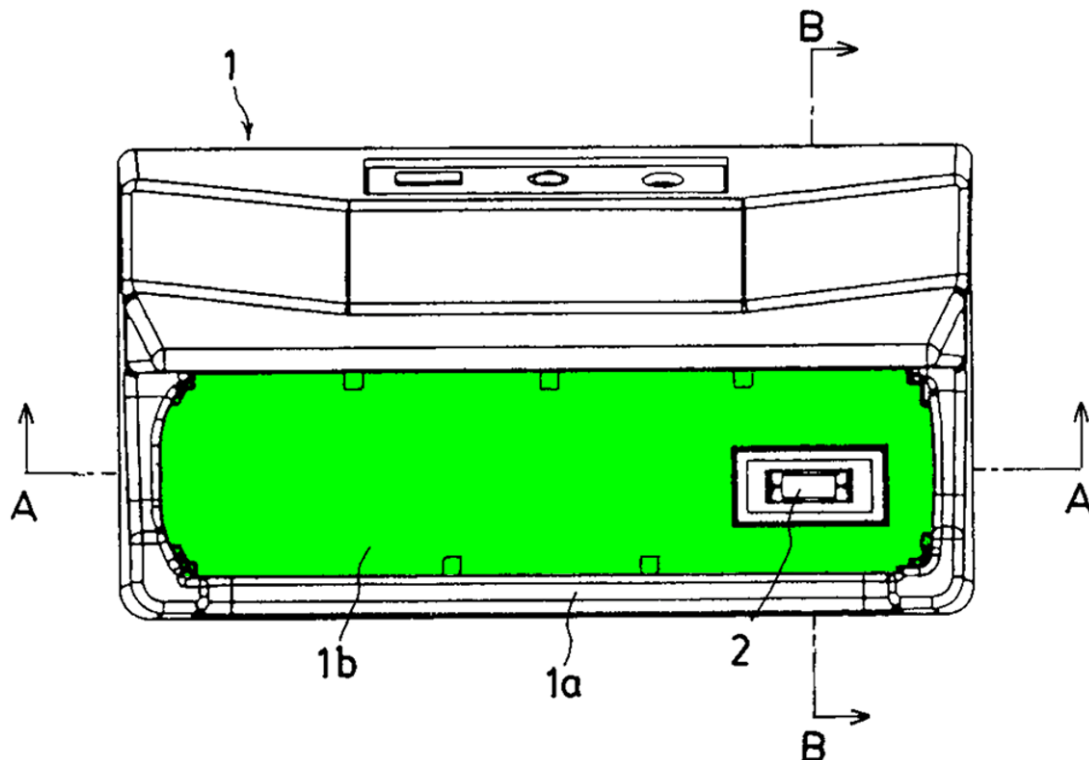
the portable device), the cushioning member **3** will elastically deform in response to absorb that force.

2. Claim 2: “A dock as claimed in claim 1, wherein the support includes a spring component received in a support tray, the spring component being elastically deformable.”

74. Tsutsui discloses that cushioning member **3** (or alternatively, cushioning member **3** and the support-portion of cradle **1a** as discussed for claim 1[b]) (“**the support**”) includes a “**spring component**,” which takes the form of the elastically deformable material in cushioning member **3** of Tsutsui. As noted above, Tsutsui confirms that the cushioning member in one embodiment “us[es] a rubber-based material or a urethane-based material with excellent elasticity,” (Tsutsui, [0017]), thus confirming that “**the spring component [is] elastically deformable.**” In fact, the spring component in Tsutsui is indistinguishable from examples of spring components in the written description of the ’247 patent, which may be “made from a flexible material such as silicone rubber, urethane rubber or cork, for example.” (’248, 5:23-24.) The cushioning member also provides a “**spring**” functionality because the elastically deformable material of cushioning member **3** will resist external forces and attempt to return the cushioning member to its original shape.

75. The spring component is also “**received in a support tray**,” as claimed. Under the first mapping of Tsutsui where the claimed “**support**” takes the form of

cushioning member 3, the support tray in Tsutsui includes mounting platform 1b, which is part of the cradle body. (Tsutsui, [0022], Figs. 1-3.) Referring again to Figure 1:

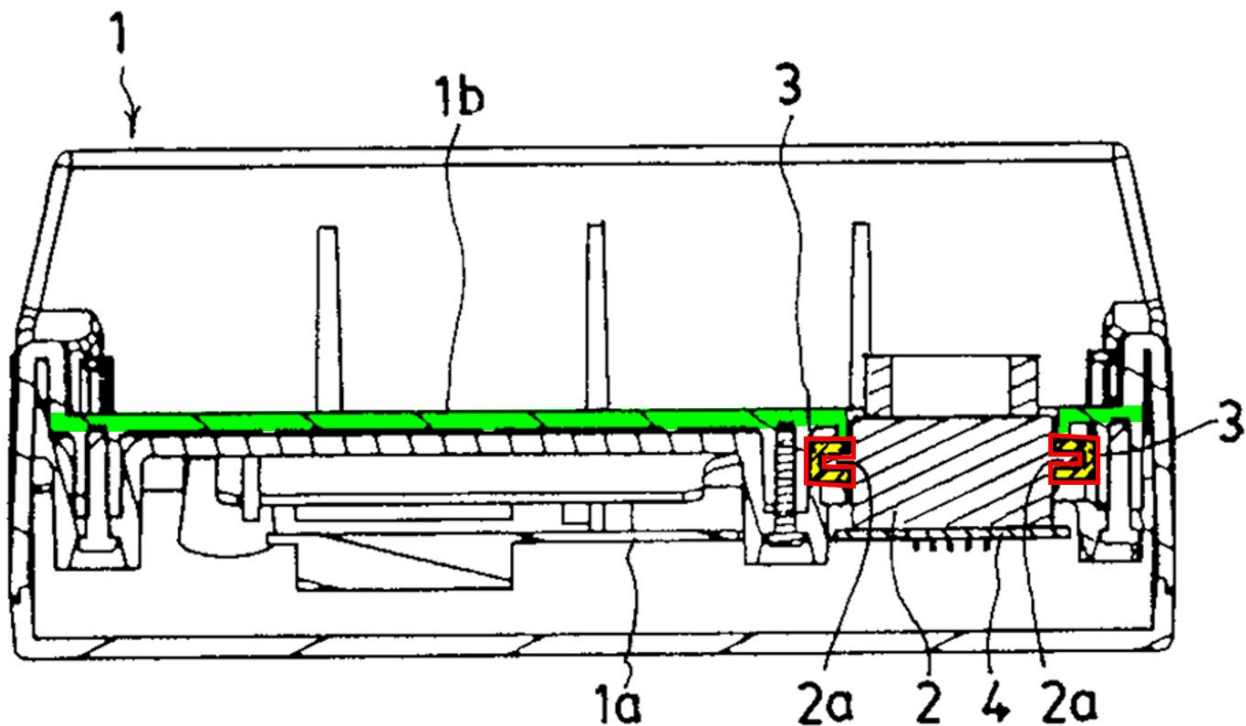


(*Id.*, Fig. 1 (highlighting added).)

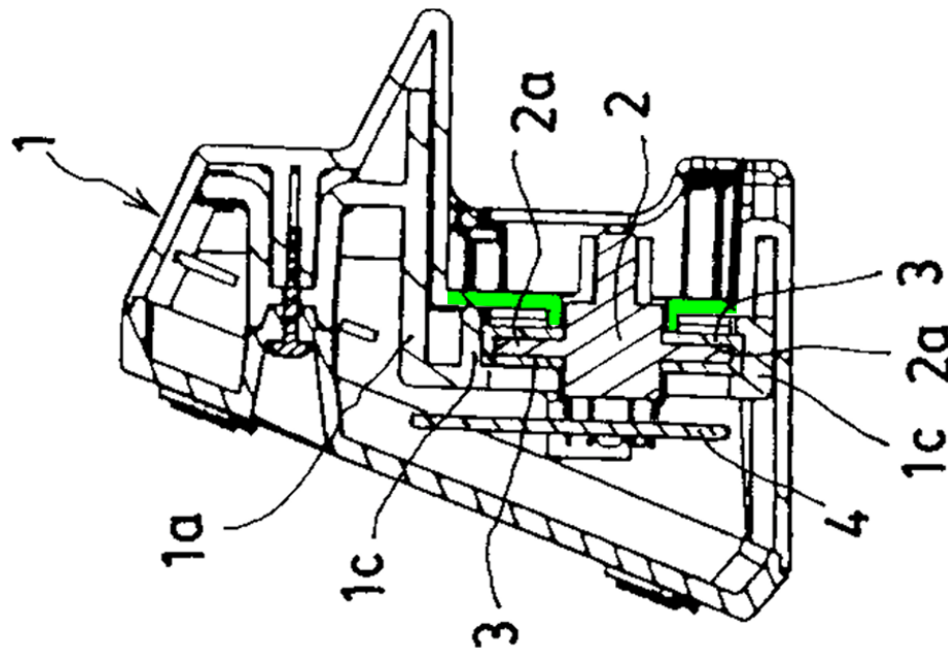
76. Tsutsui explains that “cradle 1 is provided with a mounting platform 1b for mounting an electronic device such as a digital camera,” and that “the connector 2 is attached at a predetermined position on the mounting platform 1b[.]” (Tsutsui, [0022] (emphasis added).) “The connector 2 has the function of a plug, and the electronic device mounted on the mounting platform 1b is provided with a socket portion (connection portion) into which the connector 2 fits.” (*Id.* (emphasis

added).) Tsutsui therefore discloses a “**support tray**” that includes mounting platform **1b** because it provides physical support for (among other things) the portable electronic device when it is mounted in the cradle.

77. Tsutsui further confirms that the elastically deformable material of the cushioning member **3** (“**the spring component**”) is “**received in a support tray**,” as claimed. Referring again to Figure 2:

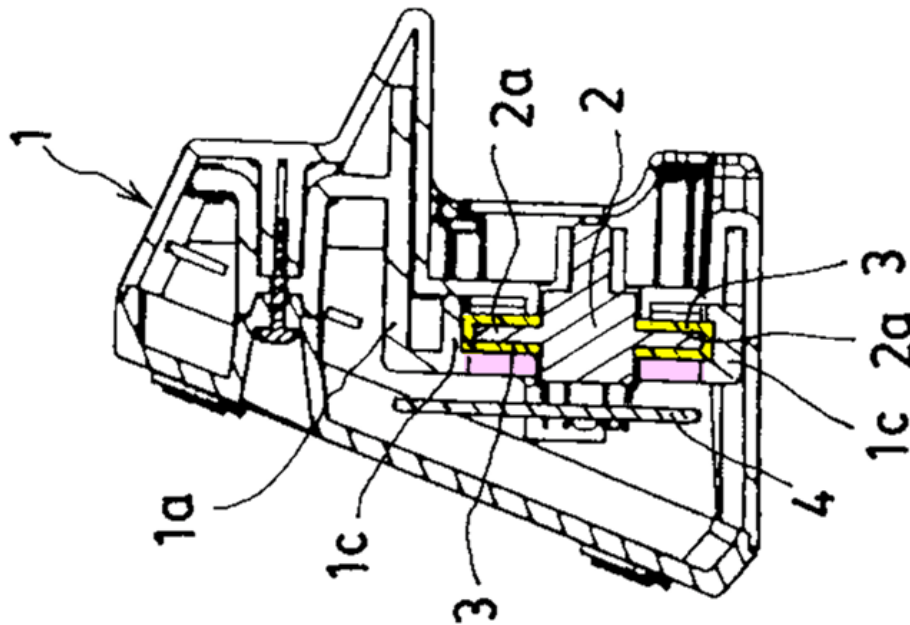


(Tsutsui, Fig. 2 (annotation added).) Figure 2 above shows cushioning member **3** (in yellow, with red outlining) being received in mounting platform **1b** (in green). Mounting platform **1b**, also as shown, includes a lip that descends downward abutting cushioning member **3**. Mounting platform **1b** and its lip, although not labeled, are also shown in Figure 3:



(*Id.*, Fig. 3 (flipped 90 degrees) (highlighting added).) As explained previously, Figure 2 shows flange portion **2a** that is covered with cushioning member **3**, which is fixed to the cradle body by a resin mold. (*Id.*, [0022].) Because mounting platform **1b** abuts cushioning member **3** and includes an aperture that accommodates cushioning member **3**, cushioning member **3** is received in mounting platform **1b**, thus meeting the claim.

78. Alternatively, under the second mapping of Tsutsui where the claimed “**support**” comprises both cushioning member **3** and the support-portion of cradle **1a**, the “**support tray**” simply corresponds to the support-portion of cradle **1a**, as highlighted in pink below:



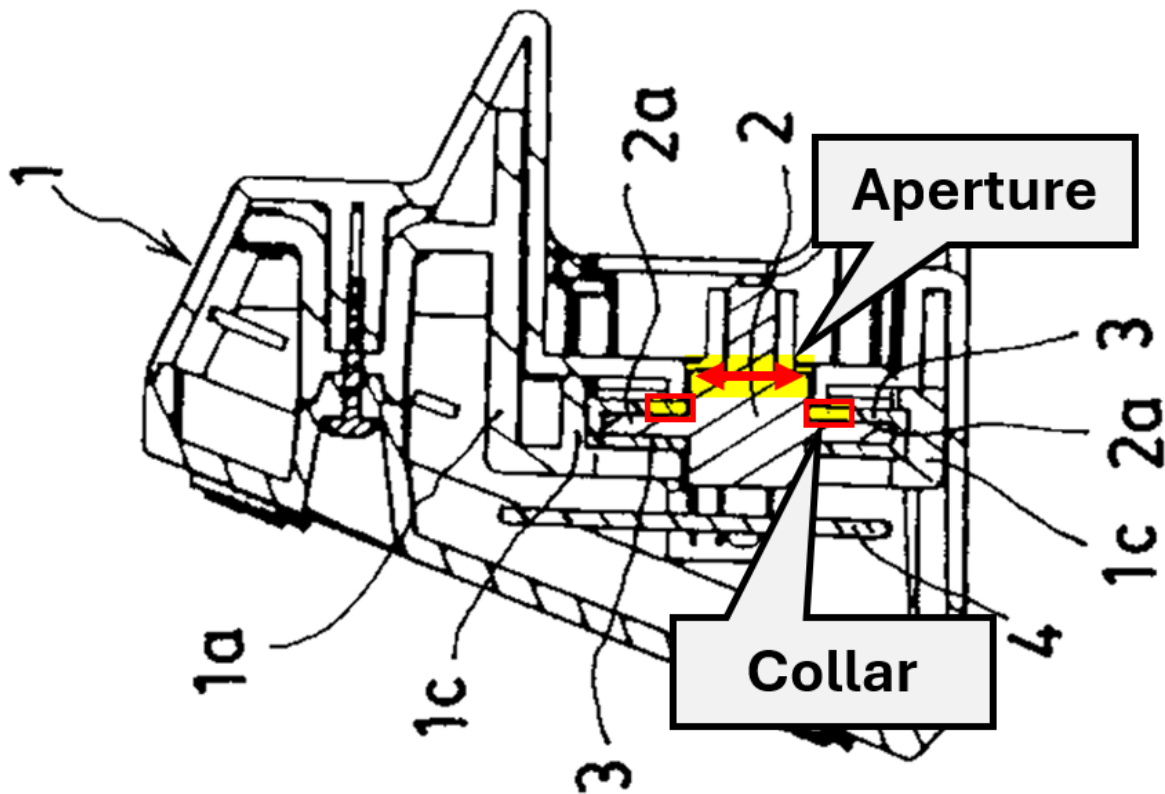
(Tsutsui, Fig. 3 (flipped 90 degrees) (annotations added).) This support-portion of cradle **1a** discloses a “**support tray**” because it provides physical support for connector **2** and for the portable electronic device when the device is mounted in the cradle. And under this alternative mapping, Tsutsui’s support includes a spring component “**received in a support tray**” because the elastically deformable material of the cushioning member **3** (“**the spring component**”) is received in the space provided and enclosed by the support-portion of cradle **1a**.

3. Claim 6: “A dock as claimed in claim 1, wherein the collar surrounds the connector at a location adjacent the aperture.”

79. As fully explained for claim 1[d] above, the claimed “**collar**” in Tsutsui abuts connector **2** within the housing. For the same reasons, the collar also “**surrounds the connector**” because cushioning member **3** surrounds the flange

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portion **2a** of connector **2**. (Tsutsui, [0022] (“[A] flange portion 2a is formed on the outer periphery of the connector 2, and the entire flange portion 2a is covered with a cushioning member 3, with only the peripheral portion of the cushioning member 3 fixed to the cradle body 1a by a resin mold....” (emphasis added)), [0024] (“[T]he cushioning member 3 is made of a rubber-based material or a urethane-based material, and has a groove 3a formed on the inner peripheral portion into which the flange portion 2a of the connector 2 is fitted, and is pre-formed as an annular member shaped to surround the flange portion 2a.” (emphasis added)).) The collar, as shown in the figure below, therefore also surrounds the connector “**at a location adjacent [to] the aperture**” because, as noted, cushioning member **3** also surrounds the aperture.



(*Id.*, Fig. 3 (flipped 90 degrees) (annotation added).)

4. **Claim 11: “A dock as claimed in claim 1, wherein the connector is a charging connector.”**

80. As explained for claim 1, Tsutsui confirms that the connector could be a charging connector. (Tsutsui, [0002] (“Conventionally, cradles are known on which are mounted electronic devices such as a digital camera, which serve as stands for the electronic devices, and which are provided with a connector to establish an electrical connection with the electronic device mounted thereon, enabling charging of the electronic device and data exchange with a computer, etc.” (emphasis added)).)

5. Claim 13: “A dock for receiving a portable electronic device, comprising:” (13[pre])

81. Claim 13 is substantially similar, in many respects, to claim 1 that I fully addressed above. Accordingly, in the interests of brevity, I will refer back to my analysis of claim 1 where appropriate. With respect to the preamble of claim 13, it is identical to the preamble of claim 1 and is therefore disclosed and rendered obvious by Tsutsui for the same reasons.

(a) “a housing comprising an aperture;” (13[a])

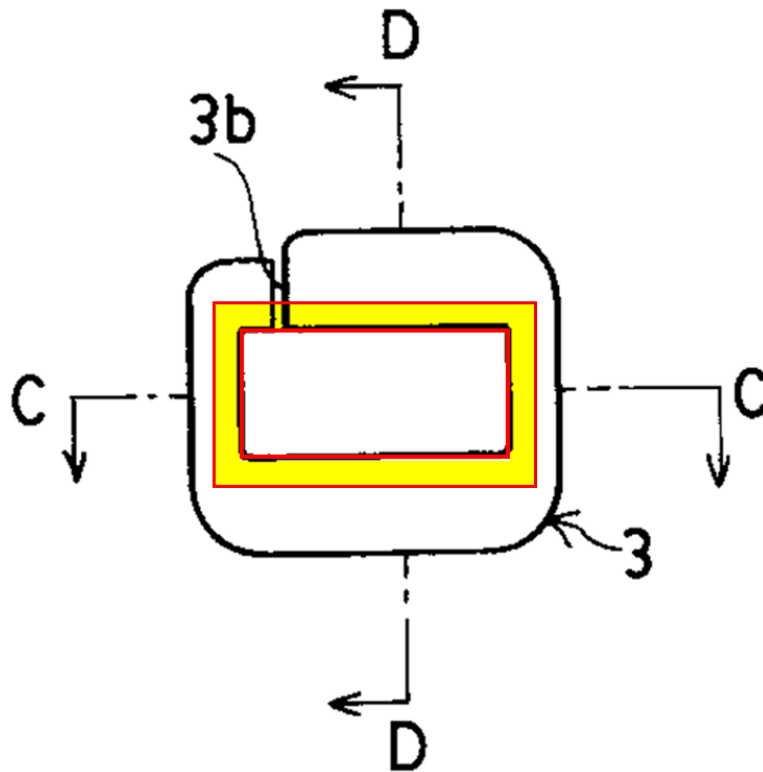
82. This limitation is identical to claim 1[a], and therefore, disclosed and rendered obvious by Tsutsui for the same reasons.

(b) “a support coupled to an inner wall of the housing, a portion of the support being elastically deformable;” (13[b])

83. This limitation is identical to claim 1[b], and therefore, disclosed and rendered obvious by Tsutsui for the same reasons.

(c) “a pad disposed in the support and elastically deformable in response to axial movement of the connector; and” (13[c])

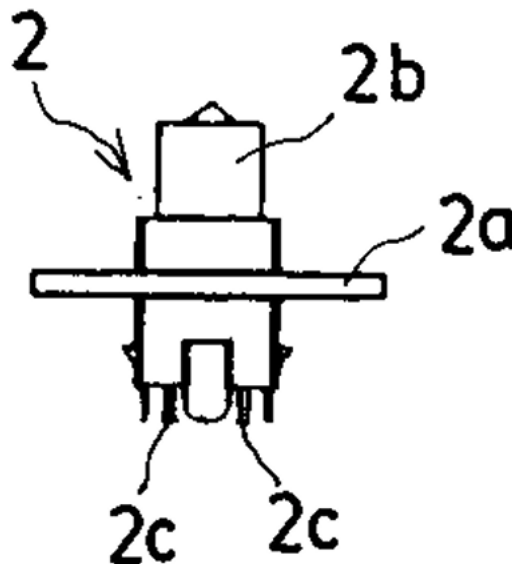
84. Tsutsui discloses a “**pad**” in the form of the inner elastic portion of cushioning member **3** (“**the support**”) that borders the connector. Referring again to Figure 7, it shows a top view of the cushioning member **3** with an opening through which connector **2** extends:



(Tsutsui, Fig. 7 (highlighting added), [0023].) Tsutsui therefore discloses “**a pad disposed in the support,**” as claimed, in the form of the inner portion of cushioning member **3** that borders connector **2**. I note that my mapping of Tsutsui relies on the cushioning member **3** as the claimed “**support,**” and on a portion of cushioning member **3** for the claimed “**pad.**” As I explained for claim 1[d], I do not see this as presenting any issue with respect to the ’247 patent, as the patent does not indicate that these two claim elements must be satisfied by entirely separate structures. I further note that this limitation 13[c] expressly recites “**a pad disposed in the support,**” which confirms that a claimed pad may be part of the same structure as the support.

85. Tsutsui also discloses and renders obvious that the pad is “**elastically deformable in response to axial movement of the connector**,” as claimed. As explained previously, cushioning member **3** is elastically deformable. (Tsutsui, *e.g.* [0009], [0017], [0027].) The pad is also elastically deformable in response to “**axial movement of the connector**,” which as the ’247 patent indicates, includes downward movement against the connector. (’247, 7:59-60 (“... a downward, or axial, force on connector **806, 808**”).)

86. It would have been apparent and obvious that the cushioning member **3** in Tsutsui would have been elastically deformable in response to at least downward (axial) movement on the connector. This is confirmed by Figure 6 of Tsutsui, which shows one embodiment of connector **2**:

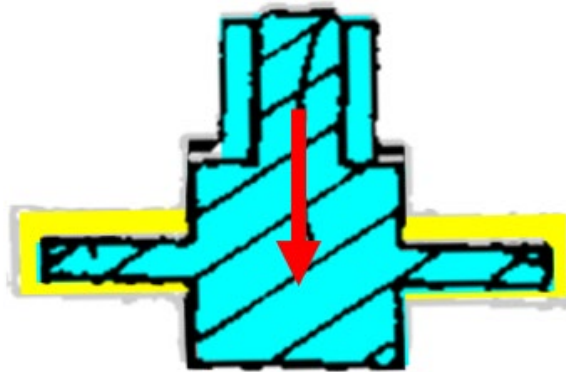


(Tsutsui, Fig. 6.)

87. As shown, connector **2** includes a flange portion **2a** which, as mentioned previously, is covered by cushioning member **3**. (Tsutsui, [0022] (“Specifically, a flange portion 2a is formed on the outer periphery of the connector 2, and the entire flange portion 2a is covered with a cushioning member 3, with only the peripheral portion of the cushioning member 3 fixed to the cradle body 1a....” (emphasis added)).) Tsutsui explains that the flange portion **2a** fits into a groove on cushioning member **3**. (*Id.*, [0024] (“[T]he cushioning member 3 is made of a rubber-based material or a urethane-based material, and has a groove 3a formed on the inner peripheral portion into which the flange portion 2a of the connector 2 is fitted, and is pre-formed as an annular member shaped to surround the flange portion 2a.” (emphasis added)).) Tsutsui further states that “[t]he square annular cushioning member 3 is attached to the flange portion 2a by fitting the flange portion 2a into the groove 3a while in an open state from the cut 3b, wrapping around the entire circumference of the flange portion 2a.” (*Id.* (emphasis added)).)

88. Accordingly, when there is downward movement against connector **2** (“**axial movement of the connector**”), for example when the portable device is being inserted into the cradle for connection to connector **2**, this axial force applied to connector **2** would cause the cushioning member **3** (“**pad**”) to elastically deform

in response to that movement. This is because, as noted, the flange **2a** on the connector **2** is entirely wrapped with cushioning member **3**, thus allowing cushioning member **3** to elastically deform when axial force is applied to the connector. For the convenience of the Board, I created the diagram below using Figure 3 of Tsutsui to illustrate how an axial force applied to the connector would compress the portion of cushioning member **3** beneath the connector's flange:



(Tsutsui, Fig. 3 (excerpt; annotation added).)

- (d) **“a connector received in the support and extending through the aperture for electrically communicating with the portable electronic device, wiring of the connector for transferring data from the portable electronic device;” (13[d])**

89. This limitation is identical to claim 1[c], and is therefore disclosed and rendered obvious by Tsutsui for the same reasons.

- (e) **“wherein the portion of the support elastically deforms in response to non-axial movement of at least a portion of the connector.” (13[e])**

90. This limitation is identical to claim 1[e], and is therefore disclosed and

rendered obvious by Tsutsui for the same reasons.

6. Claim 15: “A connector assembly for a dock, the connector assembly comprising:” (15[pre])

91. Claim 15 is similar to claim 1 but written to recite “[a] **connector assembly**” instead of “[a] **dock**,” but it otherwise recites similar limitations. Accordingly, in the interests of brevity, I will refer back to my analysis of claim 1 where appropriate. With respect to the preamble, Tsutsui discloses a connector assembly that includes connector **2** and cushioning member **3**, for cradle **1** (“**a dock**”), described in more detail in the limitations that follow.

(a) “a support for coupling to an inner wall the dock, the support comprising a collar, a portion of the support being elastically deformable; and” (15[a])

92. This limitation is substantially similar to claim 1[b], except that it recites a support for coupling to an inner wall of “**the dock**,” whereas claim 1[b] recites that the support is coupled to an inner wall “**of the housing**.” This does not present a material difference; as fully explained for claim 1[b], Tsutsui discloses cushioning member **3** (alone or in combination with support-portion of cradle **1a** as explained for claim 1[b]) (“**a support... comprising a collar**”) for coupling to an inner wall of cradle (“**the dock**”). Tsutsui thus discloses and renders obvious this limitation for the same reasons as claim 1[b].

- (b) **“a connector received in the support for electrically communicating with a portable electronic device received by the dock, wiring of the connector for transferring data from the portable electronic device;” (15[b])**

93. This limitation is substantially similar to claim 1[c], except that claim 1[c] recites that the connector is received in the support **“and extending through the aperture,”** whereas claim 15[b] does not recite any aperture. As explained for claim 1[c], Tsutsui discloses connector **2** (**“a connector”**), that is received in cushioning member **3** (**“received in the support”**), that communicates with an electronic device such as a digital camera inserted in the cradle (**“a portable electronic device received by the dock”**). As further explained for claim 1[c], Tsutsui discloses and renders obvious wiring of connector **2** to wiring board **4** for transferring data from the portable electronic device.

- (c) **“wherein the portion of the support elastically deforms in response to non-axial translation and pivoting relative to the collar of at least a portion of the connector.” (15[c])**

94. This limitation is largely an amalgam of claims 1[d] and 1[e], and is disclosed and rendered obvious by Tsutsui for the same reasons. As fully explained for claim 1, in response to non-axial translation and pivoting of connector **2** relative to the collar (such as shifting or rotating of connector **2** within cushioning member **3**), cushioning member **3** elastically deforms in response to that movement.

7. **Claim 16: “A connector assembly as claimed in claim 15, wherein the support includes a spring component received in a support tray, the spring component being elastically deformable.”**

95. Claim 16 is substantially similar to claim 2, differing only in its claim dependencies, and is disclosed and rendered obvious by Tsutsui for the same reasons.

8. **Claim 19: “A connector assembly as claimed in claim 15, comprising a collar abutting the connector within the housing to limit translation of the connector.”**

96. Claim 19 is substantially similar to claim 1[d]. As fully explained for claim 1[d], the connector assembly in Tsutsui includes a collar abutting the connector. I note that claim 19 recites the connector “**within the housing,**” but claim 15 from which claim 19 depends does not recite a housing. I have assumed that “the housing” should be understood to refer to “a housing,” and understood to refer to the same housing recited in other claims of the ’247 patent. This is consistent with Patent Owner’s claim construction expert in the pending litigation. (EX1006, ¶17.) As explained for claim 1[a], Tsutsui discloses cradle body **1a** (“**housing**”), and the collar in Tsutsui abuts connector **2** within cradle body **1a**, which is the same structure that I have cited for the “housing” for other claims of the ’247 patent.

97. The collar in Tsutsui also serves “**to limit translation of the connector.**” This is because, as explained above, cushioning member **3** is elastically

deformable and resists force applied to the connector **2**, including axial and non-axial movement of the connector, to which it responds by attempting to return connector **2** to a position based on the original shape of cushioning member **3**.

V. NO SECONDARY CONSIDERATIONS OF NONOBVIOUSNESS

98. As explained in **Part III.B**, I understand that “secondary considerations” may be used as indicia of nonobviousness, provided that any such consideration has a nexus to the invention claimed. I understand from Petitioner’s counsel that Patent Owner in the related district court litigation has not yet identified any evidence related to secondary considerations with a nexus to the claimed invention. Nor am I aware of information, such as commercial success, unexplained results, long felt but unsolved need, industry acclaim, simultaneous invention, copying by others, skepticism by experts in the field, and failure of others, suggesting that the claims addressed in this Declaration are not obvious. To the extent Patent Owner later provides information it claims relates to secondary considerations, I reserve the right to supplement my analysis and opinions to comment on it.

VI. CONCLUSION

99. In signing this Declaration, I recognize that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the

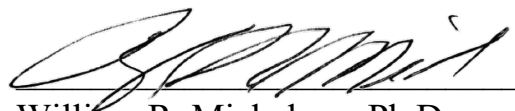
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United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in this proceeding. If required, I will appear for cross-examination at the appropriate time. I reserve the right to offer opinions relevant to the invalidity of the challenged claims at issue and/or offer testimony in support of this Declaration.

100. I hereby declare that all statements made herein of my own knowledge are true and that all statements are made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

Dated: 7 October 2025

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'W. Michalson', written over a horizontal line.

William R. Michalson, Ph.D.

Appendix A

Curriculum Vitae for William R. Michalson

Research Associates, LLC
PO Box 673
Douglas, MA 01516
Email: wrn@wmichalson.com
Cell: (508) 331-4134

1. Personal:

1.1 Education

Ph.D. in Electrical Engineering, 1989, Worcester Polytechnic Institute, Worcester, Massachusetts.

Dissertation: *A Parallel Computer Architecture for Real-Time Decision Making*. The dissertation develops a hierarchical, multiple processor, computer architecture for executing artificial intelligence programs in real-time. Dissertation Directors: Dr. Peter E. Green and Dr. R. James Duckworth.

Minor Areas: Minor sequences completed in Mathematics and Physics.

Specialties: Area examinations passed in the fields of Computer Architecture, Probabilistic Systems Analysis, and State Space Analysis.

M.S. in Electrical Engineering, 1985, Worcester Polytechnic Institute, Worcester, Massachusetts.

Specialties: The courses taken stressed Computer Architecture, Communications Systems, and Solid-State Physics.

B.S. in Electrical Engineering, 1981, Syracuse University, Syracuse, New York.

1.2 Work experiences - Academic.

1991-Present Worcester Polytechnic Institute

Professor of Electrical and Computer Engineering; also holds collaborative appointments as a Professor of Computer Science, a Professor of Mechanical Engineering and a Professor of Robotics Engineering.

Effective Sep, 2016 Granted a collaborative appointment as a Professor of Mechanical Engineering.

Effective July 1, 2005 Promoted to the rank of Full Professor (Professor of Electrical and Professor of Computer Science)

<i>November 17, 2004</i>	Appointed dual professorship, adding the title of Associate Professor of Computer Science.
<i>July 1, 1998</i>	Granted tenure and promoted to the rank of Associate Professor.
<i>August 1, 1992</i>	Assistant Professor of Electrical Engineering (tenure-track).
<i>August 1, 1991</i>	Visiting Assistant Professor of Electrical Engineering.
<i>January 1, 1990</i>	Adjunct Assistant Professor of Electrical Engineering.

1.3 Work experiences other than teaching (chronological).

2024-Present US Coast Guard Auxiliary

Member of the US Coast Guard Auxiliary, focusing on public education, communications, and boat crew operations.

2022-Present BLS, LLC

BLS, LLC is a company formed in 2022 which focuses on the development of non-intrusive technologies for improving firearm safety.

2012-2014 Grid Roots, LLC

Grid Roots, LLC is a company which was formed in 2012 for the purpose of commercializing a navigation and tracking device for use by children and the elderly to allow caregivers to non-intrusively monitor their activities. The system under development integrates GPS, inertial and beacon-based navigation technologies to develop a system for users to track deployed devices. My responsibilities within Grid Roots, LLC relate to hardware and software engineering, as well as the development of IP related to tracking individuals.

1995-Present Research Associates, LLC

Research Associates, LLC is a company I formed in which I perform engineering and consulting in the areas of computer systems, communications and navigation. All of my litigation-related and other consulting activities are performed through Research Associates, LLC.

1988-1991 Raytheon Company

Subsequent to receiving my Ph. D., I returned to the Equipment Division of the Raytheon Company. Shortly after I returned, I was promoted to a title of Engineer, Design and Development which was the highest title I could hold based on my level of education and years of experience. Within a year, I was selected to sit on the engineering staff of a newly formed System Engineering Department of the Division's Computer and Displays Laboratory. In this department I acted primarily as a consultant to other departments within the laboratory. My responsibilities ranged from leading the hardware/software development of supercomputer-class computer systems to performing applied research into the exploitation of new technology. My

role was similar to that of a Principle Investigator in an academic setting as I was responsible for securing funding and personnel, leading research efforts, interacting with the research sponsor, and reporting results. At the time of my departure I was involved with the following projects:

Fault-Tolerant Multiprocessor

The development of a highly fault tolerant, highly reliable, real-time computer system intended for long-duration spaceborne applications. This system is designed to produce in excess of one gigaoperation per second of raw processing power.

Optimal Task Allocation

A program of applied research into the use of Genetic Algorithms for deriving optimal mappings of software tasks to the hardware processing elements in distributed systems.

Performance Modeling and Scaling

This project focused on the development of simulation models for characterizing the performance of a large scale multiple processor system. These models formed a basis for predicting system performance for several different hardware configurations to ensure compliance with system specifications.

High Clutter Signal Detection

A program of applied research into the use of Neural Networks to detect the presence of targets in extremely high clutter environments.

Power Efficient Computing

A program of applied research into an Integrated Optical computer structure that is designed to maximize the number of computations that can be performed per unit of power.

1985-1988 Raytheon Company (Leave of Absence)

In 1985 I became one of two people in the Equipment Division to receive Aldo Miccioli Fellowships. This Fellowship was awarded to allow me to pursue full-time study towards the Ph.D. degree. I returned to Raytheon during the summer of 1986, but otherwise remained on leave of absence to dedicate my time to my studies.

1982-1985 Raytheon Company

Engineer in the VLSI Design Department of the Computer and Displays Laboratory within Raytheon's Equipment Division. I was lead engineer for the design of several semi-custom VLSI circuits for both signal and data processing applications.

1981-1982 Raytheon Company

Engineer in the Cursive Displays Department of the Computer and Displays Laboratory. I designed and debugged circuit assemblies which were used in vector displays for air traffic control applications.

1.4 Consulting experiences.

1.4.1 Law-Related

Hermes IP Management LLC V. Samsung Electronics Company, Ltd.

Retained by Arnold & Porter Kaye Scholer LLP on behalf of Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. Case before the United States Court for the Eastern District of Texas (Case No. 2:24-cv-00540-JRG). Provided a declaration in support of IPR filing IPR2025-00953. Retained 3/25.

Volkswagen Group of America, Inc. v. Longhorn Automotive Group, LLC

Retained by Finnegan, Henderson, Farabow, Garrett & Dunner, LLP on behalf of petitioner Volkswagen AG. Provided a declaration in support of IPR filing IPR2025-00925. Retained 2/25.

Commonwealth of Massachusetts v. Bradley Rein

Retained by Fund & FitzGerald as an expert on behalf of defendant Bradley Rein. Case before the Commonwealth of Massachusetts Plymouth, SS. Superior Court Department. Docket No. 2383CR0080). Retained 3/24.

Harley Kaplan and Sybil Kaplan v. New England Paragliding and Hang Gliding Club, et al.,

Retained by Campbell Conroy & O'Neil as an expert on behalf of defendant Matthew Foster. Case before the Commonwealth of Massachusetts Plymouth, SS. Superior Court Department. Docket No. 2183CV0331). Retained 3/24 – 5/24. Submitted expert disclosure. Case dismissed.

Textron Innovations INC. v. SZ DJI Technology Co, LTD. et al.

Retained by Baker Botts, LLP as an expert on behalf of plaintiff Textron. Case before the United States District Court for the Eastern District of Texas (Case No. 2:22-cv-351). Retained 6/23 – 3/24.

Geoscope Technologies Pte. Ltd. V. Google LLC

Retained by William & Connolly LLP on behalf of defendant Google. Case before the United States District Court for the Eastern District of Virginia (Case No. 1:22-cv-01331-MSN-IDD). Retained 2/23 – 9/23, Deposed 8/17/23.

American Patents, LLC v. Texas Instruments, Inc., Realtek Semiconductor Corporation and Mediatek Inc.

Retained by Texas Instruments, Realtek, and Mediatek as an expert on defendants. Case before the United States District Court for the Eastern District of Texas – Sherman Division (Case Nos. 4:22-cv-478, 4:22-cv-479, and 4:22-cv-480). Declaration with respect to claim construction 2/10/23). Retained 1/23 – 4/23.

United Services Automobile Association v. Auto Telematics Ltd.

Retained by Fish & Richardson as an expert on behalf of petitioner United Services Automobile Association. Provided declarations in support of multiple IPR filings (IPR2023-00518,

IPR2023-00519, IPR2023-00768, IPR2023-00769, IPR2023-00770, IPR2023-00857, IPR2023-00858, IPR2023-00859, IPR2023-00911, and IPR2023-00912). Retained 12/22.

Railware, Inc. v. National Railroad Passenger Corporation dba Amtrak

Retained by Venable, LLP as an expert on behalf of defendant Amtrak. Case before the United States District Court for the Southern District of New York (Case No. 1:22-cv-05013). Provided declarations in support of multiple IPR filings (IPR2023-1179, IPR2023-1180, and IPR2023-1181). Retained 12/22 – 6/24.

Volvo Penta of the Americas, LLC. v. Brunswick Corporation

Retained by Kilpatrick Townsend & Stockton, LLP as an expert on behalf of petitioner Volvo Penta. Provided declarations in support of multiple IPR filings (IPR2022-01366, IPR2022-01367, IPR2022-01368, IPR2022-01369, and IPR2022-01424). Retained 6/22 – 9/23.

Textron Innovations INC. v. SZ DJI Technology Co, LTD. and DJI Europe B.V.

Retained by Baker Botts, LLP as an expert on behalf of plaintiff Textron. Case before the United States District Court for the Western District of Texas (Case No. 6:21-cv-00740-ADA). Retained 2/22 – 4/23, Deposed 1/22/23 and 1/24/23, Testified 4/17-18.

Smartsky Networks, LLC, v. GOGO Business Aviation, LLC and GOGO INC.

Retained by Sidley Austin, LLP as an expert on behalf of defendant Gogo. Case before the United States District Court for the District of Delaware (Case No. 22-266 UNA). Deposed 5/19/22. Retained 3/22.

Via Transportation, Inc. v. RideCo Inc.

Retained by Erise, IP on behalf of defendant RideCo. Case before the United States District Court for the Western District of Texas, (Case No. No. 6:21-cv-00457). Retained 1/22.

BillJCo, LLC v. Cisco Systems, Inc., Apple Inc., Hewlett Packard Enterprise Co. and Aruba Networks, LLC

Retained by the law firms of Merchant & Gould, P.C., DLA Piper, and Greenberg Traurig, LLP Purpose on behalf of their clients Cisco Systems, Inc., Apple Inc., Hewlett Packard Enterprise Co. and Aruba Networks, LLC for the analysis of certain patents relating to methods and systems for location tracking of mobile devices. Submitted declaration related to IPR2022-420 and IPR2022-00427. Retained 12/21 – 6/23.

Mark Adams, Sr., v. Cataldo Ambulance Service, Inc,

Retained by Morrisson Mahoney, LLP on behalf of defendant Cataldo Ambulance Service. Case before Middlesex Superior Court, Commonwealth of Massachusetts, Civil Action No. 19-CV-1931. Retained 10/21.

Omnitracs, LLC et al. v. Platform Science, Inc.

Retained by Fish & Richardson on behalf of defendant Platform Science, Inc. Case before the Federal District Court Southern District of California. Case No. 3:20-cv-0958-JS-MDD. Retained 8/21 – 9/23, Deposed 8/23-24/23.

LoganTree, LP v. Garmin International, Inc. and Garmin USA, Inc.

Retained by EriselP on behalf of defendant Garmin. Case before the District of Kansas, Case No. 17-cv-01217 2:16-cv-190 involving U.S. Patent No. 6,059,576. Submitted Expert Report on Non-Infringement; Deposed 12/1/21; Testified in Court 10/26/22; Retained 7/21 - 10/22.

Allstate Insurance Company V. Atos, LLC

Retained by Sidley Austin, LLP on behalf of petitioner Allstate Insurance Company challenging the validity of US Patent Nos. 8,527,140; 9,152,609; and 9,846,174 at the Patent Trial and Appeal Board of the U.S. Patent Office. Submitted declarations in IPR2021-01118, IPR2021-01209, and IPR2021-01449. Deposed 3/31/22 and 4/7/22; Retained 2/21 – 1/23.

R&R Packaging, Inc. D/B/A R&R Solutions v. Evenflo Company, Inc.

Retained by Polsinelli on behalf of Plaintiff R&R. Case before the Western District of Arkansas (Fayettevill Division), Case No. 5-20-cv-05095. Submitted Reports on Claim Construction; Deposed 7/21; Retained 11/20.

InfoGation Corporation v. Google LLC.

Retained by O'Melveny & Meyers, LLP as an expert on behalf of defendant Google Inc. Patents-in-suit are U.S. Patents 6,199,014. Case before the United States District Court for the Southern District of California, San Diego Division (Case No. 3:21-CV-00843-H-JLB). Deposed 2/27/23 - 2/28/23. Retained 8/20 to 6/22.

WSOU Investments LLC v. Dell Technologies Inc. et al.

Retained by Gibson-Dunn on behalf of defendant Dell. Case before the United States District Court for the Western District of Texas, (Case Nos. 20-cv-00473-ADA; 20-cv-00474-ADA; 20-cv-00475-ADA; 20-cv-00476-ADA; 20-cv-00477-ADA; 20-cv-00478-ADA; 20-cv-00479-ADA; 20-cv-00482-ADA). Deposed 5/11/23. Retained 7/20 – 6/22.

Apple v. LBS Innovations, LLC.

Retained by EriselP on behalf of petitioner Apple, Inc., challenging the validity of U.S. Patent No. 6,091,956 at the Patent Trial and Appeal Board of the U.S. Patent Office, IPR2020-00696. Retained 02/20 – 8/20. Submitted declaration.

Makor Issues & Rights Ltd. v. Google LLC et al.

Retained by Arnold & Porter Kaye Scholer LLP on behalf of defendant Google. Case before the District of Delaware, Case No. 1:16-cv-00100. Retained 12/19.

Intellectual Ventures I, LLC and Intellectual Ventures II, LLC v. NetApp, Inc.

Retained by Gibson Dunn on behalf of defendant NetApp, Inc. Case before the District of Massachusetts, Case No. 1:16-cv-10868-PBS. Retained 09/19. Submitted Expert Reports on Invalidity and Non-Infringement.

Google, LLC v. Traxcell Technologies, LLC.

Retained by Finnegan, Henderson, Farabow, Garrett & Dunner, LLP on behalf of petitioner Google, Inc., challenging the validity of U.S. Patent Nos. 9,918,196 and 10,820,147 at the Patent Trial and Appeal Board of the U.S. Patent Office, IPR2021-01004 and IPR2022-00442. Retained 06/18 – 1/22. Submitted declarations.

Lipton, et al. v. Knight, et al.

Retained by Campbell Conroy & O'Neil, PC on behalf of defendant First Student. Case before the Superior Court of Massachusetts, Plymouth, Case No. PLCV 2014-00528. Retained 05/19-8/19. Submitted Expert Disclosure.

PPS Data, LLC., v. Jack Henry & Associates, Inc.

Retained by Polsinelli on behalf of defendant Jack Henry and Associates. Case before the Eastern District of Texas. Retained 11/18-9/19. Submitted Expert Reports on Invalidity and Non-Infringement; Deposed 5/29/19, testified in Court 9/11/19.

Cisco Systems, Inc. v. TracBeam, LLC.

Retained by Haynes Boone, LLP on behalf of petitioner Google, Inc., challenging the validity of U.S. Patent Nos. 7,525,484 9,277,525, and 7,298,327 at the Patent Trial and Appeal Board of the U.S. Patent Office, IPR2018-01722 - IPR2018-01728. Retained 06/18. Submitted declarations.

Burris Company, Inc. v. Garmin International, Inc.

Retained by Shook Hardy and Bacon on behalf of defendant Garmin. Case before the District of Oregon, Case No. 6:18-CV-00700. Submitted Declaration wrt Invalidity; Testified in Court (PI hearing) 07/11/18; Retained 04/18-08/18.

American GNC Corporation v. LG Electronics Inc., LG Electronics Mobilecomm U.S.A., Inc., and LG Electronics Mobile Research U.S.A., LLC.

Retained by White & Case on behalf of defendant LG. Case before the Southern District of California, Case No. 3:17-CV-01090-BAS-BLM. Retained 11/17. Submitted Declaration wrt Claim Construction; Deposed 1/18.

Qualcomm v. Apple

Retained by Quinn-Emanuel on behalf of plaintiff Qualcomm. Case before the Southern District of California, Case Nos. 3:17-cv-00108-GPC-MDD and 3:17-cv-01010-GPC-MDD. Retained 10/17-5/19; Submitted Expert Report; Deposed 10/18.

Samantha Ingram v. New England Beauty Academy, LLC a/k/a Toni&Guy Hairdressing Academy, Newell Rubbermaid INC. and Goody Products, INC. d/b/a Solano.

Retained on behalf of plaintiff Samantha Ingram. Case before the Worcester Superior Court, Commonwealth of Massachusetts, Civil Action 1385CV02129D. Retained 09/17-09/18; Submitted Expert Disclosure.

FISERV, INC., Jack Henry & Associates, Inc., Q2 Software, Inc., American National Bank of Texas and Hanmi Bank, Petitioners v. Mirror Imaging LLC., Patent Owner.

Retained by Polsinelli on behalf of petitioners to provide declarations for multiple petitions for covered business methods review. See CBM2018-00012, CBM2018-00014, and CBM2018-00015. Retained 1/18-03/18.

Acceleron v. Dell Inc.

Retained by Baker Botts on behalf of defendant Dell. Case before the Northern District of Georgia, Case No. 1:12-cv-04123-TCB. Submitted Expert Reports related to Claim Construction, Invalidity and Non-Infringement; Deposed 10/13/17 and 6/20/19; Trial 9/6/21 to 9/17/21; Retained 7/17 to 9/21.

Omega Patents, LLC v. CalAmp Corp.

Retained by Sidley Austin on behalf of defendant CalAmp. Case before the Middle District of Florida, Case No. 6:13-cv-1950 involving U.S. Patent Nos. 6,346,876; 6,756,885; 7,671,727 and 8,032,278. Retained 5/17 to 12/17.

Unified Patents, Inc.

Retained by Unified Patents to provide declarations for multiple petitions for *inter partes* review related to patents U.S. Patent No. 7,650,234 and 8,538,498. Retained 03/17-05/17.

Garmin Switzerland GmbH, and Garmin Corporation v. Navico Inc., C-MAP USA, Inc., and C-MAP/Commercial, Ltd.

Retained by Shook, Hardy & Bacon, L.L.P. on behalf of plaintiff Garmin. Case before the District of Kansas, Case No. 16-cv-2706 involving U.S. Patent Nos. 7,268,703 and 6,459,987. Submitted Declaration On Claim Construction; Deposed 12/21/17; Retained 10/16 to 02/18.

Navico Inc. and Navico Holdings AS, v. Garmin International, Inc. and Garmin USA, Inc.

Retained by Paul Weiss on behalf of defendant Garmin. Case before the Eastern District of Texas, Case No. 2:16-cv-190 involving U.S. Patent Nos. 9,223,922 and 9,244,168. Submitted Expert Report on Non-Infringement; Deposed 12/14/16, 5/25/17; Testified in Court 9/7/17; Retained 8/16 to 9/17.

Orbcomm, Inc. v. CalAmp Corp.

Retained by Sidley Austin on behalf of defendant CalAmp. Case before the Eastern District of Virginia, Case No. 3:16-cv-208 involving U.S. Patent Nos. 6,292,724, 6,611,686, 6,651,001, 6,735,150, and 8,855,626. Expert Declaration on Claim Construction, Reports on Invalidity and Non-Infringement; Retained 5/16 to 2/17.

Navico Inc. and Navico Holdings AS, v. Garmin International, Inc. and Garmin USA, Inc.

Retained by Paul Weiss on behalf of defendant Garmin. Case before the Northern District of Oklahoma, Case No. 14-cv-303 involving U.S. Patent Nos. 8,300,499, 8,305,840, and 8,605,550. Deposed 11/8/15; Retained 10/15 to 10/17.

Johnson Outdoors Inc. and Johnson Outdoors Marine Electronics, Inc., v. Garmin International, Inc. and Garmin USA.

Retained by Paul Weiss on behalf of defendant Garmin. Case before the Middle District of Alabama, Case No. 14-cv-683 involving U.S. Patent Nos. 7,652,952, 7,710,825, and 7,755,974. Retained 10/15 to 5/16. Case dismissed.

Google, Inc. v. Silver State Intellectual Technologies, Inc.

Retained by Paul Hastings on behalf of petitioner Google, Inc. to provide declarations for multiple petitions for *inter partes* review. See IPR2015-01737 and IPR2015-01738. Retained 10/15 to 12/15.

Vehicle IP LLC v. AT&T Mobility, LLC, et al.

Retained by Akin Gump and by Perkins-Coie on behalf of defendants AT&T Mobility LLC; Cellco Partnership; Networks In Motion, Inc.; TeleCommunications Systems, Inc.; and Telenav Inc. Case before the District of Delaware, Case No. 1:09-cv-01007-LPS involving U.S. Patent

No. 5,987,377. Expert Report on Invalidity; Deposed 5/20/16; Retained 9/15 to 1/17. Matter settled.

TracBeam, L.L.C. v. T-Mobile US, Inc., et al.,

Retained by Baker Botts on behalf of defendant T-Mobile US, Inc., et al. Case before the Eastern District of Texas (6:14-cv-678-RWS). See also IPR2015-01681, IPR2015-01682, IPR2015-01684, IPR2015-01686, IPR2015-01687, IPR2015-01708, IPR2015-01709, IPR2015-01711, IPR2015-01712, and IPR2015-01713. Expert Report on Invalidity; Deposed 10/04/16; Retained 7/15 to 12/16. Matter settled.

Google, Inc. v. Porto Technology Co., Ltd.

Retained by Fish and Richardson on behalf of petitioner Google, Inc., patent owner Porto Technology Inc. IPR2016-00022 and IPR2016-00045. Expert Declarations; Deposed: 7/14/16 (IPR2016-00022); 7/14/16 (IPR2016-00045). Retained 7/15 to 7/20.

Bradium Technologies LLC v. Microsoft Corporation,

Retained by Perkins Coie on behalf of defendant Microsoft Corporation. Case before the District of Delaware (15-0031-RGA). See also IPR2015-01432, IPR2015-01434, IPR2015-01435, IPR2016-00448 and IPR2016-00449. Expert Declarations; Deposed 8/5/16, 02/21/17; (IPR2015-01432); Retained 3/15 to 10/17.

ACQIS LLC v. EMC Corp.,

Retained by Gibson Dunn on behalf of defendant EMC Corp. Case before the District of Massachusetts (1:14-cv-13560). Expert Report on Invalidity; Retained 2/15 to 2/21.

Locata LBS LLC v. YellowPages.com LLC,

Retained by Baker Botts on behalf of defendant YellowPages.com. Case before the Central District of California (2:13-cv-07664). See also IPR2015-00151. Submitted Declaration. Retained 9/14 to 4/15. Matter settled.

M/A-COM Technology Solutions Holdings, Inc. v. Laird Technologies, Inc.

Retained by Erise IP on behalf of Laird Technologies, Inc., for invalidity consulting regarding U.S. Patent No. 6,272,349. Retained 6/14 to 9/14.

Certusview Technologies, LLC v. S&N Locating Services, LLC and S&N Communications, Inc.,

Retained by Baker & McKenzie on behalf of defendant S&N. Patents-in-suit are U.S. Patents 8,265,344, 8,290,204, 8,340,359, 8,407,001, and 8,532,341. Case before the Eastern District of Virginia, (2:13-cv-346). Expert Report on Non-Infringement; Deposed 11/8/14; Retained 6/14 to 12/14.

adidas AG and adidas America, Inc. v. Under Armour, Inc. and MapMyFitness, Inc.

Retained by Kilpatrick Townsend on behalf of plaintiff adidas. Case before the District of Delaware, (1:14-cv-00130). See also IPR2015-00697, IPR2015-00698, and IPR2015-00700. Deposed: 10/21/16 and 10/22/16 relative to 1:14-cv-00130; 2/5/16 relative to IPR2015-00697; 2/5/16 relative to IPR2015-0068; 2/5/16 relative to IPR2015-0700. IPR Declarations, Expert Report on Validity; Deposed 02/05/16; Retained 5/14 to 7/16.

GeoTag, Inc., v. AT&T Mobility LLC and AT&T Services, Inc.,

Retained by Baker Botts as an expert on behalf of defendant AT&T. Patent-in-suit is U.S. Patent 5,930,474. Case before the Northern District of Texas, Dallas Division, (3:13-cv-00169). Expert Report on Invalidity; Deposed 5/29/14; Retained 1/14 to 9/14. Matter settled.

Nokia Corp v. HTC Corp.

Retained by Quinn Emanuel as an expert on behalf of defendant HTC. Case being litigated in Germany. Patent number EP0766811B1. Retained 12/13 to 2/14. Matter settled.

Porto Technology, Co., Ltd. et al. v. Cellco Partnership d/b/a Verizon Wireless

Retained by Wiley-Rein as an expert on behalf of defendant Verizon. Case before the United States District Court for the Eastern District of Virginia (Case No. 3:13-cv-00265). Declaration ISO Claim Construction and Summary Judgement of Invalidity; Expert Report on Invalidity; Retained 10/13 to 2/14. Matter dismissed.

Nokia Corp v. HTC Corp.

Retained by McDermott Will and Emery and White & Case as an expert on behalf of defendant HTC. Case before the United States District Court for the District of Delaware (Case No. Case No. 1:12-cv-00550-UNA and Case No. 1:12-cv-551-UNA. Retained 6/13 to 2/14. Matter settled.

NXP B.V. v. Research In Motion, Ltd., et al.

Retained by Fish and Richardson as an expert on behalf of defendant Research In Motion. Patent-in-suit is U.S. Patent 6,501,420. Case before the United States District Court for the Middle District of Florida (Case No. 6:12-cv-00498). Expert Report on Invalidity, Expert Report on Non-Infringement; Deposed 9/18/13; Testified in Court: 4/1/14 and 4/2/14; Retained 5/13 to 4/14.

Vehicle IP LLC v. Wal-Mart Stores Inc., et al.

Retained by Polsinelli-Shugart, as an expert on behalf of defendant Werner Enterprises. Patent-in-suit is U.S. Patent 5,694,322. Case before the United States District Court for the District of Delaware (Case No. 1:10-cv-00503). Expert Report on Invalidity, Expert Report on Non-Infringement; Deposed 7/15/13 and 9/20/13; Testified in Court: 9/27/13 and 9/30/13; Retained 4/13 to 9/13.

Commonwealth Scientific and Industrial Research Organisation v. Realtek Semiconductor Corporation

Retained by Sidley Austin, LLP as an expert on behalf of defendant Realtek Semiconductor Corporation. Patent-in-suit is U.S. Patent 5,487,069. Case before the United States District Court for the Eastern District of Texas (Tyler Division) (Case No. 6:12-cv-00578). Expert Report on Invalidity, Expert Report on Non-Infringement; Deposed 3/6/15; Retained 4/13 to 4/15. Matter settled.

TracBeam, LLC v. Google Inc.

Retained by Quinn-Emanuel as an expert on behalf of defendant Google. Patents-in-suit are U.S. Patents 7,764,231 and 7,525,484. Case before the United States District Court for the Eastern District of Texas (6:11-cv-00093). Deposed 2/5/14; Retained 3/13 to 6/14.

Microsoft Corporation and Google Inc., v. GeoTag, Inc.

Retained by Perkins-Coie as an expert on behalf of plaintiff Microsoft Corporation. Patent-in-suit is U.S. Patents 5,930,474. Case before the United States District Court for the District of Delaware (1:11-cv-00175). Retained 1/13 to 9/14.

GeoTag, Inc., v. Frontier Communications Corp., et al.,

Retained by multiple firms as an expert on behalf of defendants. Patent-in-suit is U.S. Patents 5,930,474. Case before the Eastern District of Texas, Marshall Division, (2:10-cv-00265; other defendants are listed in case numbers 2:10-cv-00265, 2:10-cv-00272, 2:10-cv-00437, 2:10-cv-00569, 2:10-cv-00570, 2:10-cv-00571, 2:10-cv-00572, 2:10-cv-00573, 2:10-cv-00574, 2:10-cv-00575, 2:10-cv-00587, 2:11-cv-00175, 2:11-cv-00404, 2:11-cv-00421, 2:11-cv-00424, 2:11-cv-00425, 2:11-cv-00570, 2:12-cv-00043, 2:12-cv-00051, 2:12-cv-00436, 2:12-cv-00438, 2:12-cv-00439, 2:12-cv-00441, 2:12-cv-00442, 2:12-cv-00444, 2:12-cv-00445, 2:12-cv-00446, 2:12-cv-00447, 2:12-cv-00448, 2:12-cv-00449, 2:12-cv-00450, 2:12-cv-00452, 2:12-cv-00454, 2:12-cv-00456, 2:12-cv-00459, 2:12-cv-00460, 2:12-cv-00462, 2:12-cv-00464, 2:12-cv-00466, 2:12-cv-00468, 2:12-cv-00469, 2:12-cv-00470, 2:12-cv-00471, 2:12-cv-00473, 2:12-cv-00474, 2:12-cv-00475, 2:12-cv-00476, 2:12-cv-00476, 2:12-cv-00477, 2:12-cv-00480, 2:12-cv-00481, 2:12-cv-00482, 2:12-cv-00482, 2:12-cv-00483, 2:12-cv-00486, 2:12-cv-00487, 2:12-cv-00520, 2:12-cv-00521, 2:12-cv-00523, 2:12-cv-00524, 2:12-cv-00525, 2:12-cv-00527, 2:12-cv-00528, 2:12-cv-00530, 2:12-cv-00532, 2:12-cv-00534, 2:12-cv-00535, 2:12-cv-00536, 2:12-cv-00537, 2:12-cv-00542, 2:12-cv-00543, 2:12-cv-00545, 2:12-cv-00547, 2:12-cv-00548, 2:12-cv-00549, 2:12-cv-00550, 2:12-cv-00551, 2:12-cv-00552, 2:12-cv-00555, 2:12-cv-00556, 2:12-cv-00570, 2:12-cv-00572, 2:12-cv-00573, 2:12-cv-00575, 2:12-cv-00587, 3:13-cv-00217). Deposed 5/29/14; Retained 1/13 to 9/14.

MOSAID Technologies Inc., v. Realtek Semiconductor Corporation

Retained by Sidley Austin, LLP as an expert on behalf of defendant Realtek Semiconductor Corporation. Patents-in-suit are U.S. Patents 5,131,006; 5,151,920; 5,422,887; 5,706,428; 6,563,786; and 6,992,972. Case before the United States District Court for the Eastern District of Texas (Tyler Division) (Case No. 2:11-cv-00179). Retained 12/12 to 12/12. Matter settled.

Hoyt A. Flemming v. Cobra Electronics Corporation

Retained by Sidley Austin, LLP as an expert on behalf of defendant Cobra Electronics Corporation. Patents-in-suit are U.S. Patents RE39038, RE40653 and RE41905. Case before the United States District Court for the District of Idaho (Case No. 1:12-cv-00392). Retained 11/12 to 06/13. Matter settled.

LBS Innovations LLC v. Aaron Bros., Inc., et al.

Retained as an expert on behalf of defendants Whole Foods Marketplace, Comerica, Hotels.com, Academy, Ltd., and Homestyle Dining. Patent-in-suit is U.S. Patent 6,091,956. Case before the Eastern District of Texas, Marshall Division, (Case No. 2:11-cv-00142-MHS-CMC. Deposed 10/5/12; Retained 7/12 to 12/12. Plaintiff moved to dismiss.

Advanced Media Networks, L.L.C. v. Gogo LLC et al.

Retained by Sidley Austin, LLP as an expert on behalf of defendant Gogo. Patent-in-suit is U.S. Patent 5,960,074. Case before the United States District Court for the Central District of California (Case No. 11-cv-10474). Deposed 2/6/13. Retained 7/12 to 8/13.

Walker Digital, LLC v. Google Inc.

Retained by O'Melveny & Meyers, LLP as an expert on behalf of defendant Google Inc. Patents-in-suit are U.S. Patents 6,199,014. Case before the United States District Court for the District of Delaware (Case No. 1:11-cv-00309-SLR). Deposed 2/27/13 - 2/28/13. Retained 6/12 to 8/13.

Silver State Intellectual Technologies, Inc. v. Garmin International, Inc., et al.

Retained by Erise IP, P.A. as an expert on behalf of defendants Garmin International, Inc. and Garmin USA, Inc. Patents-in-suit are U.S. Patents 6,525,768; 6,529,824; 6,542,812; 7,343,165; 7,522,992; 7,593,812; 7,650,234; 7,702,455 and 7,739,039. Case before the United States District Court for the District of Nevada (Case No. 2:11-cv-1578). Deposed 2/19/14; Testified in Court: 5/21/15; Retained 4/12 to 5/15.

Beacon Navigation GmbH v. Toyota Motor Corporation, et al.

Retained by Kirkland & Ellis, LLP on behalf of defendants Toyota Motor Corporation; Toyota Motor North America, Inc.; Toyota Motor Sales, U.S.A. Inc.; Toyota Motor Engineering & Manufacturing North America, Inc.; Toyota Motor Manufacturing, Indiana, Inc.; Toyota Motor Manufacturing, Kentucky, Inc.; Toyota Motor Manufacturing Mississippi, Inc.; Mazda Motor Corporation; Mazda Motor of America, Inc.; Fuji Heavy Industries, Ltd.; Fuji Heavy Industries U.S.A. Inc.; Subaru of America, Inc.; Jaguar Land Rover North America, LLC; Jaguar Cars Limited; Land Rover; Volvo Car Corporation; and Volvo Cars of North America, LLC; Adduci Mastriani & Schaumberg, LLP on behalf of defendants Suzuki and Garmin; Crowell-Moring on behalf of General Motors; Dickstein Shapiro on behalf of Chrysler Group, LLC; Finnegan, Henderson, Farabow, Garrett & Dunner on behalf of Bayerische Motoren Werke AG, BMW of North America, LLC, and BMW Manufacturing Co. LLC; Fish & Richardson on behalf of Honda Motor Co., Ltd., Honda North America, Inc., American Honda Motor Co., Inc., Honda Manufacturing of Alabama, LLC, Honda Manufacturing of Indiana, LLC, and Honda of America, Mfg., Inc.; Frommer Lawrence and Haug, LLP on behalf of Dr. Ing. h.c.F. Porsche AG and Porsche Cars North America, Inc.; Hogan Lovells on behalf of Daimler AG, Mercedes-Benz USA, LLC, or Mercedes-Benz U.S. International, Inc.; Quinn-Emanuel on behalf of Nissan and Ford. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain Automotive Navigation Systems, Components Thereof, and Products Containing Same, Inv. No. 337-TA-814. Case withdrawn by Plaintiff. Retained 1/12 – 4/12.

Beacon Navigation GmbH v. Toyota Motor Corporation, et al.

Retained by Kirkland & Ellis, LLP on behalf of defendants Toyota Motor Corporation; Toyota Motor North America, Inc.; Toyota Motor Sales, U.S.A. Inc.; Toyota Motor Engineering & Manufacturing North America, Inc.; Toyota Motor Manufacturing, Indiana, Inc.; Toyota Motor Manufacturing, Kentucky, Inc.; Toyota Motor Manufacturing Mississippi, Inc.; Mazda Motor Corporation; Mazda Motor of America, Inc.; Fuji Heavy Industries, Ltd.; Fuji Heavy Industries

U.S.A. Inc.; Subaru of America, Inc.; Jaguar Land Rover North America, LLC; Jaguar Cars Limited; Land Rover; Volvo Car Corporation; and Volvo Cars of North America, LLC. Multiple cases before the United States District Court for the District of Delaware. Case numbers 1:11-cv-00942-UNA, 1:11-cv-00941-UNA, 1:11-cv-00951-UNA, 1:11-cv-00952-UNA, 1:11-cv-00936-UNA, 1:11-cv-00937-UNA, 1:11-cv-00955-UNA, 1:11-cv-00959-UNA, and 1:11-cv-00960-UNA. Currently stayed. Retained 1/12.

Beacon Wireless Solutions, Inc., et al., v. Garmin International, Inc., et al.

Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of defendant Garmin. Matter involves alleged trade secret misappropriation. Case before the United States District Court for the Western District of Virginia, Harrisonburg Division (Case No. 5:11-cv-00025). Testified in Court: 5/25/12. Retained 12/11 to 5/25/12.

Tramontane IP, LLC v. Garmin Int'l, Inc., et al.

Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of defendant Garmin. Patents-in-suit are U.S. Patents 6,526,268 and 7,133,775. Case before the United States District Court for the Eastern District of Virginia (Case No. 1:2011-cv-00918). Case Settled. Retained 11/11 to 12/11.

Sourceprose, Inc. v. AT&T, Inc., MetroPCS Communications, Inc., et al.

Retained by Kilpatrick Townsend as an expert on behalf of defendant AT&T. Patents-in-suit are US Patent Nos. 7,142,217 and 7,161,604. Case before the United States District Court for the Western District of Texas, Austin Division. Case number 1:11-cv-00117. Retained 11/11 to 3/16.

Furuno Electric Co., Ltd. and Furuno U.S.A., Inc. v. Honeywell International, Inc.

Retained by Quinn-Emanuel as an expert on behalf of complainant Furuno. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain GPS Navigation Products, Components Thereof, and Related Software," Investigation number 337-TA-810. Patents-in-suit are U.S. Patent Nos. 6,084,565; 7,095,367; 7,089,094; and 7,161,561. Case settled. Retained 8/11 – 12/11.

Honeywell International, Inc. v. Furuno Electric Co., Ltd. and Furuno U.S.A., Inc.

Retained by Quinn-Emanuel as an expert on behalf of respondent Furuno. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain GPS Navigation Products, Components Thereof, and Related Software," Investigation number 337-TA-783. Patents-in-suit are U.S. Patent Nos. 7,209,070; 6,865,452; 5,461,388; and 6,088,653. Case Settled. Retained 8/11 – 12/11.

Triangle Software, Inc. v. Garmin International, Inc.

Retained by Weil, Gotshal & Manges, LLP., as an expert on behalf of defendant Garmin. Patents-in-suit are US Patents 7,557,730, 7,221,287, 7,375,649, 7,508,321 and 7,702,452. Case before the United States District Court, Eastern District of Virginia, Case No. 1:10-cv-1457 CMH/TCB. Deposed 7/28/11; Testified in Court: 11/3/11 (jury trial). Retained 4/11 to 11/11.

Garmin International, Inc. v. Pioneer Corporation and Pioneer Electronics (USA), Inc.

Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of plaintiff Garmin. Patents-in-suit are U.S. Patents 5,365,448; 5,424,951; and 6,122,592. Case before the United States District Court for the District of Kansas. Case No. 10-CV-2080 JWL/GLR. Declarative Judgment action stayed. Retained 3/11 to 11/11.

Visteon Global Technologies, Inc. And Visteon Technologies, LLC v. Garmin International, Inc.

Retained by Shook, Hardy and Bacon as an expert on behalf of defendant Garmin. Patents-in-suit are US Patents 5,544,060, 5,654,892, 5,832,408, 5,987,375 and 6,097,316. Case before the United States District Court, Eastern District of Michigan, Case No. 2:10-cv-10578--PDB-MAR. Deposed 10/9/12; Retained 12/10 to 10/17.

Thomson Licensing SAS and Thomson Licensing, LLC. v. Realtek Semiconductor Corporation

Retained by Sidley-Austin as an expert on behalf of respondent Realtek Semiconductor. Case before the US International Trade Commission, Washington D.C., in the matter of: "Certain Liquid Crystal Display Devices, Including Monitors, Televisions, Modules, And Components Thereof," Investigation number 337-TA-741. Patent-in-suit is US Patent 6,121,941. Deposed 6/29/11; Testified in Court: 9/15/11 and 9/16/11. Retained 11/10 – 9/11.

Ambato Media, LLC. v. Clarion Co., LTD., et al.

Retained by Traurig-Greenberg as an expert on behalf of defendant Garmin. Patent-in-suit is US Patent 5,432,542. Case before the United States District Court for the Eastern District Of Texas, Marshall Division. Case number 2:09-CV-242. Deposed 4/26/12 and 5/10/12; Testified in Court: 7/11/12. Retained 10/10 to 7/12.

Gabriel Technologies Corporation and Trace Technologies, LLC, v. Qualcomm Incorporated, Snaptrack, Inc. and Norman Krasner

Retained by Cooley-Godward as an expert on behalf of defendants Qualcomm, Snaptrack, and Krasner. Trade secret misappropriation case related to US Patents 6,377,209, 6,583,757, 6,661,372, 6,799,050, 6,861,980, 6,895,249, 7,254,402, 7,289,786, 7,319,876, 7,421,277, 7,446,655, 7,570,958, 7,574,195, and 7,660,588. Case before the Southern District of California San Diego Division, Case No. 08-cv-1992 MMA POR. Retained 6/10 to 7/12.

SiRF/CSR v. Global Locate/Broadcom Corporation

Retained by Wilmer-Hale as an expert on behalf of defendant Global Locate / Broadcom. Patents-in-suit are US Patents 5,663,735, 6,480,150, 6,519,466, 6,650,879, 6,882,827, 6,934,322, 7,412,157, 7,236,883, and 7,573,422. Case before the Central District of California, Case No. 8:06-cv-01216 and Case No. 8:10-cv-01281. Retained 9/10 to 1/11.

Pioneer Electronics v. Garmin Corporation

Retained by Shook, Hardy and Bacon, LLP as an expert on behalf of respondent Garmin In the matter of Certain Multimedia Display and Navigation Devices and Systems, Components Thereof, and Products Containing Same; Inv. No. 337-TA-694. Patents-in-suit are U.S. Patents 5,365,448; 5,424,951; and 6,122,592. Case before the U.S. International Trade Commission.

Deposed on 7/29/10; Testified at technology tutorial (8/27/10) and in the evidentiary hearing (9/20/10). Retained 4/10 to 9/10.

EMSAT Advanced Geo-Location Technology, LLC and Location Based Services LLC, v. AT&T Mobility, LLC

Retained by Baker-Botts as an expert on behalf of defendant AT&T Mobility, LLC. Patents-in-suit are U.S. Patents 7,289,763; 5,946,611; 6,324,404; and 6,847,822. Case before the U.S. District Court for the Northern District of Ohio, Eastern Division, Civil Action No. 4:08 CV 822. Deposed 5/4/10; Testified in Court: 5/10/10 (Markman hearing). Retained 12/09 to 3/11.

Tendler Cellular of Texas, LLC v. AT&T Mobility, LLC, et al.

Retained by Baker-Botts as an expert on behalf of defendants AT&T Mobility, LLC, et al. Patents-in-suit are U.S. Patents 7,447,508; 7,305,243; 7,050,818; and 6,519,463. Case before the U.S. District Court for the Eastern District of Texas (Tyler), Civil Action No. 6:09-CV-00115. Retained 8/09 to 7/10.

Ambit Corporation v. Delta Air Lines, Inc., and Aircell LLC.

Retained by Sidley Austin, LLP., as an expert on behalf of defendants Delta Airlines, Inc., and Aircell, LLC. Patent-in-suit is US patent 7,400,858. Case before the US District Court, District of Massachusetts, Boston, Civil Action No. 1:09-CV-10217-WGY. Deposed 12/4/09; Testified in Court: 12/7/09 (evidentiary hearing), 7/10 (jury trial). Retained 8/09 to 7/10.

GPS Industries, Inc. and Optimal I.P. Holdings, L.P. v. Altex Corporation, et. al.

Retained by Hitchcock-Evert as an expert on behalf of defendants Altex Corporation, Deca International Corporation, Golflogix, Inc. and L1 Technologies. Patent-in-suit is US patent 5,364,093. Case before the US District Court, Northern District of Texas, Dallas Division, Civil Action No. 3-07-CV0831-K. Deposed 6/30/09. Retained 5/08 through 7/09.

Satellite Tracking of People, LLC v. Omnilink Systems, Inc.

Retained by DLA Piper as an expert on behalf of defendant Omnilink Systems, Inc.. Patent-in-suit is US patent RE39,909. Case before the US District Court, Eastern District of Texas, Marshall Division, Civil Action No. 2-08CV-116. 12/08 – 1/11.

SiRF Technology, Inc. v. Global Locate, Inc.

Retained by DLA Piper/WilmerHale as an expert on behalf of Global Locate. Patents-in-suit include US patents 6,304,216; 6,417,801; 6,606,346; 6,651,000; 6,704,651; 6,937,187; 7,043,363; 7,091,904; 7,132,980 and 7,158,080. Case before the US International Trade Commission, Washington D.C., in the matters of: “Certain GPS Devices and Products Containing Same,” Investigation number 337-TA-602 (Global Locate, plaintiff) and “Certain GPS Chips, Associated Software and Systems, and Products Containing Same,” Investigation number 337-TA-596 (SiRF Technologies, plaintiff). My work focused on the 7,043,363 and 7,091,904 patents in defense of Global Locate/Broadcom from June 2007 through March 2008. Deposed 1/18-1/19/08; testified at trial 3/18-3/19/08.

Intellectual Science and Technology

Retained Dykema Gossett, PLLC as a technical expert on patent infringement issues related to “suspend-to-RAM” technologies in personal computers. Pre-litigation work.

Intellectual Science and Technology, Inc., v. Sony, JVC and Panasonic

Retained Dykema Gossett, PLLC as a technical expert on patent infringement issues related to US Patent 5,748,575, US Patent 6,222,799, US Patent 6,785,198, US Patent 6,662,239 and US Patent 6,717,890. Sony Electronics Inc., case number 2:06-CV-10406, JVC Americas Corp., case number 2:06-CV-10409 and Panasonic Corporation of North America case number 2:06-CV-10412. Cases heard in United States District Court, Eastern District of Michigan, Southern Division. Expert for Intellectual Science and Technology, Inc. Dec 2006 – 2008..

Kirsch Technologies v. Xerox, Canon

Retained Dykema Gossett, PLLC as an Expert Witness on patent infringement issues related to US Patent 4,816,911, Canon case number CA 00-72775, Xerox case number CA 00-72778, cases heard in United States District Court, Eastern District of Michigan, Southern Division. Expert for Kirsch Technologies. Nov 2006 – 2008..

American Video Graphics v. ATI Technologies

Retained by Sidley, Austin, Brown & Wood, Dallas, TX as a technical expert on patent infringement issues related to US Patents 5,132,670, 5,109,520, 5,084,830, 4,761,642, 4,742,474, 4,734,690, 4,730,185 and 4,694,286. Hewlett-Packard Co., et al., defendants, case number CA 6:04-CV-379-LED and Sony Corporation of America et al., defendants, case number CA 6:04-CV-399-LED. Cases heard in United States District Court, Eastern District of Texas, Tyler Division. Expert for ATI Technologies, intervener. Jan 2005 – Sep 2005.

Microsoft v. EMC

Dewey Ballantine, LLP, Washington, D.C., as a technical expert on patent infringement issues related to US Patents 5,588,147; 5,689,700; 6,393,466; 6,424,151; 6,490,594; and 6,632,248. Wrote a declaration on behalf of Microsoft. Oct 2004 – Jan 2005.

Optimum Return v. Meier Brothers

Retained by Sidley, Austin, Brown & Wood, Dallas, TX as a technical expert on Copyright infringement allegations related to software owned by Optimum Return, LLC. Cyberkatz Consulting, Inc., Handsquare, LLC, Meier Brothers, et al., defendants, case number CA 3-03CV1064-D. Case heard in United States District Court, Northern District of Texas, Dallas Division. Expert for Meier Brothers. July 2004.

Parental Guide of Texas, Inc. v. Funai Corp., et. al.

Technical expert for defendants JVC and Panasonic in their dispute over non-infringement of US Patent number 4,605,964.

Elonex I.P. Holdings, LTD. and Elonex PLC, Phase II

Expert witness for defendants Chuntex, Acer, Tatung, Lite-On, Daewoo and Envision in their dispute with Elonex non-infringement and validity for US Patent numbers 5,389,952; 5,648,799; and 5,880,719.

Storage Computer Corporation vs. Veritas Software

Technical expert for the plaintiff in matters involving Patents US 5,257,367; US 5,893,919; and US 6,098,128.

Storage Computer Corporation vs. Seagate Technology LLC

Technical expert for the defendant in matters involving US Patent RE 34,100.

Elonex I.P. Holdings, LTD. and Elonex PLC, vs. Packard Bell et. al., CA 98-689-GMS

Expert witness for defendants ViewSonic Corp., Dell Computer Corporation, MAG Technology USA, Princeton Graphic Systems, Inc., Micron Electronics, Sony Electronics and Capetronic Computer USA in their dispute with Elonex non-infringement and validity for US Patent numbers 5,389,952; 5,648,799; and 5,880,719.

1.4.2 Engineering Consulting**Offspring Media Inc.**

Technical consultant for the development of real-time auralization algorithms for integration into a consumer electronics product. Sep 2004.

Raytheon Company, Sudbury, MA

Development of techniques and requirements for implementing a fault tolerant computer system using software implemented fault tolerance (SIFT) techniques on commercial off-the-shelf processing hardware. The resultant system is to be used for highly reliable radar data and signal processing.

TVM Techno Venture Management

Provided consulting services to assist in assessing the technical claims of a company pursuing venture capital investment for a hardware implemented RAID 5 system .

Keyhold Engineering Inc., Northboro, MA.

Development of a prototype system for automatically calibrating multiple channel audio systems.

American Navigation Systems Inc., Milbury, MA.

Consulting on the development of the hand-held personal navigation and mapping system.

Lincoln Laboratory, Bedford, MA.

Simulated, tested and evaluated a GPS integrity monitoring algorithm developed at Lincoln Laboratories.

1.5 Licenses and Certifications**1.5.1 Commercial Radio Operator**

General Radiotelephone Operator License
Ship RADAR endorsement

1.5.2 Amateur Radio Operator

Amateur Extra class radio operator license.

1.5.3 Diving Certifications

PADI Open Water Diver (ISO 24801-2 Diver Level 2 – Autonomous Diver)

1.5.4 Other Certifications

Remote Pilot Certificate (FAA Part 107 Small UAs)

2. Courses Taught at WPI

2.1 Course Descriptions

Short descriptions of the courses taught are as follows:

EE572N Advanced System Architecture

This course focuses on the architectural techniques used to achieve high-performance in SISD and SIMD computer systems. In this course the interaction between the software application and hardware architecture and the effect of this interaction on achievable performance is stressed. The course begins by covering the basic architectural tricks used to enhance system performance and ends with a series of case studies that analyze specific architectures such as the CRAY and CDC vector supercomputers, the MasPar, the Connection Machine, the ICL DAP, and others.

ECE505 Computer Architecture

This course is an introductory graduate course in computer architecture. Most aspects of CPU architecture are covered using a combined hardware/software approach. Specific topics include datapath design, memory systems, microprogramming, memory management, operating systems, and instruction set design.

ECE579M Real-Time System Design

This course focuses on the design of computer systems for which the timeliness of producing results is a critical factor for establishing the correctness of the system design. Topics covered include hardware specification, real-time operating systems and programming, scheduling, communications, and validation/verification. Issues and choices arising for single processor and distributed systems are also covered. Both hard and soft real-time system issues and the interactions between real applications and real systems is stressed.

ECE2010 Introduction to Electrical and Computer Engineering.

The objective of this course is to introduce students to the broad field of electrical and computer engineering within the context of real world applications. This course is designed for first-year students who are considering ECE as a possible major or for non-ECE students

fulfilling an out-of-major degree requirement. The course will introduce basic electrical circuit theory as well as analog and digital signal processing methods currently used to solve a variety of engineering design problems in areas such as entertainment and networking media, robotics, renewable energy and biomedical applications. Laboratory experiments based on these applications are used to reinforce basic concepts and develop laboratory skills, as well as to provide system-level understanding. Circuit and system simulation analysis tools are also introduced and emphasized.

ECE2019 Sensors, Circuits, and Systems.

This course investigates commonly used sensors such as resistive temperature sensors, capacitive touch sensors, and inductive motion sensors and actuators. Numerous applications are presented to motivate coverage of fundamental operating principles of circuit elements such as resistors, capacitors, and inductors; model the signals produced by these sensors; and analyze the circuits and systems used to amplify and process these signals. After a review of Kirchhoff's current and voltage laws, fundamental analysis techniques such as Thevenin and Norton's theorems and the superposition principle are used to model and analyze sensors, circuits, and systems. Concepts from analysis of linear, time-invariant continuous-time signals and systems are introduced as necessary, including Fourier series and characterization of systems such as filters in both the frequency domain (bandwidth, transfer function) and time domain (rise time, step response). Capacitance, inductance and mutual inductance are explored as energy storage elements, including consideration of resonance and energy losses in power systems. Concepts will be reinforced with the use of laboratory exercises and computer simulation. Recommended background: ECE 2010, MA 1024 (or equivalent), PH 1120/21 and MA 2051 (concurrent) Note: Students who have received credit for ECE 2111 may not receive credit for ECE 2019.

ECE2022 Introduction to Digital Circuits and Computer Engineering.

The objective of this course is to expose students (including first year students) to basic electrical and mathematical concepts that underlie computer engineering while continuing an introduction to basic concepts of circuits and systems in a hands-on environment. Experiments representing practical devices introduce basic electrical engineering concepts and skills which typify the study and practice of electrical and computer engineering. In the laboratory, the students construct, troubleshoot, and test analog and digital circuits that they have designed. They will also be introduced to the nature of the interface between hardware and software in a typical microprocessor based computer.

ECE2801 Foundations of Embedded Systems

This course teaches the principles of programming microprocessors and microcontrollers for real-time applications. Students are introduced to software engineering principles and are taught how to translate product specifications into engineering solutions.

ECE2799 ECE Design

This is a new course added to the curriculum that teaches sophomore Electrical Engineering students the basic principles of design. Topics are covered which range from project planning and management through manufacturing and implementation. Students are exposed to external factors influencing design such as safety, liability, cost, and other constraints.

ECE3801 Logic Circuits

This is an introductory course in logic circuit design. Topics covered include Boolean Logic, Algebraic minimization of logic equations, Karnaugh Maps, sequential machine design and timing analysis.

ECE3803 Introduction to Microprocessor Systems

This is an undergraduate-level first-course in microprocessor design. Topics covered include timing analysis, address decoding, memory system design, assembly language programming, programmed I/O, and digital/analog interfacing. Experiments are run using ISA-bus interfaces to standard PCs.

ECE3810 Advanced Digital System Design

This course addresses the design of advanced digital logic systems using VHDL to design, synthesize and model digital circuits, and to implement these circuits using Xilinx FPGA devices. The course emphasizes understanding functional design, designing for speed and power objectives, and testing. The course ends with students designing moderately complicated “system on a chip” (SOC) based systems

ECE4815 Computer Architecture (crosslisted as CS4515)

A first course in computer architecture. Essential aspects of CPU architecture are covered using a combined hardware/software approach. Students learn how a CPU interprets and processes instructions. Issues associated with interfacing hardware with software are covered in detail as are the hardware/software tradeoffs associated with performance optimization.

ECE4801 Microprocessor System Design

Microprocessor System Design is the second course in the microprocessor sequence. In this course, students learn the advanced concepts used in modern microprocessor systems. Topics such as system organization, dynamic and cache memory systems, communications, mixed language programming, and device driver design are covered.

ECE430X Fundamentals of Navigation Systems

This course introduces students to the fundamentals of navigation using electronic systems. The course covers types of navigation systems, how to interpret sensor data and sources of navigation system error. Topics include: types of navigation systems (dead reckoning, inertial, radio based systems), sensors and error sources, coordinate frames and transformations, system

dynamics and measurement processing. Case studies explore the use of accelerometers, gyroscopes, GPS (including, differential and assisted GPS) as well as other types of navigation systems.

RBE 3001 Unified Robotics III

Third of a four-course sequence introducing foundational theory and practice of robotics engineering from the fields of computer science, electrical engineering and mechanical engineering. The focus of this course is actuator design, embedded computing and complex response processes. Concepts of dynamic response as relates to vibration and motion planning will be presented. The principles of operation and interface methods various actuators will be discussed, including pneumatic, magnetic, piezoelectric, linear, stepper, etc. Complex feedback mechanisms will be implemented using software executing in an embedded system. The necessary concepts for real-time processor programming, re-entrant code and interrupt signaling will be introduced. Laboratory sessions will culminate in the construction of a multi-module robotic system that exemplifies methods introduced during this course.

RBE 3002 Unified Robotics IV

Fourth of a four-course sequence introducing foundational theory and practice of robotics engineering from the fields of computer science, electrical engineering and mechanical engineering. The focus of this course is navigation, position estimation and communications. Concepts of dead reckoning, landmark updates, inertial sensors, vision and radio location will be explored. Control systems as applied to navigation will be presented. Communication, remote control and remote sensing for mobile robots and tele-robotic systems will be introduced. Wireless communications including wireless networks and typical local and wide area networking protocols will be discussed. Considerations will be discussed regarding operation in difficult environments such as underwater, aerospace, hazardous, etc. Laboratory sessions will be directed towards the solution of an open-ended problem over the course of the entire term.

RBE 400x Robot System Engineering and Design

The designers of robotic systems start with a system requirement to define the mechanical, electrical and software systems which must work together to achieve the system goals. Typically, parallel teams of engineers will work concurrently to create the requirements document as well as model various aspects of the system to verify operational capabilities and the ability to meet time and budget constraints. For complex systems, the development of such teams can itself be a complex problem since the project has to be organized in such a way that parallel teams can work independently, yet have excellent communication channels and information passing to insure project success.

This course explores the tools and techniques used to develop complex systems. The topics covered include: requirements development; system architecture and partitioning; requirements flowdown; functional and interface specifications; trade studies; system modeling and simulation; system integration; as well as design verification and validation.

RBE500 Foundations of Robotics

Foundations and principles of processing sensor information in robotic systems. Topics include an introduction to probabilistic concepts related to sensors, sensor signal processing, multi-sensor control systems and optimal estimation. The material presented will focus on the types of control problems encountered when a robot must operate in an environment where sensor noise and/or tracking errors are significant. Techniques for assessing the stability, controllability and expected accuracy of multi-sensor control and tracking systems will be presented. Lab projects will involve processing live and synthetic data, robot simulation and projects involving the control of robot platforms.

RBE502 Robot Control

This course reviews the interplay between control and robotics through introducing theory and demonstrating applications. It aims to provide an in-depth coverage of control design for robotic manipulators and mobile robots. We focus primarily on fundamental theory, control design methods, and their application on practical robotic systems. Topics may include modeling of robotic systems, linear/nonlinear control of robotic systems, control of under-actuated robotic systems, optimal control, adaptive control, behavior-based robots. Course projects will emphasize modeling, simulation and practical implementation of control systems for robot applications.

RBE594 Capstone Project Experience In Robotics Engineering

This project-based course integrates robotics engineering theory and practice, and provides the opportunity to apply the skills and knowledge acquired in the Robotics Engineering curriculum. The project is normally conducted in teams of two to four students. Students are encouraged to select projects with practical significance to their current and future professional responsibilities. The projects are administered, advised, and evaluated by WPI faculty as part of the learning experience, but students are also encouraged to seek mentorship from experienced colleagues in the Robotics Engineering profession.

3. List of Publications:

3.1 Journal Papers

- [1] DiLuoffo, Vincenzo, and William R. Michalson. "A Survey on Trust Metrics for Autonomous Robotic Systems." arXiv preprint arXiv:2106.15015 (2021).
- [2] V. Diluoffo, W. R. Michalson and B. Sunar, "Robot Operating System 2: The need for a holistic security approach to robotic architectures," International Journal of Advanced Robotic Systems, 15.3, 2018.
- [3] T. Padir, W.R. Michalson, et. al., "Implementation of an Undergraduate Robotics Engineering Curriculum," Computers in Education Journal, vol. I, no. 3, pp. 92-101, 2010.
- [4] W. R. Michalson, A. Navalekar and H. Parikh, "Error mechanisms in indoor positioning systems without support from GNSS," The Journal of Navigation, Cambridge University Press, vol. 62, no. 2, pp. 239-49, 2009.

- [5] H.K. Parikh and W. R. Michalson, "Impulse Radio - UWB or Multicarrier UWB for Non-GPS based Indoor Precise Positioning Systems," *NAVIGATION J. Inst. Nav.*, Vol. 55, no. 1, 2008.
- [6] I. F. Progri, W. R. Michalson, J. Wang and M.C. Bromberg, "Indoor Geolocation Using FCDMA Pseudolites: Signal Structure and Performance Analysis", *NAVIGATION J. Inst. Nav.*, Vol. 54, No. 3, Fall 2007.
- [7] I. F. Progri, M. C. Bromberg and W. R. Michalson, "Maximum-Likelihood GPS Parameter Estimation", *NAVIGATION J. Inst. Nav.*, vol. 52, no. 4, pp. 229-238, Winter, 2005-2006.
- [8] I.F. Progri, W.R. Michalson, and D. Cyganski, "An OFDM/FDMA Indoor Geolocation System," *NAVIGATION J. Inst. Nav.*, vol. 51, no. 2, pp. 133-142, Summer, 2004.
- [9] I.F. Progri, G. Bogdanov, V.C. Ramanna, and W.R. Michalson, "An Investigation Of A GPS Adaptive Temporal Selective Attenuator," *NAVIGATION J. Inst. Nav.*, Vol. 49 No. 3, pp. 137-147, 2002.
- [10] G. Bogdanov, W. R. Michalson, and R. Ludwig, "A new apparatus for non-destructive evaluation of green-state powder metal compacts using the electrical resistivity method," *Measurement Science and Technology*, IOP Publishing, vol. 11, pp. 157-166, January 2000.
- [11] B. Findlen, E. Reuter, R. Campbell, and W. R. Michalson, "Effects of time domain response on the sonic characteristics of microphones," *Journal of the Acoustical Society of America*, vol. 104, no. 3, pt. 2 pp. 1764, September 1998.
- [12] J. Sedgwick, W. R. Michalson, and R. Ludwig, "Design of a Digital Gauss Meter for Precision Magnetic Field Measurements," *IEEE Transactions on Instrumentation and Measurement*, vol. 47, no. 4, pp. 972-977, August 1998.
- [13] J. Stander, J Plunkett, W. Michalson, J. McNeill, and R. Ludwig, "A Novel Multi-Probe Resistivity Approach to Inspect Green-State Powdered Metallurgy Compacts," *Journal of Non-Destructive Evaluation*, vol. 16, no. 4, pp. 205-214, 1997.
- [14] Woltereck, R. Ludwig, and W. Michalson, "A Quantitative Analysis of the Separation of Aluminum Cans Out of a Waste Stream Based on Eddy Current Induced Levitation," *IEEE Transactions on Magnetics*, vol. 33, no. 1, pp. 772-781, January 1997.
- [15] W. R. Michalson, "Auralization on a Laptop PC," abstract appears in *The Journal of the Acoustical Society of America* , vol. 100 No. 4, Pt 2, pp. 2608, October 1996.
- [16] R. H. Campbell, S. K. Martin, I. Schneider, and W. R. Michalson, "Analysis of Mosquito Wingbeat Sound," *The Journal of the Acoustical Society of America* vol. 100 No. 4, Pt 2, pp. 2710, October 1996.
- [17] W. R. Michalson, "Ensuring GPS Navigation Integrity using Receiver Autonomous Integrity Monitoring," *IEEE Aerospace and Electronic Systems Magazine*. vol. 10, no. 10, pp. 31-34, October 1995.
- [18] S. Clayton, R. J. Duckworth, W. Michalson, A. Wilson, "Determining Update Latency Bounds in Galactica Net," *Concurrency: Practice, and Experience*, vol. 7, no. 7, pp. 595-611, October 1994.

3.2 Conference Papers

- [1] E. Skorina, R. Rameshwar, S. Pirasmepulkul, T. Khuu, A. Caracappa, P. Luxsuwong, M. Luo, W. R. Michalson, and C. Onal, "Soft Robotic Glove System for Wearable Haptic Teleoperation," WM Symposium 2018, March 18 - 22, 2018 - Phoenix Convention Center.
- [2] K.C. Seals, W.R. Michalson, R.J. Hartnett and P.F. Swaszek, "Using Both GPS L1 C/A and L1C: Strategies to Improve Acquisition Sensitivity," Proc. 26th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS 2013), Sep. 16-20, 2013.
- [3] K.C. Seals, W.R. Michalson, R.J. Hartnett and P.F. Swaszek, "Semi-Coherent and Differentially Coherent Integration for L1C Acquisition," Proc. 2013 International Technical Meeting of the Institute of Navigation (ION ITM 2013), Honolulu, HI, Apr. 22-25, 2013.
- [4] J.M. Barrett, M.G. Gennert, W. R. Michalson, et. al., "Development of a Low-Cost, Self-Contained, Combined Vision and Inertial Navigation System," 2013 International Conference on Technologies for Practical Robotic Applications, Boston, MA Apr. 22-23, 2012.
- [5] K.C. Seals, W.R. Michalson, R.J. Hartnett and P.F. Swaszek, "Analysis of L1C Acquisition by Combining Pilot and Data Components Over Multiple Code Periods," Proc. 2013 International Technical Meeting of the Institute of Navigation (ION ITM 2013), San Diego, CA, Jan. 28-30, 2013.
- [6] K.C. Seals, W.R. Michalson, R.J. Hartnett and P.F. Swaszek, "Analysis of Coherent Combining for L1C Acquisition," Proc. 25th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS 2012), pp.384-393, Nashville, TN, Sep. 17-21, 2012.
- [7] J.M. Barrett, M.G. Gennert, W. R. Michalson and J.L. Center, "Analyzing and Modeling an IMU for Use in a Low-Cost Combined Vision and Inertial Navigation System," 2012 International Conference on Technologies for Practical Robotic Applications, Boston, MA Apr. 23-24, 2012.
- [8] G. Fischer, W. R. Michalson, T. Padir and G. Pollice, "Development of a Laboratory Kit for Robotics Engineering Education" AAAI 2010 Spring Symposium on Educational Robotics and Beyond: Design and Evaluation, Mar. 22-24, Palo Alto, CA, 2010.
- [9] W.R. Michalson, and F. J. Looft, "Designing Robotic Systems: Preparation for an Interdisciplinary Capstone Experience," American Society of Engineering Educators 2010 Annual Conference, Louisville, KY, Jun 20-23, 2010.
- [10] W.R. Michalson, S.J. Bitar and R.C. Labonte, "The Technical, Process, and Business Considerations For Engineering Design – A 10 Year Retrospective," American Society of Engineering Educators 2010 Annual Conference, Louisville, KY, Jun 20-23, 2010.

- [11] M. Gennert, M. Demietrio and W. R. Michalson, "A Robotics Engineering M.S. Degree," American Society of Engineering Educators 2010 Annual Conference, Louisville, KY, Jun 20-23, 2010.
- [12] R. Beach, W. R. Michalson, et. al., "Robotics Innovations Competition and Conference (RICC): Building Community Between Academia and Industry Through a University-Level Student Competition," American Society of Engineering Educators 2010 Annual Conference, Louisville, KY, Jun 20-23, 2010.
- [13] G. Tryggvason, W.R. Michalson, et. al., Teaching Multidisciplinary Design to Engineering Students: Robotics Capstone," American Society of Engineering Educators 2010 Annual Conference, Louisville, KY, Jun 20-23, 2010.
- [14] A.C.Navalekar, W.R. Michalson, "Asymmetric throughput problem due to Push-to-talk (PTT) delays in CSMA/CA based heterogeneous Land Mobile Radio (LMR) networks", accepted for publication, Milcom 2009.
- [15] A. Navalekar and W.R. Michalson, "Effects of Unintentional Denial of Service (DOS) due to PTT delays on performance of CSMA/CA based Adhoc Land Mobile Radio (LMR) networks", accepted for publication, ICST Adhocnet 2009.
- [16] W. R. Michalson, et. al., "Unified Robotics: Balancing Breadth and Depth in Engineering Education", American Society of Engineering Educators 2009 Annual Conference, AC 2009-1681, Austin, TX, Jun 14-17, 2009.
- [17] G. Tryggvason, W.R. Michalson, et. al., "Robotics Engineering: A New Discipline for a New Century", American Society of Engineering Educators 2009 Annual Conference, AC 2009-997, Austin, TX, Jun 14-17, 2009.
- [18] M. DiBlasi, W. R. Michalson, et. al., "Social Networking in the FIRST Robotics Competition Community," ASEE Northeast Section Conference, University of Bridgeport, Apr 3-4, Bridgeport, CT, 2009.
- [19] A. Navalekar, H.K Parikh and William R. Michalson, "Error Mechanisms in Indoor Positioning Systems without Support from GNSS", RIN NAV 08.
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3.3 Book Chapters

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3.4 Patents

Firearm Safety and Training Aid

United States Patent Application, 19/170,742, April 2025.

Discloses a system and various embodiments which allow sensing the motion of a firearm at the time the trigger is pulled and for estimating the point of impact of a projectile, alerting the user of the status of the firearm, sensing the differences between proper and improper targets, locating a lost or stolen firearm, and other features.

Haptic glove as a wearable force feedback user interface

United States Patent 10,551,923, Issued February 4, 2020

A toroidal actuator is responsive to a teleoperator for providing haptic feedback responsive to a curvature or articulated movement applied to a gripped object. The toroidal actuator surrounds an operator member such as a finger, and is responsive to pneumatic pressure for increasing telepresence force defined by resistance encounter against a teleoperated robotic claw. As the teleoperated claw grips an object, increased pneumatic pressure in the toroidal actuator tends to elongate the toroidal shape in a linear manner and oppose a curvature force applied by an inserted operator finger. Resistive force is based on soft sensing of the gripped object, thus the toroidal actuator applies an increasing resistive force to curvature as the robotic claw closes around a gripped object by solenoid regulated air pressure.

Precision location methods and systems

United States Patent 8,928,459, Issued January 6, 2015

The invention describes systems and methods for determining the location of a transmitter by jointly and collectively processing the full sampled signal data from a plurality of receivers to form a single solution.

Tracking device and remote monitoring system

United States Patent Application US20140274115A1

A system includes a remote monitoring device configured to detect and measure one or more signals and to convey detected and measured signal information to a central location. The central location is configured to determine the location of the remote monitoring device based on the received signal information and is also configured to determine at least one hypothetical path of the remote monitoring device. Abandoned.

Apparatus and methods for addressable communication using voice-grade radios

United States Patent 8,284,711, Issued 9 October 2012

The invention relates to methods and apparatus for conducting directed communication using voice-grade radios. The methods and apparatus can be used to form a packet-switched wireless network using legacy analog transceivers, providing, e.g., both data and voice-over-Internet Protocol communication.

Multi-channel electrophysiologic signal data acquisition system on an integrated circuit.

United States Patent 7,896,807, issued 3 March 2011.

A physiologic data acquisition system includes an analog input, a sigma-delta front end signal conditioning circuit adapted to subtract out DC and low frequency interfering signals from and amplify the analog input before analog to digital conversion. The system can be programmed to acquire a selected physiologic signal, e.g., a physiologic signal characteristic of or originating from a particular biological tissue. The physiologic data acquisition system may include a network interface modulating a plurality of subcarriers with respective portions of an acquired physiologic signal. A receiver coupled to the network interface can receive physiologic data from, and send control signals and provide power to the physiologic data acquisition system over

a single pair of wires. The network interface can modulate an RF carrier with the plurality of modulated subcarriers and transmit the resulting signal to the receiver across a wireless network. An integrated circuit may include the physiologic data acquisition system. Also included are methods for acquiring physiologic data comprising the step of selectively controlling an acquisition circuit to acquire the physiologic signal.

Methods and apparatus for high resolution positioning. United States Patent 7,292,189. The invention relates to a method of signal analysis that determines the location of a transmitter and to devices that implement the method. The method includes receiving by at least three receivers, from a transmitter, a first continuous-time signal having a first channel. The first channel includes a first plurality of signal carriers having known relative initial phases and having known frequencies which are periodically spaced and which are orthogonal to one another within a first frequency range. The signal analysis method also includes determining the phase shifts of the carriers of the first channel resulting from the distance the carriers traveled in reaching the first receiver. Analysis of the phase shifts yields time difference of arrival information amongst the receivers, which is further processed to determine the location of the transmitter. 6 Nov 2007.

A Reconfigurable Indoor Geolocation System, US Patent Number 7,079,025. A portable reconfigurable geolocation system is provided. The system includes a portable user node and one or more portable pseudolite nodes in communication one another and with the user node. Each of the user nodes and pseudolite nodes includes a transmitter that generates a signal on one or more carrier frequencies. Each signal is modulated with digital signals necessary to establish distances between the nodes and to convey data between the nodes. Each node also includes a receiver for receiving and demodulating the signals transmitted between the nodes, and a processor for receiving the demodulated signals, extracting data values and derived values from the demodulated signals and determining a three-dimensional position of each node in the system. Issued 18 Jul 2006.

Auto-Calibrating Surround System, United States Patent 7,158,643. A multi-channel surround sound system and method is described that allows automatic and independent calibration and adjustment of the frequency, amplitude and time response of each channel of the surround sound system. The disclosed auto-calibrating surround sound (ACSS) system includes a processor that generates a test signal represented by a temporal maximum length sequence (MLS) and supplies the test signal as part of an electric input signal to a loudspeaker. A microphone coupled to the processor receives the signal in a listening environment. The processor correlates the received sound signal with the test signal in the time domain and determines from the correlated signals a whitened response of the audio channel in the listening environment. Issued 2 Jan 2007.

Hand-held GPS-mapping device, US. Patent Number 5,987,380. A hand-held navigation, mapping and positioning device contains a GPS receiver, a database capable of storing vector or bit mapped graphics, a viewing port, an embedded processor, a simplified user interface, a data compression algorithm, and other supporting electronics. The viewport is configured such that the data presented in the viewport is clearly visible in any ambient light condition. The database stores compressed image data which might include topographical map data, user annotations, building plans, or any other image. The system includes an interface to a personal computer

which may be used to annotate or edit graphic information externally to the device for later upload. In addition, the device contains a simple menu-driven user interface which allows panning and zooming the image data, marking locations of interest, and other such functions. The device may be operated from an internal rechargeable battery, or powered externally. Issued 16 Nov 1999.

Hand-held GPS-mapping device, US. Patent Number 5,902,347. A hand-held navigation, mapping and positioning device contains a GPS receiver, a database capable of storing vector or bit mapped graphics, a viewing port, an embedded processor, a simplified user interface, a data compression algorithm, and other supporting electronics. The viewpoint is configured such that the data presented in the viewport is clearly visible in any ambient light condition. The database stores compressed image data which might include topographical map data, user annotations, building plans, or any other image. The system includes an interface to a personal computer which may be used to annotate or edit graphic information externally to the device for later upload. In addition, the device contains a simple menu-driven user interface which allows panning and zooming the image data, marking locations of interest, and other such functions. The device may be operated from an internal rechargeable battery, or powered externally. Issued 11 May 19/99.

3.5 Professional Presentations

American Ambulance Association Annual Meeting: Low-cost VHF/UHF Interoperability for digital telemetry, Las Vegas, NV, Dec. 2005.

California Ambulance Association, Keynote address: Alternatives to solving interoperability problems in Land Mobile Radios, Lake Tahoe, NV, July 2005.

Museum of Science Lecture Series: The Next Generation of Information and Communications Technologies-What does the Future Hold?, William R. Michalson and Brian King, January 14, 2004.

Agilent Wireless Technology Summit: Dynamic Node Location in an Ad Hoc Indoor Communications and Positioning Network, William R. Michalson, January 27, 2004

Security & Technology Online (SATO) Security Leadership Council. Panel discussion on Smart Surveillance, Command and Control, Oct 28-29, 2004.

“Worcester Polytechnic Institute Barcelona Summit: The Future of Information Technology,” delivered presentation entitled “Personal Navigation in the Information Age,” Apr 2001.

4. Projects advised (undergraduate).

4.1 Major Qualifying Projects (current)

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- [2] *SailBot 2021*, C.J. Burri, M.J. Laks, L.C. Zebrowski, N.H. Jackson, C.J. Scholler, N.J. Eusman, A.V. Thammana, MQP-WZM-SB21, 2021.
- [3] *Ship Recycling Robot*, N.M. Kalsih, S.I. Morales, J. Cybul, J.D. Hoy, T.H. Reiser, MQP-BC2-SRR1, 2021.
- [4] *Tethered Submersible Surveyor*, B.L. Ward, L.C. Reid, J.A. Conklin, J.Y. Huang, MQP-YGB-SUB2/MQP-WZM-SUB1, 2021.
- [5] *Underwater Communications*, L. Spalding, MQP-WZM, 2021.
- [6] *Lionfish IIII*, MQP-CBP, 2021.

4.2 Major Qualifying Projects (completed)

- [7] **Remote Water Monitoring*, Daniel Shrives, T. Vose, and B. Rolfes, MQP-WZM-AB0R, 2020. [* Winner – Provost’s MQP Award in Robotics Engineering]
- [8] *SailBot 2019-2020 MQP*, I. Lavryonova, T. Andrews, M. Guzman, and K. Reese, MQP-WZM-ABWT, 2020.
- [9] *Firefighting Remote Exploration Device II*, J. Cheng, D. Karavoussianis, A. Moseley, and L. Sahyun, CP4-MQP-FIRE, co-advised, 2020.
- [10] *Mohamed Bin Zayed International Robotics Challenge at Takemura Lab, Osaka University*, N. Greig and D. McHorney, WZM-MQP-ABVE, 2020
- [11] *Lionfish Harvesting Robot – Phase III*, M. Abadjiev, Q. Chen, C. Ewen, N. Johnson, N. Olgado, H. Saperstein, O. Strickland, and C. Whimpenny, WZM-MQP-ABVF, 2020.
- [12] *Underwater 3D Data Collection*, D. Pelaez, T. LaCroce, and N. Budris, WZM-MQP-ABVK, 2020.
- [13] *Efficient Multi Robot Mapping: Quick and Sustained Environmental Surveying with Limited Communication*, D. Abraham, T. Bergeron, and C. Dembski, WZM-MQP-AB0P
- [14] *Leveraging NVMe Management Interface to Provide SES Support for Enterprise Server Diagnostics*. T. P. Mackintosh, WZM-MQP-ABQ3, 2019.
- [15] *Sailbot 2018-19*. S. T. Palmer, K.B. Randall and S. A. Fisher, MQP-KZS-SBOT/MQP-WZM-SAIL, 2019.
- [16] *Firefighting Remote Exploration Device*, E. M. Barinelli, J. L. Berman-Jolton, G. K. MacNeal, K. R. Naras, M. Tasellari, and Y. A. Verdeja. MQP-CP4-ABQE, 2019.
- [17] *Vertical Take-Off and Landing Autonomous Aircraft Design*, Q. C. Barker, T. P. Bergeron, J. A. Goldsberry, J. Romelle, B. H. Pasculano, B. M. Waterman, T. M. Weiss, and Z. J. Zolotarevsky, MQP-RVC-1901, 2019.

- [18] *Mobile Manipulation Testbed*, N. S. Dennler, M. LeMay, and T. J. Macaluso, MQP-WZM-AD19, 2019.
- [19] *K.O.L.T.: Known Object Localization and Mapping*, N. A. Rosenberg, MQP-WZM-DRMP, 2019.
- [20] *Walking Quadrupedal Platform*, N. C. Franco, N. M. Liedtke, and D. Lu, MQP-WZM-QUAD, 2019.
- [21] *Wolfgang: An Autonomous Mobile Robot for Outdoor Navigation*, A. U. Cookson, M.E. Landergan, and S. T. O’Neil, MQP-XIH-AD19, 2019.
- [22] *MGH Biomedical Imaging Tools*, I. Alexiou, MQP-SNM-SNMA, 2019. *Automated Sandwich Assembly*, Derek W. Feehrer, Carter C. Reynolds, Jaime R. Stephen, Taylor A. Stephen, MQP WZM 17A1, 2018.
- [23] *Localization for FRC*, Hu, J., Mitrano, P., Puczydowski, K. and Vere, N., 2017.
- [24] **Sailbot 2017-2018 Final Report*, Burklund, J., Johnson, H., Norris, T. and Shanahan, L. 2018. [* Winner – Provost’s MQP Award in Robotics Engineering, Winner – Professional Writing Award].
- [25] *QRP – Quadrupedal Robotics Platform*, Armsby, Z., Cole, R., Coll, B., Martin, J., and Nagal, A., 2018.
- [26] *Embedded GPU-Based Image & Signal Processing Prototype*, Baker, L and Song, D. Lincoln Laboratories, 2018.
- [27] *Music and Wearable Technology*, Perry, L.M., Ferguson, E.E., Barreiro, M.P., 2017.
- [28] *Collaborative Robotics Heads-Up Display*, Christopher Bove and Alexander Wald, MQP-WZM-16A1, Lincoln Laboratories, 2017.
- [29] *Low Cost Quadrupeds*, Joshua Graff, Kevin Maynard, and Alonzo Martinz, MQP-WZM-16A2, 2017.
- [30] *Fire Response Drone*, John Lomi, Zachary Hood, Kyle Young, Chase St. Laurent, and William Boyd, MQP-WZM-16A3, 2017.
- [31] *Smart Transradial Prosthesis*, Yesugey Sipka, ID-CDO-1603, 2017
- [32] **Sailbot 2016*, Nicholas Gigliotti, James Kuszmaul, Tucker Martin, and Ryan Wall, 2016. [* nominated for the Provost’s MQP Award in Computer Science].
- [33] *Autonomous Snowblower*, Nicholas Rowles, Daniel Pongratz, Harrison Vaporciyan, , 2017.
- [34] **Body Armor Impact Map System*, Carolyn S. Keyes, ME; Nicholas B. Potvin, ECE; and Zachary R. Richards, CS, MQP-WZM-15A1, 2016. [* winner of the Mechanical Engineering Department’s MQP Award].
- [35] *Highway Safety Merge System*, Dante A. Pace, ECE; and Sunghoon Yoon, CS, MQP-MYE-AAS5, 2016.
- [36] *Highway Safety Merge System*, Christopher M. Ellen, RBE; MQP-MYE-AATK, 2016.

- [37] *Collaborative Robotics Heads-Up Display*, Bove, C.P. and Wald, A., WPI Lincoln Laboratories Project Center, 2016.
- [38] *De-Mining with UAVs*, Gregory G Tighe
- [39] *Arc-Liberation of Intermolecular Bond Energy for Marine Propulsion*, Rohan Jhunjhunwala, ME; James Deane Jackman, CS; Tyler Jon Ewing, ME; Christopher Michael Byrne, ECE; Christopher William Egan, ECE, 2015.
- [40] *Glovesense Data Glove*, Nathan William Joseph Wiegman, ECE,; Nathan Harrison Wells, ECE; Russell Hagan Hedlund, ECE,; and Mert Can Erad, ECE, 2015.
- [41] *Mobile Motion Capture*, Robert Patrick Dabrowski, ID; and Matthew Stephen Costi, ID, 2014.
- [42] *Intelligent LED Display*, Harrison Chabot Williams, ECE; Rayce Coleman Stipanovich, ECE; and Alexander Joseph Ryan, ECE, 2014.
- [43] **Design and Optimization of a FSAE Vehicle*, Justin Shane Paprota, ECE; and Camden Ryan Mallette, ECE, 2014. [* winner of the Provost's MQP Award in Mechanical Engineering].
- [44] *Sailboat Stabilization System*, Steven Mize Rutledge, ECE; Pedro John Miguel, ECE; Dominic Student author Gonzalez, ECE; and Michael Eric Brendlinger, RBE, 2014.
- [45] *Real Time Person Tracking and Identification using the Kinect sensor*, Nikolaos Matthiopoulos and Matthew Francis Fitzpatrick, 2013.
- [46] *H.E.A.T. – Home Energy Automation Technology*, John Thomas Manero, ECE; Scott James Cloutier, ECE; Michael Dominick Audi, ECE-RBE, 2012.
- [47] *Automated Refueling for Hovering Robots*, Raymond P. Short, RBE; Janine S. Pizzimenti, RBE; and Nigel Bowers Cochran, RBE, 2012.
- [48] *Improved Intelligence and Systems Integration for WPI's UGV – Prometheus*, Gregory Duncan McConnell, RBE; Samson Michael King, RBE; Craig Alan DeMello, RBE; Michael A. Rodriguez, RBE; and Eric J. Fitting, ID, 2012.
- [49] *Aeacus – development of a bio-inspired robotic platform for swarm-based multi-object transport over uneven terrain*, N. Anderson, D. Praetorius and C. Roddy, co-advised with S. Nestinger, 2011.
- [50] *Realization of Performance Advancements for WPI's UGV-Prometheus*, M. Akmanalp, R. Doherty, J. Gorges, P. Kalasuskas, E. Peterson and F. Polido, co-advised with T. Padir, S. Nestinger, M. Ciraldi, K. Stafford, 2011.
- [51] *Optimization of an Autonomous Underwater Vehicle*, J. Baker, C. Frumento, J. Grzyb and T. North, co-advised w/I. Hussein, 2011.
- [14] *Intelligent Tactical Vest*, V. Brisian, J. Fernando, A. Khandaker and J. Zorrilla DeLos Santos, 2011.
- [15] *Quadrotor UAV Interface and Localization Design*, N. Smith, B. Berard and C. Pietre, Lincoln Laboratory Project Center, co-advised with G. Heineman, 2011.
- [16] *Voice Release System*, J. Low, WZM-MQP-1M10, 2010.

- [17] *Design and Realization of an Intelligent Unmanned Ground Vehicle*, J. Barrett, B. Roy and D. Sacco, Co-Advised w/T. Padir, 2010.
- [18] *Real-time Digital Modeling of analog circuitry for audio applications*, B. Gleason, WZM-MB09, 2010.
- [19] *Optimization and Control Design of an Autonomous Underwater Vehicle*, D. Moussette, A. Palooparambil, and J. Raymond, AE- IIH-0003, co-advised w/I. Hussein, 2010.
- [20] *Design of Autonomous Underwater Vehicle and Optimization of Hydrodynamic Properties and Control*, R. David, WZM-3A08, 2009.
- [21] *Autonomous Vehicle Control*, Breznak, R. S., Cunningham, A. G and Kleinfeld, Z., 2008.
- [22] *Roof Robot Phase 2*, Zachary James Strowe, ECE; and Xu Lin, ECE, 2008.
- [23] *The Thumper Robotic Bass*, B. Kosherick, M. Brown, and A. Teti, WZM-RB08, 2008.
- [24] *Public Safety Integration Center*, P. Lucia, I. Levin and M. Barone, WZM-1A08, 2008.
- [25] *Aircraft Lasercom Terminal Compact Optical Module*, B. Scoville and S. Rose, Lincoln Laboratory Project Center, WZM-2A08, 2008.
- [26] *PANSAT Triple Modular Redundant (TMR) Satellite Flight Computer v3*, Kevin Zhang, ECE; and Karim G. Makram, ECE, 2006.
- [27] *GPS Attitude Determination System*, J.P. Salmon, Michael LaBossiere and Mark Minotaur, 2005.
- [28] *FPGA Implementation of an OFDM Modem*, Andrew Dupont and Jack Coyne, 2005.
- [29] *TREMOR – A Triple Modular Redundant Flight Computer for WPI’s PANSAT – Revision 2*, Maulin Patel, Omar Moussa and Matthew Kwiatkowski, 2005.
- [30] *Construction of a GPS Pseudolite*, Tim Coffey, 2005.
- [31] *Dipole Antenna Placement in a Falcon-20 Aircraft*, Emily Anesta and David Plourde, Lincoln Laboratories Project Center, A-Term, 2004.
- [32] *GPS Attitude Determination System*, Joshua Holwell, Himanshu Agrawal and Andrew Coonrad, 2004.
- [33] *TMR Computer System*, Ryan Angilly, Mitch Lauer and Dan Debiasio, 2004.
- [34] *Personal Inertial Navigation System*, Jason DeChiaro and Christopher Strus, 2003.
- [35] WZM-MQP-4A02: *PC I/O in High Stress Environments*, John Niesz and James Kent, 2003.
- [36] WZM-MQP-2A02: *Vacuum Tube Amplifier*, Joseph Kambourakis and Gregory Molnar, 2003.
- [37] *Container Tracking System*, Victoria Chaplick, 2003.
- [38] WZM-MQP-2A03: *Heat Management System for PCs*, Ernest Cardin, Kevin Candiloro and Stephen Leavey, 2002.

- [39] WZM-MQP-1313: *Digital Image Enhancement*, Julie Bolduc, Joeseeph Perry, Wei Fu, 2002.
- [40] WZM-MQP-2A01: *Synchronized Audio Sample Looper*, Joel Gottshalk, Robert Conrad and Sanford Freedman, 2002.
- [41] WZM-MQP-1A01: *Springboard Digital Multimeter*, Pavel Loven and Andrew Young, 2002.
- [42] *Ballistic Missile Defense Analysis Toolkit*, Winfield Peterson, Doug Tilkin and Benjamin Wilson, Lincoln Laboratories Project Center, 2002.
- [43] HU-FB-CS01, *C Sound Synthesizer*, Peter W. DeBonte (co-advised).
- [44] WZM-MQP-1A00: *StrongArm-Based Computer System*, Bradford Snow, 2001.
- [45] WZM-MQP-1C01: *PC Controlled Laser Light Show Device*, Joel Smith, 2001.
- [46] WZM-MQP-1E00: *PIC-based MIDI Sequencer* Malcolm Beaulieu, 2001.
- [47] WZM-MQP-2A00: *Automotive PC Development Platform* Travis Pouliot and David Philips, 2001.
- [48] *The RoadCom Automotive Computing System*, Benjamin Kennedy and John Pong, 2000.
- [49] WZM-MQP-1A99: *Compressed Sample Wavetable Synthesizer*, Justin Brzozoski, 2000.
- [50] WZM-MQP-3499, *Automatically Equalizing Monitor*, Fernando Braghin, Tenzin Lama, Rahul Bhan and Dion Soetadi, 2000.
- [51] 99D163M: *Railroad Communication*, Benjamin Richards, 2000.
- [52] CS-MXC-IE00: *PIC Real-Time Sequencer*, Alexander Goodrich, 2000.
- [53] 99D514M: *Design of a Microphone Preamplifier*, Eric Reuter, 2000.
- [54] WZM-MQP-1A99, *MPEG Audio Deck*, Justin Brzozoski, 2000.
- [55] *Digital Image Enhancement*, Julie Bolduc, Wei Fu and Joseph Perry, 2000.
- [56] WZM-MQP-4A98, *Railroad Communications System*, Matthew Lug, 1999.
- [57] 99D078M: *Modular Effects Processor II*, Erik Neyland, 1999.
- [58] 99D176M: *Portable Digital Audio Recorder* Eric Toledo and Duc Truong, 1999.
- [59] EE-WZM-1A97, *C Sound Synthesizer*, Ross E. Borgeson, Michael W. Hamel and Matthew S. Walsh, 1998.
- [60] EE-WZM-4A97, *Firewire Audio Device*, Daniel R. Stutzbach, 1998.
- [61] EE-WZM-2A97, *Modular Effects Processor*, Michael J. Dellisanti, 1998.
- [62] EE-WZM-3A97, *GPS Personal Navigation*, Jeffery A. Alderson and Helder Machado, 1998.
- [63] HU-FB-CS01, *C Sound Synthesizer*, Peter W. DeBonte (co-advised).
- [64] EE-WZM-1E97, *PM Measurement System*, Yevgeniy Bogdanov.

- [65] EE-REL-C008, *Design and Development of a Microprocessor-Based Gaussmeter*, David M. Burnham.
- [66] EE-WZM-RC01, *Acoustic Guitar Amplifier*, Christopher Thomas.
- [67] EE-WZM-GSD1, *Guitar Sustaining Device*, Paul D'Ambra.
- [68] EE-RXV-5260, *Audio Feedback Elimination System*, Ross D. Pease and John R. Pelliccio.
- [69] EE-RJD-M963, *Embedded Systems Design*, Christopher A. Briggs and Anthony J. Viapiano.
- [70] EE-WHE-9601, *GPS Hazard Detector*, Michael Roberts, William Cidela, and Chris Mangiarelli.
- [71] EE-WZM-2C96, *Flexible Synthesis*, Noah T. Vawter and Luke Demoracski.
- [72] EE-WZM-1A96, *Tap Dancer MIDI Interface*, Thomas Trela and William Dowell.
- [73] EE-WZM-2A96, *GPS Hazard Detector II*, Will Brothers, Jon Day, and John Zaghi.
- [74] EE-WZM-3A96, *Loudspeaker Data Acquisition System*, Adam Gross.
- [75] EE-WZM-4A96, *Audio Morphing Processor*, William Butterfield and Ted Phipps.
- [76] EE-WZM-5A96, *Acoustic Modeling*, Peter DeBonte.
- [77] EE-WZM-1B96, *Distributed Audio Controller*, Stephen S. Richardson.
- [78] EE-WZM-1A95, *Acoustic Hazard Meter*, Ronald D. Slack.
- [79] EE-WZM-2A95, *Forest Service DGPS*, Joshua J. Single and Michael T. Spadazzi.
- [80] EE-WZM-1C95, *Audio to MIDI Converter*, Jennifer R. Principe.
- [81] EE-WZM-1D95, *Low Cost Auralizer*, Jason R. Hills and Mark R. Paulson.
- [82] EE-WZM-3A95, *Passive Radiator Design*, Kevin R. Weldon.
- [83] EE-WZM-1C94, *Char Model Generation*, Colin J. Florendo.
- [84] EE-WZM-1D94, *Wide Area DGPS Simulator*, Daniel Cohen and Robert Schroter.
- [85] EE-WZM-2D94, *Digital Soundcard*, Timothy Alsberg (Russian Project Center).
- [86] EE-WZM-3D94, *Digital Univibe*, Andrew Willis and Daniel Toohey.
- [87] EE-WZM-1A94, *DSP Based Real-Time Audio Feedback Eliminator*, Kevin M. Eddy.
- [88] EE-WZM-2A94, *Digital LCD Oscilloscope*, William F. Brown and John F. Ebersole.
- [89] 93D236M, *MIDI Mapper*, Jonathan Kemble and Brian Candiloro.
- [90] EE-WZM-1C93, *Fault-Tolerant Computer*, Frederick N. Parmenter.
- [91] EE-WZM-1A93, *Wireless MIDI Controller*, Sanjay Raja, Charles Cimalore, Ty Panagoplos.
- [92] EE-WZM-2A93, *Multiple Pitch Detector*, Jeanne A. Sawtelle.

- [93] EE-WZM-3A93, *Multiprocessor Cache Coherence*, Lauren C. Lind and Norman E. Rhodes.
- [94] EE-WZM-1C92, *A Simulation of the DLX Architecture*, Lisa Harlow.
- [95] EE-WZM-2C92, *A New Microprocessor Development System*, Gregory B. Burlingame, David J. Fortin, Kevin S. Pearson.
- [96] EE-WZM-1A92, *Digital Audio Sampler*, Roger D. Gagnon and James M. Lach.
- [97] EE-WZM-2A92, *Intelligent Harmonizer*, Prabhjot S. Anand and Aftab M. Yusuf.
- [98] EE-WZM-3A92, *Computerized Audio Mixer*, Richard J. Wood.
- [99] EE-WZM-1B92, *Real-Time Harmonizer*, Mohiuddin M. Kahn.
- [100] EE-WZM-1A91, *Residue Number System Processor*, Ravdeep S. Anand and Christine A. Easton.
- [101] EE-WZM-2A91, *SCSI Bus Analyzer*, Brian Costello, George Delouriero, Matthew Maguire, and Keith Nevins.

4.3 Interactive Qualifying Projects (completed)

- [1] *Bell Towers*, Bowman, I.H., Casciola, I.O., Adiletta, M.J., Bruneau, C.D., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.
- [2] *Creating a Circular Economy with Urban Farming*, Ward, B.L., Cyran, B., Premo, J., Soens, N., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.
- [3] *Plastic-Free Venice*, S.L. Bonanno, V.C.Nguyen, A.H. Hagedorn, T.S. Howlett, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.
- [4] *30th Anniversary Exhibit*, N. Bajakian, J. Wong, J. DeDonato, and N. Stallings, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.
- [5] *Venice Crowdfunding*, T. Ferrara, F de Leo, M. Bernardo and S. O'Connell, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.
- [6] *Visitor Experiences in Venice*, T. King, C. Anderson, M. Laks, and C. Hoey, WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2019.
- [7] *Venice From Above: Preserving Venetian Bell Towers*, Iuliano, C.T., Kavassalis, F.I., Colucci, N.D., Lessard, P., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.
- [8] *Celebrating 30 Years of the Venice Project Center*, Ellis, E.J., Morton, K.J., Carpinì, N.A.D., Hale, S.A., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.
- [9] *PreserVenice Launch: A Crowdfunding Solution to Preserving Venetian Heritage*, Hetherington, B.F., Berardi, D., Thompson, K.R., Joy, S.P., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.

- [10] *Tech Mecca in Giudecca*, McMahon, A.J., Hiscox, C.A., Maida, P.J., Lee, R.T., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.
- [11] *Exploring Urban Permaculture: Initializing a Path to a Greener Venice*, Jordan, A.S., O'Driscoll, K.J., Manca, R. A., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.
- [12] *Open For Business: Analyzing Venetian Storefronts*, Bartone, J.R., Scales, K.J., Racca, S.R., Chen, Y., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.
- [13] *Venice Without Obstacles*, DeRusha, A.C., Abenante, E.R., DiStefano, M.S., Jones, S.A., WPI Venice Project Center, advised by W. Michalson and F. Carrera, 2018.
- [14] *Documenting and Promoting the Impacts of the Melbourne Project Center*, Seely, C.A., Day, J.L., Cochran, I.L., and Carlson, K.A.M., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.
- [15] *Students' Mental Wellbeing in Universities Located in Melbourne*, Isaro, A., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.
- [16] *I See a Psychologist -- Reducing Stigma through Normalizing Mental Health Care in Australia*, Vayas, NN., Daci, E.G., and Bianco, C.E., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.
- [17] *Improving Web Presence and Stakeholder Interaction for the Emergency Services Foundation*, Savage, H.A, Sanchy, M.T., Capozzi, R. and Babel, B.M., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.
- [18] *Understanding Visitor Experiences at the Pauline Gandel Children's Gallery*, Nigro, J.T., France, G.T., Coppolino, J.R. and Blakslee, B.S., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.
- [19] *A Citizen Science Platform for Long-Term Monitoring of Microplastic Pollution in Port Phillip Bay*, Bayas, A.C., Buckley, M.J., Ford, C.K. and Lawes, J.A., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.
- [20] *A Comprehensive Methodology for Assessing the Quality of Solar Photovoltaic Systems*, Arthur, D.P., Hoey, C.J., Laffer, T. and Westgate, B., WPI Melbourne Project Center, advised by S. McCauley and W. Michalson, 2017.
- [21] *High Efficiency Power Inverter*, Grzegorz J. Klos and Robert Hall, 2015.
- [22] *An Analysis and comparison of affordable and ecological short-term transportation energy solutions*, Bryan Thomas Gleason, 2009.
- [23] *Lens and Lights Operational Overview*, Andrew Thomas Wilkins, ECE; Matthew Houstle, ECE; and Anthony R. Azersky, CS, 2009.

4.4 Graduate Theses Advised and Co-Advised

4.4.1 MS Theses (current)

- [1] Pratik Jawahar, "High-Level Exogenous Fault Detection in Multi Robot Systems with Variational Autoencoders and Normalizing Flows," MS Thesis, co-advisor, 2022.

- [2] Rohan Walia, "Formation-Centric Software Interface," MS Thesis, co-advisor, 2022.

4.4.2 MS Theses (completed)

- [1] Nathaniel Michaels, "A Modular Robotic AFO for detecting phase changes during Walking Gait," MS Thesis, co-advisor, 2020.
- [2] Hernandez, A. C., "Implementing and Comparing Image Convolution Methods on an FPGA at the Register-Transfer Level," MS Thesis, co-advisor, 2019.
- [3] Katie Gandomi, "Implementation of a Modular Software Architecture on a Real-Time Operating System for Generic Control over MRI Compatible Surgical Robots," MS Thesis, co-advisor, 2018.
- [4] Adhavan Jayabalan, "Decentralized Persistent Connectivity Deployment in Robot Swarm," MS Thesis, co-advisor, 2018.
- [5] Janani Mohan, "Dynamic Task Allocation in Robot Swarms with Limited Buffer and Energy Constraints," MS Thesis, co-advisor, 2018.
- [6] Rogers, J.P., GNSS and Inertial Fused Navigation Filter Simulation, MS Thesis, co-advisor, 2018.
- [7] Christopher Bove, "Constrained Motion Planning System for MRI-Guided, Needle-Based, Robotic Interventions," MS Thesis, co-advisor, 2018.
- [8] Vyas, Shivang, "Feature detection in an indoor environment using Hardware Accelerators for time-efficient Monocular SLAM," MS Thesis, primary advisor, Worcester Polytechnic Institute, 2015.
- [9] Morin, Russell, "A Novel Localization System For Experimental Autonomous Underwater Vehicles," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2010.
- [10] Navalekar, Abhijit, "Design of an OFDM-Based VHF Modem," MS Thesis, primary advisor, Worcester Polytechnic Institute.
- [11] Ahlehagh, Hasti, "Techniques for Communications and Geolocation Using Wireless Ad Hoc Networks," MS Thesis, primary advisor, Worcester Polytechnic Institute, 2004.
- [12] Sebastian, Dalys, "Development of a Field-Deployable Ultrasound Scanner System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2004.
- [13] Tobgay, Sonam, "Novel Concepts for RF Surface Coils with Integrated Receivers," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2004.
- [14] Breen, Daniel, "Characterization of Multi-Carrier Locator Performance," MS Thesis, co-advisor, 2004.
- [15] Aghogho, Obi, "A Novel Radio Frequency Coil Design for Breast Cancer Screening in a Magnetic Resonance Imaging System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 2003.
- [16] Fei, Ming, "Electromagnetic Detection, Infrared Visualization and Image Processing Techniques for Non-Metallic Inclusions in Molten Aluminum," MS Thesis, co-advisor, 2002.

- [17] Lavoie, Bruce, "Design and Implementation of an N-Channel Self Calibrating Audio System," MS Thesis, primary advisor, Worcester Polytechnic Institute, 2000.
- [18] Bogdonov, Gene, "Theoretical and Practical Implementation of Electrical Impedance Material Inspection of Powder Metallurgy Compacts," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1999.
- [19] Messier, Andrew, "Modeling the Effects of Terrain Masking on GPS Accuracy and Integrity," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1998.
- [20] Antonescu, Bogdan, "Elliptic Curve Cryptosystems on Embedded Microprocessors," Bogdan Antonescu, MS Thesis, co-advisor, Worcester Polytechnic Institute, 1998.
- [21] Lai, Qiang, "Ground-Penetrating Radar Data Processing System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1998.
- [22] Soria-Rodríguez, Pedro, "Multicast-Based Interactive-Group Object-Replication For Fault Tolerance," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1998.
- [23] Hoy, William, "Audio Signal Denoising Using Wavelets," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1997.
- [24] Progri, Ilir, "Harmonic Flow Monitoring by means of Global Positioning System," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1997.
- [25] Bretchko, Pavel, "Pulsed Hysteresis Graph System," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1997.
- [26] Repkin, Dmitry V., "A Hierarchical Neural Network Based Data Processing System for Ground Penetrating Radar," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1997.
- [27] Metsis, Sophocles, "Design of a Real-Time Capable, Fault-Tolerant, Distributed System," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1996.
- [28] Hill, Jonathan, "Efficient Implementation of Mesh Generation and FDTD Simulation of Electromagnetic Fields," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1996.
- [29] Dunkelberg, John, "FEM Mesh Mapping to a SIMD Machine Using Genetic Algorithms," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1996.
- [30] Leuenberger, Georg, "Design and Development of a Microprocessor Based Gauss Meter," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1995.
- [31] Valentino, Ralph, "DISC: A Dynamic Instruction Set Coprocessor," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1995.
- [32] Muley, Aalok, "A Fault Tolerant Network for a Real-Time Environment," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1994.
- [33] Mohan, Surrender, "Automatic Surface Mesh Generation for 3D Solid Models Using Delaunay Algorithm," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1994.
- [34] Petrangelo, John, "Experimental Preconditioners for Large Dense Systems," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1994.

- [35] Schneider, Eric, "Design, Simulation, and Analysis of a 3D Integrated Optical Computer," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1993.
- [36] Palmer, Bradley, "A Comparison of Three Protocols Supporting Time-Dependent and Time-Independent Communications," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1992.
- [37] Clayton, Shawn, "An Analysis of the Real-Time Behavior of Galactica Net," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1992.
- [38] Levergood, Thomas, "An Experimental Evaluation of Split User/Supervisor Cache Memories," MS Thesis, primary advisor, Worcester Polytechnic Institute, 1992.
- [39] Lavalee, James, "The Design and Development of Real-Time Systems Using Ada and the Activation Framework," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1992.
- [40] Velazques, Javier, "The Development of a Real-Time Environment Using the Activation Framework," MS Thesis, co-advisor, Worcester Polytechnic Institute, 1992.

4.4.3 Ph. D. Dissertations (current)

- [1] Vincenzo Diluoffo, "Security in the Robot Operating System Version 2 (ROS 2) Environment," primary advisor.
- [2] Jitesh, "Ad-Hoc Networking for Bandwidth Limited LMR Systems," primary advisor.

4.4.4 Ph. D. Dissertations (completed)

- [1] Carvalho, P. A., "Advancing Technologies for Interventional MRI Robotics with Clinical Applications," 2019.
- [2] Ferreira, PVR "SRML: Space Radio Machine Learning," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2017.
- [3] Iyer, Vishwanath, "Broadband Impedance Matching of Antenna Radiators," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2010.
- [4] Navalekar, Abhijit, "Distributed Digital Radios For Land Mobile Radio Applications," Ph.D. Dissertation, primary advisor, Worcester Polytechnic Institute, 2009.
- [5] Parikh, Hemish, "Design of an OFDM Transmitter and Receiver for Precision Personnel Location," primary advisor.
- [6] Progni, Ilir, "An Assessment of Indoor Geolocation Systems," Ph.D. Dissertation, primary advisor, Worcester Polytechnic Institute, 2003.
- [7] Li, Xinrong, "Super-Resolution TOA Estimation with Diversity Techniques for Indoor Applications," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2003.
- [8] Leuenberger, Gerog H. W., "Electrostatic Density Measurements in Green-State PM Parts," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2003.
- [9] Bogdanov, Gene, "Radio-Frequency Coil Design for High Field Magnetic Resonance Imaging," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2002.

- [10] Elbirt, Adam J., "Reconfigurable Computing for Symmetric-Key Algorithms," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2002.
- [11] Bretchko, Pavel, "Design and Development of Ultra-wideband DC-Coupled Amplifier," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 2001.
- [12] Hill, Jonathan, "Development of an Experimental Global Positioning System (GPS) Receiver Platform for Navigation Algorithm Evaluation," Ph.D. Dissertation, primary advisor, 2001.
- [13] Spasojević, Mirko, "Creation of Sparse Boundary Element Matrices for 2-D and Axis-symmetric Electrostatic Problems Using a Bi-orthogonal Wavelet," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 1997.
- [14] Shi, Funan, "Optimal Designs of Gradient and RF Coils for Magnetic Resonance Imaging (MRI) Instrument," Ph.D. Dissertation, co-advisor, Worcester Polytechnic Institute, 1996.

5. Proposals and Funding:

5.1 Funding Received

\$300,000	MRI: Development of an autonomous, Connected and Data-Driven Vehicle for Multi-Disciplinary Research, Co-PI, 09/13/16.
\$200,000	Advanced Bayesian Methods for Autonomous Navigation, Co-PI, 07/25/11.
\$50,524	PCOG Broadband Modem, PI, \$50,524, 05/15/09.
\$839,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 09/06/07.
\$83,726	State Communications Interoperability, PI, 07/18/07.
\$224,822	MANET Protocols for Capacity-Limited Channels, PI, 03/08/07.
\$44,366	TATRC: Wireless Sensor Communications, Co-PI, 12/20/06.
\$95,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 02/13/06.
\$3,225,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 12/19/05.
\$1,973,286	Precision Indoor/Outdoor Personnel Locator, Co-PI, 09/23/05.
\$25,000	Sensor-on-a-Chip for Electrophysiological Monitoring, Co-PI, 08/08/05.
\$1,245,000	Real-Time Troop Physiological Status Monitoring System, Co-PI, 12/23/04.
\$1,370	WPI-NanoSAT Program, Co-PI, 11/03/04.
\$37,408	Precision Indoor/Outdoor Personnel Locator, Co-PI, 10/05/04.
\$74,048	Real-Time Troop Physiological Status Monitoring System, PI, 09/15/04.
\$813,141	Real-Time Troop Physiological Status Monitoring System, PI, 12/08/03.
\$255,496	Precision Indoor/Outdoor Personnel Locator, Co-PI, 10/31/03.
\$3,246	WPI-NanoSAT Program, Co-PI, 10/20/03.
\$2,789	WPI-NanoSAT Program, Co-PI, 03/06/03.

\$827,000	Real-Time Troop Physiological Status Monitoring System, PI, 11/22/02.
\$14,866	Norfolk County Sheriff's Office Data Mining, Co-PI, 02/01/02.
\$54,483	Auto-calibrating surround sound system, PI, 2001.
\$11,252	Auto-calibrating surround sound system, PI, 2000.
\$18,977	GPS-Based Attitude Determination System, PI, 07/1998.
\$70,000	Development of an Electric Resistivity Instrument for the Testing of Green-State P/M Compacts, Co-PI, 01/1997.
\$10,550	GPS Hazard Detection, Co-PI, 1996.
\$200,000	Integrity for the Global Positioning System - Supplemental Funding I, Co-PI, 1995.
\$3,000	GPS-Based Tracking of Forest Vehicles, PI, 1995.
\$7,200	Acoustic Identification of Mosquito Species, Co-PI, 1995.
\$9,978	Acoustic Identification of Mosquito Species, Co-PI, 1995.
\$11,527	Laboratory Equipment for Microkernel Based Embedded Systems, Co-PI, 1995.
\$74,388	RF Circuit and Antenna Modeling on High Performance Computers, Co- PI, 1994.
\$199,075	Integrity for the Global Positioning system, PI, 1994.
\$326,336	3D Modeling of Microwave Antennas on High-Performance Parallel Computers, Co-PI, 1993.
\$338, 687	Integrity for the Global Positioning system, Co-PI, 1993.

6. Honors, Awards, and Recognitions:

Elected Senior Member of the IEEE.

Joseph Samuel Satin Distinguished Fellowship awarded for the 1994-1995 academic year.

Aldo Miccioli Fellowship recipient from Raytheon Equipment Division.

ION Best Paper Award - GPS-96 for W. R. Michalson, W. Cidela, et. al., "A GPS-Based Hazard Detection and Warning System," in review, " *ION GPS-96, 9th International Meeting of the Satellite Division of the Institute of Navigation*, pp. 167-175, Kansas City, MO, Sep 17-20, 1996

2nd Place - 2004 ECE Department MQP Award / Provost's MQP Award for *GPS-Based Orbit and Attitude Determination System for PANSAT*, Joshua Holwell, Andrew Coonradt and Himanshu Agrawal.

1st Place - 2003 ECE Department MQP Award / Provost's MQP Award for *Personal Inertial Navigation System*, Jason DeChiaro and Chris Struus.

1st Place - 2002 ECE Department MQP Award / Provost's MQP Award for *Handspring Digital Voltmeter*, Andrew Young and Pavel Loven.

3rd Place - 1998 ECE Department MQP Award / Provost's MQP Award for *Design of a Personal Handheld GPS Receiver*, Jeffery Alderson and Helder Machado.

2nd Place - 1997 ECE Department MQP Award / Provost's MQP Award for *Distributed Audio Controller*, EE-WZM-1B96, Stephen S. Richardson.

3rd Place - 1997 ECE Department MQP Award / Provost's MQP Award for *GPS Hazard Detector II*, EE-WZM-2A96, Will Brothers, Jon Day, and John Zaghi.

1st Place - 1996 ECE Department MQP Award / Provost's MQP Award for *GPS Hazard Detector*, EE-WHE-9601, Michael Roberts, William Cidela, and Chris Mangiarelli.

6.1 Memberships and offices held in professional society

- Institute of Electrical and Electronic Engineers, Senior Member
- Institute of Navigation
- Royal Institute of Navigation
- American Society of Engineering Educators
- National Academy of Inventors
- Society of Automotive Engineers

6.2 Professional Service

Massachusetts Board of Bar Overseers Hearing Committee Member, 2010-Present.

Steering Committee – 2009 First Annual Robotics Innovations Competition and Conference (RICC '09), Nov 7-8, Worcester, MA, 2009.

Conference Technical Co-Chair – 2009 IEEE International Conference on Technologies of Practical Robot Applications (TePRA 2009), Nov. 9-11, Woburn, MA, 2009.

Reviewer – Proposal number CRDPJ 379622-08, Natural Sciences and Engineering Research Council of Canada (NSERC), Mar. 2009

Co-Chair – Urban and Indoor Geolocation, Institute of Navigation International Technical Meeting (ITM2009), Anaheim CA, Jan. 2009.

Reviewer – Proposal number CRDPJ 379622-08, Natural Sciences and Engineering Research Council of Canada (NSERC), Mar. 2009