UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA INC.

Petitioner

v.

CHARGE FUSION TECHNOLOGIES LLC

Patent Owner

Inter Partes Review Case No. IPR2025-00152

U.S. Patent No. 11,990,788

DECLARATION OF SCOTT ANDREWS

TABLE OF CONTENTS

I. INTRODUCTION 13

A. EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE 13

II. MATERIALS CONSIDERED 17

III. OVERVIEW AND LEGAL STANDARDS 21

A. PERSON OF ORDINARY SKILL IN THE ART 22

B. OBVIOUSNESS 23

C. CLAIM CONSTRUCTION 28

1. Unitary vehicle charge indicator 28

2. Determine…a charging schedule 29

IV. LEVEL OF A PERSON OF ORDINARY SKILL 30

V. OVERVIEW OF THE '788 PATENT 32

A. SUMMARY 32

1. Field of Endeavor 32

2. Problem Solved by the Inventor 34

B. PROSECUTION HISTORY 37

C. PRIORITY 37

VI. OVERVIEW OF THE TECHNOLOGY 38

A. ELECTRIC VEHICLES 39

B. CHARGING SYSTEMS 39

1. Charge Rates and Schedules 40

2. Parking Detection 44

3. Charging Control 45

C. DISPLAYS AND INTERFACES FOR VEHICLES 48

1. Battery Charge Status and Vehicle Displays 48

2. Vehicle User Interfaces 51

D. BATTERY LEVEL NOTIFICATION 53

VII. SUMMARY OF THE PRIOR ART REFERENCES 54

A. SUTARDJA 54
B. DONNELLY 59
C. LETENDRE 63
D. SEELIG 67
E. KNOCKEART 70

VIII. GROUNDS OF UNPATENTABILITY 73

IX. OPINIONS REGARDING GROUND 1: OBVIOUSNESS OF CLAIMS 1-4, 6-9, AND 11-14 73

A. CLAIM 1 IS OBVIOUS OVER SUTARDJA IN COMBINATION WITH DONNELLY AND LETENDRE 73

1. *Claim 1[Pre]: "An electrical charging system, comprising:" 73*
2. *Claim 1[a]: "one or more processing devices; and" 76*
3. *Claim 1[b]: "a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:" 81*
4. *Claim 1[b][i]: "receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle" 85*
5. *Claim 1[b][ii]: "via a Graphical User Interface (GUI) forming a part of the electric vehicle and" 88*
   a) Donnelly's Teachings 89
   b) Motivation to combine 91
6. *Claim 1[b][iii]: "adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric*

vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;" *96*

a) A Combination of Input and Output GUI Elements 97

(1) Donnelly's Teachings 97

(2) Motivation to Combine 101

b) Slider for Specifying an Amount of Charge 105

(1) '788 Patent's Description of a Slider 105

(2) Sutardja's Teachings 106

(3) Letendre's Teachings 106

(4) Sutardja-Donnelly-Letendre Teach Claim 1[b][iii] 109

(5) Motivation to Combine 110

7. Claim 1[b][iv]: "displaying a charging status of the electric vehicle via the GUI; and" *116*

a) Sutardja's Teachings 117

b) Donnelly's Teachings 118

c) Motivation to Combine 119

8. Claim 1[b][v]: "increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;" *121*

9. Claim 1[b][vi]: "wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge." *122*

B. CLAIM 2: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 1, WHEREIN EXECUTING THE INSTRUCTIONS BY THE ONE OR MORE PROCESSING DEVICES FURTHER RESULTS IN: DETERMINING, BASED AT LEAST ON THE DESIRED CHARGE LEVEL, A CHARGING SCHEDULE FOR THE ELECTRIC VEHICLE." 122

C. CLAIM 3: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 2, WHEREIN THE INCREASING OF THE LEVEL OF CHARGE IS PERFORMED IN ACCORDANCE WITH THE CHARGING SCHEDULE." 125

D. CLAIM 4: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 1, WHEREIN THE FIRST PORTION OPERATES TO OUTPUT THE AMOUNT OF CHARGE RESIDING IN THE BATTERY, THE SECOND PORTION OPERATES TO OUTPUT THE UNCHARGED CAPACITY OF THE BATTERY AND THE THIRD PORTION IS AN INPUT GUI ELEMENT." 126

E. CLAIM 6 IS OBVIOUS OVER SUTARDJA IN COMBINATION WITH DONNELLY AND LETENDRE 126

1. *Claim 6[Pre]: "An electrical charging system, comprising:"* *126*

2. *Claim 6[a]: "one or more processing devices; and"* *126*

3. *Claim 6[b]: "a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:"* *126*

4. *Claim 6[b][i]: "receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle"* *126*

5. *Claim 6[b][ii]: "via a Graphical User Interface (GUI) forming a part of the electric vehicle and"* *127*

6. *Claim 6[b][iii]: "adapted to display a unitary vehicle charge indicator comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;"* *127*

7. *Claim 6[b][iv]: "displaying a charging status of the electric vehicle via the GUI; and"* *127*

8. *Claim 6[b][v]: "increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;"* *127*

9. *Claim 6[b][vi]: "wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge."* *127*

F. CLAIM 7: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 6, WHEREIN EXECUTING THE INSTRUCTIONS BY THE ONE OR MORE PROCESSING DEVICES FURTHER RESULTS IN: DETERMINING, BASED AT LEAST ON DESIRED CHARGE LEVEL, A CHARGING SCHEDULE FOR THE ELECTRIC VEHICLE." 128

G. CLAIM 8: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 7, WHEREIN THE INCREASING OF THE LEVEL OF CHARGE IS PERFORMED IN ACCORDANCE WITH THE CHARGING SCHEDULE." 128

H. CLAIM 9: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 6, WHEREIN THE FIRST PORTION IS AN OUTPUT GUI ELEMENT, THE SECOND PORTION IS AN OUTPUT GUI ELEMENT AND THE THIRD PORTION IS AN INPUT GUI ELEMENT." 128

I. CLAIM 11 IS OBVIOUS OVER SUTARDJA IN COMBINATION WITH DONNELLY AND LETENDRE 128

1. *Claim 11[Pre]: "An electrical charging system, comprising:"* *128*

2. *Claim 11[a]: "one or more processing devices; and"* *128*

3. *Claim 11[b]: "a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:"* *128*

4. *Claim 11[b][i]: "receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle"* *128*

5. *Claim 11[b][ii]: "via a Graphical User Interface (GUI)"* *129*

6. *Claim 11[b][iii]: "adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;"* *129*

7. *Claim 11[b][iv]: "displaying a charging status of the electric vehicle via the GUI; and"* *129*

8. *Claim 11[b][v]: "increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;"* *129*

9. *Claim 11[b][vi]: "wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge."* *129*

J. CLAIM 12: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 11, WHEREIN EXECUTING THE INSTRUCTIONS BY THE ONE OR MORE PROCESSING DEVICES FURTHER RESULTS IN: DETERMINING, BASED AT LEAST ON THE DESIRED CHARGE LEVEL, A CHARGING SCHEDULE FOR THE ELECTRIC VEHICLE." 130

K. CLAIM 13: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 12, WHEREIN THE INCREASING OF THE LEVEL OF CHARGE IS PERFORMED IN ACCORDANCE WITH THE CHARGING SCHEDULE." 130

L. CLAIM 14: "THE ELECTRICAL CHARGING SYSTEM OF CLAIM 11, WHEREIN THE FIRST PORTION OPERATES TO OUTPUT

THE AMOUNT OF CHARGE RESIDING IN THE BATTERY, THE SECOND PORTION OPERATES TO OUTPUT THE UNCHARGED CAPACITY OF THE BATTERY AND THE THIRD PORTION IS AN INPUT GUI ELEMENT.” 130

X. GROUND 2: OBVIOUSNESS OF CLAIMS 5, 10, AND 15 130

A. CLAIM 5: “THE ELECTRICAL CHARGING SYSTEM OF CLAIM 1, WHEREIN THE INCREASING OF THE LEVEL OF CHARGE OF THE BATTERY OF THE ELECTRIC VEHICLE, COMPRISES: TRANSMITTING A CONTROL SIGNAL TO A PARKING SPACE CHARGE DEVICE THAT STARTS A CHARGING, IN ACCORDANCE WITH THE CHARGING SCHEDULE, OF THE ELECTRIC VEHICLE.” 130

B. CLAIM 10: “THE ELECTRICAL CHARGING SYSTEM OF CLAIM 6, WHEREIN THE INCREASING OF THE LEVEL OF CHARGE OF THE BATTERY OF THE ELECTRIC VEHICLE, COMPRISES: TRANSMITTING A CONTROL SIGNAL TO A PARKING SPACE CHARGE DEVICE THAT STARTS A CHARGING, IN ACCORDANCE WITH THE CHARGING SCHEDULE, OF THE ELECTRIC VEHICLE.” 139

C. CLAIM 15: “THE ELECTRICAL CHARGING SYSTEM OF CLAIM 11, WHEREIN THE INCREASING OF THE LEVEL OF CHARGE OF THE BATTERY OF THE ELECTRIC VEHICLE, COMPRISES: TRANSMITTING A CONTROL SIGNAL TO A PARKING SPACE CHARGE DEVICE THAT STARTS A CHARGING, IN ACCORDANCE WITH THE CHARGING SCHEDULE, OF THE ELECTRIC VEHICLE.” 139

XI. GROUND 3: OBVIOUSNESS OF CLAIMS 16-17 139

A. CLAIM 16: “THE ELECTRICAL CHARGING SYSTEM OF CLAIM 11, WHEREIN THE GUI IS FORMS A PART OF A MOBILE DISPLAY DEVICE.” 139

B. CLAIM 17: “THE ELECTRICAL CHARGING SYSTEM OF CLAIM 16, WHEREIN THE MOBILE DISPLAY DEVICE IS A SMARTPHONE.” 143

XII. CONCLUSION 145

CLAIM LISTING

Claim Designation	Claim Language
Claim 1[Pre]	An electrical charging system, comprising:
Claim 1[a]	one or more processing devices; and
Claim 1[b]	a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:
Claim 1[b][i]	receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle
Claim 1[b][ii]	via a Graphical User Interface (GUI) forming a part of the electric vehicle and
Claim 1[b][iii]	adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;
Claim 1[b][iv]	displaying a charging status of the electric vehicle via the GUI; and
Claim 1[b][v]	increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;
Claim 1[b][vi]	wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge.
Claim 2	The electrical charging system of claim 1, wherein executing the instructions by the one or more processing devices further results in: determining, based at least on the desired charge level, a charging schedule for the electric vehicle.
Claim 3	The electrical charging system of claim 2, wherein the increasing of the level of charge is performed in accordance with the charging schedule.

Claim Designation	Claim Language
Claim 4	The electrical charging system of claim 1, wherein the first portion operates to output the amount of charge residing in the battery, the second portion operates to output the uncharged capacity of the battery and the third portion is an input GUI element.
Claim 5	The electrical charging system of claim 1, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises: transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle.
Claim 6[Pre]	An electrical charging system, comprising:
Claim 6[a]	one or more processing devices; and
Claim 6[b]	a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:
Claim 6[b][i]	receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle
Claim 6[b][ii]	via a Graphical User Interface (GUI) forming a part of the electric vehicle and
Claim 6[b][iii]	adapted to display a unitary vehicle charge indicator comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;
Claim 6[b][iv]	displaying a charging status of the electric vehicle via the GUI; and
Claim 6[b][v]	increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;
Claim 6[b][vi]	wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge.

Claim Designation	Claim Language
Claim 7	The electrical charging system of claim 6, wherein executing the instructions by the one or more processing devices further results in: determining, based at least on desired charge level, a charging schedule for the electric vehicle.
Claim 8	The electrical charging system of claim 7, wherein the increasing of the level of charge is performed in accordance with the charging schedule.
Claim 9	The electrical charging system of claim 6, wherein the first portion is an output GUI element, the second portion is an output GUI element and the third portion is an input GUI element.
Claim 10	The electrical charging system of claim 6, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises: transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle.
Claim 11[Pre]	An electrical charging system, comprising:
Claim 11[a]	one or more processing devices; and
Claim 11[b]	a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:
Claim 11[b][i]	receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle
Claim 11[b][ii]	via a Graphical User Interface (GUI)
Claim 11[b][iii]	adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;
Claim 11[b][iv]	displaying a charging status of the electric vehicle via the GUI; and

Claim Designation	Claim Language
Claim 11[b][v]	increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;
Claim 11[b][vi]	wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge.
Claim 12	The electrical charging system of claim 11, wherein executing the instructions by the one or more processing devices further results in: determining, based at least on the desired charge level, a charging schedule for the electric vehicle.
Claim 13	The electrical charging system of claim 12, wherein the increasing of the level of charge is performed in accordance with the charging schedule.
Claim 14	The electrical charging system of claim 11, wherein the first portion operates to output the amount of charge residing in the battery, the second portion operates to output the uncharged capacity of the battery and the third portion is an input GUI element.
Claim 15	The electrical charging system of claim 11, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises: transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle.
Claim 16	The electrical charging system of claim 11, wherein the GUI is forms a part of a mobile display device.
Claim 17	The electrical charging system of claim 16, wherein the mobile display device is a smartphone.

I, Scott Andrews, declare as follows:

I. INTRODUCTION

1. I have been retained by counsel for Petitioner as a technical expert in the above-captioned case. Specifically, I have been asked to render certain opinions regarding the IPR petition with respect to U.S. Patent No. 11,990,788 ("the '788 Patent"). I understand that the Challenged Claims are 1-17, and my opinions are limited to those claims. A true and correct copy of my Curriculum Vitae, which provides further details about my background and experience, is appended to this Declaration.

A. Educational Background and Professional Experience

2. My current curriculum vitae is attached as Exhibit A, which includes a detailed listing of my education, work experience, honors, awards, professional associations, publications, and a list of my expert consulting activities during the past five years in which I have testified as an expert at deposition or trial.

3. I have over 30 years of professional experience in the field of electronics, mobile information technology, and communication systems. Further, I have authored numerous published technical papers and am a named inventor on 13 U.S. and foreign patents.

4. I received a Bachelor of Science degree in Electrical Engineering from University of California, Irvine in 1977 and a Master of Science degree in Electronic Engineering from Stanford University in 1982.

5. From 1977 to 1979, I worked at Ford Aerospace where I designed, tested and delivered microwave radar receiver systems. From 1979 to 1983, I worked at Teledyne Microwave, where I developed high reliability microwave components and developed CAD tools. From 1983 to 1996, I worked at TRW, Inc., having held various positions. From 1983 to 1985, I was a Member of the technical staff and a Department Manager in the Space Electronics sector. Between 1985 and 1990 I was a project manager working on various communications systems projects including the US DoD Advanced Research Projects Administration (ARPA) MIMIC Program. Between 1990 and 1993 I was the Manager of MMIC (monolithic-microwave-integrated-circuit) Products Organization. In this role, I developed business strategy and managed customer and R&D programs. During this time, I also developed the first single chip 94 GHz Radar, used for automotive cruise control and anti-collision systems. In 1993, I transferred to the TRW Automotive Electronics Group, and managed about 30 engineers in the Systems Engineering and Advanced Product Development organization. In this role, I managed advanced development programs such as electronic and electrohydraulic steering systems, automotive radar, adaptive cruise control, occupant sensing, automatic crash notification systems, in-vehicle

information systems, vehicle user interfaces, and other emerging transportation products.

6. I was employed as a Project General Manager in the Electronics Division of Toyota Motor Corporation at Toyota headquarters in Toyota City, Japan from April 1996 to around April 2000. In this position, I was responsible for leading the development of vehicle telematics systems, infotainment systems, including onboard and off-board navigation systems, traffic information systems, vehicle communications systems, safety applications, and automated vehicle control systems. This work also included advanced parking management systems wherein parking lot sensors would be used to identify open parking places that could then be communicated to drivers via the connected vehicle information system.

7. I am currently a consultant for Cogenia Partners, LLC, focusing on systems engineering, business development and technical strategy supporting automotive and information technology. I have been in this position since 2001. In one of my active engagements, I serve as the technical lead on a project funded by the National Highway Traffic Safety Administration (NHTSA) to develop requirements for connected vehicle safety systems in preparation for NHTSA regulations governing such systems. I also serve as a technical consultant on multiple projects sponsored by the Federal Highway Administration (FHWA) related to connected vehicle technology research. One project on which I was the chief systems

engineer was a truck parking information and reservation system. In this system, truck drivers were provided information on available parking at truck stops along the road ahead of their current location. The system would identify their hours of service, and recommend where they should stop to rest based on parking availability. The system included various techniques for sensing open truck parking places (including ultrasonic (sonar), infrared, and camera sensors), and allowed the driver to also potentially reserve a space. This project also explored mechanisms for truck electrification which is a technique for providing electric power to parked trucks to minimize the use of diesel fuel while parked and idling.

8. In 2003, working with two colleagues, I designed a prototype electric vehicle with the aim of providing a high-performance vehicle with extensive electronic features such as electronically controlled steering, suspension, in vehicle information systems and such. As part of this development effort, I also developed a patent related to how information in a highly integrated vehicle would be shared among the various electronic control units. This invention is described, in, among various other patents, U.S. Patent 7,802,263. Many of the features envisioned for this vehicle are now found in commercially available electric vehicles. As a result of this activity, I have a deep understanding of the architecture of electric vehicles, the limitations and characteristics of the powertrain and energy sources, and the various considerations associated with charging these vehicles.

9. In the various positions mentioned above, I was responsible for research and development projects relating to numerous mobile and vehicle information systems, hybrid vehicles systems, vehicle networks, user interface systems, sensory systems, communications systems, control systems and safety systems, and had the opportunity to collaborate with numerous researchers and suppliers that are involved in the field of automotive control systems. I therefore believe that I have a detailed understanding of the state of the art during the relevant period, as well as a sound basis for opining how persons of skill in the art at that time would understand the technical issues in this case.

II. MATERIALS CONSIDERED

10. In forming my opinions, I have relied on my own knowledge and experience, including my education, training, and work experience in the field of electrical engineering, my experience in working with others in this field, and my experience in the design, development, and operation of relevant systems.

11. In developing my opinions, I have considered the following materials:

Exhibit	Description
1001	U.S. Patent No. 11,990,788 (the "'788 Patent")
1002	File History of the '788 Patent (the "'788 File History")
1006	U.S. Patent No. 7,124,691 to Donnelly et al. ("Donnelly")
1007	Letendre, S.E. and Kempton, W. *The V2G Concept: A New Model for Power?* Public Util. Fortn. February 2002, 140, pp. 16-26. ("Letendre")
1010	U.S. Patent No. 6,622,083 to Knockeart et al. ("Knockeart")
1011	U.S. Patent Publication No. 2008/0136371 to Sutardja ("Sutardja")

1012	Willett Kempton and Jasna Tomić. *Vehicle-to-grid power fundamentals: Calculating capacity and net revenue.* Journal of Power Sources. 2005. 144. pp. 268–279 ("Kempton 2005 – Revenue")
1013	Chan, *The State of the Art of Electric and Hybrid Vehicles,* February 2002, Vol. 90, No. 2, IEEE ("Chan")
1014	*Electric Vehicle Battery Systems,* Sandeep Dhameja, Newnes, 2002 ("Sandeep")
1015	U.S. Patent No. 5,573,090 to Ross ("Ross")
1016	Weed, R. *Electric Vehicles: Copper Applications in Electrical*. February 1998. ("Weed")
1017	*Rawson, Kateley,* Electric Vehicle Charging Equipment Design and Health and Safety Codes, SAE Intl., 1999 ("Rawson")
1018	U.S. Patent No. 7.693,609 to Kressner et al. ("Kressner")
1019	U.S. Patent No. 7,084,859 to Pryor ("Pryor")
1020	U.S. Patent Publication No. 2008/0039980 to Pollack et al. ("Pollack")
1021	*Installation Guide for Electric Vehicle Charging Equipment,* Massachusetts Division of Energy Resources, September 200 ("Massachusetts Division of Energy Resources")
1022	U.S. Patent No. 5,467,006 to Sims ("Sims")
1023	U.S. Provisional Application 61/134,646 ("'646 Provisional")
1024	U.S. Patent Publication No. 2009/0312903 to Hafner et al. ("Hafner")
1025	U.S. Patent No. 6,081,205 to Williams ("Williams")
1026	U.S. Patent No. 6,614,204 to Pellegrino et al. ("Pellegrino")
1027	Brooks, Gage, *Integration of Electric Drive Vehicles with the Electric Power Grid – a New Value Stream,* EVS 18 Berlin, 2001 ("Brooks")
1028	U.S. Patent Publication No. 2008/0312782 to Berdichevsky et al. ("Berdichevsky")
1029	U.S. Patent No. 5,487,002 to Diller et al. ("Diller")
1030	U.S. Patent No. 2,309,941 to Drummond ("Drummond")
1031	U.S. Patent Publication No. 2003/0230443 to Cramer et al. ("Cramer")
1032	Aylor et al., *A Battery State-of-Charge Indicator for Electric Wheelchairs,* IEEE Transactions on Industrial Electronics, Vol. 39, No. 5, October 1992 ("Aylor")

1033	Nadal, M and Birbar, F. *Development of a Hybrid Fuel Cell/Battery Powered Electric Vehicle.* Iht. J. Hydrogen Energy. 1996. Vol. 21, No. 6. pp. 491-505. ("Nadal")
1034	2006 Civic Hybrid Online Reference Owner's Manual, Honda ("2006 Honda Civic Manual")
1035	2000 Insight Online Reference Owner's Manual, Honda ("2000 Honda Insight Manual")
1036	Owners Manual: 2008 Tesla Roadster, Tesla ("2008 Tesla Roadster")
1037	*The Human-Computer Interaction Handbook: Tangible User Interfaces,* Second Edition, 2007, Hiroshi Ishii, MIT Media Laboratory, ("Ishii")
1038	*The Graphical User Interface: An Introduction,* Jansen, Computer Science Program University of Maryland, 1998, SIGCHI Bulletin ("Jansen")
1039	Johnsgard et al., *A Comparison of Graphical User Interface Widgets for Various Tasks,* Proceedings of the Human Factors and Ergonomics Society, 39th Annual Meeting, 1995 ("Johnsgard")
1040	Olsen Jr. et al., *Input/Output Linkage in a User Interface Management System,* ACM, Vol. 19, No. 3, 1985 ("Olsen")
1041	U.S. Patent No. 6,577,928 to Obradovich ("Obradovich")
1045	*Proper Handling Helps Make the Most of Li-Ion Batteries,* Maxim Integrated, Application Note 663, January 24, 2001 ("Proper Handling")
1046	*Proper Care Extends Li-Ion Battery Life,* Fran Hoffart, Linear Technology, April 1, 2008, https://www.electronicdesign.com/markets/mobile/article/21190344/proper-care-extends-li-ion-battery-life ("Proper Care")
1047	*Battery Monitoring Considerations for Hybrid Vehicles and Other Battery Systems with Dynamic Duty Loads,* Andrew Kallfelz, Battery Power Products and Technology, Vol. 10, No. 3, June 2006 ("Kallfelz")
1048	U.S. Patent Application Publication No. 2003/0004662 to Mitchell et al. ("Mitchell")
1049	U.S. Patent No. 5,698,967 to Baer et al. ("Baer")
1050	U.S. Patent No. 5,563,491 to Tseng ("Tseng")
1051	U.S. Patent No. 6,154,005 to Hyogo et al. ("Hyogo")

1052	*Sakamoto et al.,* Large Air-Garp Coupler for Inductive Charger, IEEE Transactions on Magnetics, Vol. 35, No. 5, September 1999 ("Matsuo")
1060	*An Introduction to Graphical User Interfaces and Their Use by CITIS,* Sherrik, Susan, U.S. Dept. of Commerce, 1992 ("Sherrick")
1061	U.S. Patent No. 5,555,502 to Opel ("Opel")
1062	*All Volkswagens Built after 2008 to get touchscreen system,* Rory Jurnecka, MT, November 12, 2007 ("Jurnecka")
1065	U.S. Patent No. 8.405,618 to Colgate et al. ("Colgate")
1066	*A Guide to Understanding Battery Specifications,* MIT Electric Vehicle Team, December 2008 ("Electric Vehicle Team")
1067	U.S. Patent No. 7,904,219 to Lowrey et al. ("Lowrey")
1071	U.S. Patent Application Publication No. 2005/0278079 to Maguire ("Maguire")
1073	Kempton et al., *Electric Vehicles as a New Power Source for Electric Utilities,* Transpn Res., Vol. 2, No. 3, Elsevier, 1997 ("Kempton")
1074	*Webster's New World Telecom Dictionary,* Ray Horak, Wiley Publishing, 2008 ("Webster's New World Telecom Dictionary")
1075	Eick, SG. *Data Visualization Sliders*, ACM UIST, November 2004, ("Eick")
1076	U.S. Patent No. 5,615,347 to Davis et al. ("Davis")
1077	Patent Owner's Preliminary Response IPR2022-01217
1078	U.S. Patent No. 5,654,621 to Seelig ("Seelig")
1080	*Pervasive Computing: The Smart Phone – Customizing User Interaction in Smart Phones,* Korpipää et al., IEEE CS, 2006 ("Pervasive Computing: The Smart Phone")
1081	*Spotlight: The Rise of the Smart Phone,* Pei Zheng et al., IEEE Computer Society, Vol. 7, No. 3, March 2006 ("Zheng")
1090	*Happy Birthday, Palm Pilot,* Gary Krakow, March 22, 2006, ("Krakow")
1091	*Your Palm Treo 700p Smartphone User Guide,* Palm, 2006 ("PALM Treo 700P Manual")
1092	U.S. Patent No. 5,596,261 to Sunyama ("Sunyama")
1094	Microsoft Press, Microsoft Computer Dictionary (5th ed. 2002) ("Microsoft Computer Dictionary")
1095	Steven Leibson, *Customizable Processors and Processor Customization*, *in* Processor Design: System-on-Chip Computing for ASICs and FPGAs 149 (Jari Nurmi ed., 2007) ("Leibson")

12. I have considered these materials from the viewpoint of a POSITA as of the priority date of the ’788 Patent. For the purposes of this declaration, the priority date of the ’788 Patent is July 1, 2009, as I discuss below. *See* Section V.C. I note that my opinions provided in this Declaration are made from the perspective of a POSITA as of this priority date of the ’788 Patent unless expressly stated otherwise. To the extent that I use any verb tense in this Declaration that is present tense (e.g., “a POSITA would understand” instead of “a POSITA would have understood”), such verb tense should be understood to be my opinion as of the ’788 Patent’s priority date (again, unless expressly stated otherwise). I merely use the present verb tense for ease of reading.

III. OVERVIEW AND LEGAL STANDARDS

13. In formulating my opinions, I have been instructed to apply certain legal standards. I am not a lawyer. I do not offer any testimony regarding what the law is. Instead, the following sections summarize the law as I have been instructed to apply it in formulating and rendering my opinions found later in this declaration. I understand that, in an *inter partes* review (“IPR”) proceeding, patent claims may be deemed unpatentable if it is shown that they are anticipated or rendered obvious in view of the prior art. I understand that prior art in an IPR review is limited to patents or printed publications that predate the priority date of the patent at issue. I understand that questions of claim clarity (definiteness) and enablement cannot be

considered as a ground for considering the patentability of a claim in these proceedings.

A. Person of Ordinary Skill in the Art

14. I understand that the '788 Patent, the record of the proceedings at the Patent Office (which I understand is called the "File History" or "Prosecution History"), and the teachings of the prior art are evaluated from the perspective of a person of ordinary skill in the art ("POSITA"). I understand that the factors considered in determining the ordinary level of skill in the art may include: (i) the levels of education of the inventor; (ii) the types of problems encountered in the art; (iii) prior art solutions to those problems; (iv) the rapidity with which innovations are made; (v) the sophistication of the technology; and (vi) the educational level of persons working in the field.

15. I understand that a person of ordinary skill in the art is not a specific real individual, but rather a hypothetical individual having the qualities reflected by the factors above. The hypothetical person is presumed to have the same level of skill as the typical practitioner of the art and is presumed to have knowledge of all prior art in the relevant field. I understand that the inventor's actual knowledge or lack of knowledge of prior art reference is irrelevant to the obviousness determination.

B. Obviousness

16. I understand that a claim may be invalid under 35 U.S.C. § 103(a) if the subject matter described by the claim as a whole would have been "obvious" to a POSITA in view of a single or combination of prior art references at the time the claimed invention was made. I further understand that a POSITA is assumed to know and to have all relevant prior art in the field of endeavor covered by the patent-in-suit and all analogous prior art. I understand that obviousness in an IPR review proceeding is evaluated using a preponderance of the evidence standard, which means that the claims must be more likely obvious than nonobvious.

17. I also understand that an obviousness determination includes the consideration of various factors including: (1) the scope and content of the prior art, (2) the differences between the prior art and the claim at issue, and (3) the level of ordinary skill in the pertinent art. I understand that secondary considerations of non-obviousness such as commercial success, long-felt but unresolved needs, failure of others, and so forth may be assessed as well. I have been informed that an obviousness analysis must consider the full scope of the claims to avoid impermissibly using hindsight to invalidate a patent.

18. In considering whether certain prior art renders a particular patent claim obvious, I have been informed that I can consider the scope and content of the prior art, including the fact that a POSITA would regularly look to the disclosures in

patents, trade publications, journal articles, conference papers, industry standards, product literature and documentation, texts describing competitive technologies, requests for comment published by standard setting organizations, and materials from industry conferences, as examples.

19. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be "analogous art" to the claimed invention. A reference is analogous art if: (1) the reference is from the same field of endeavor as the claimed invention (even if it addresses a different problem); or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the claimed invention). For a reference to be "reasonably pertinent" to the problem, it must logically have commended itself to an inventor's attention in considering the problem. In determining whether a reference is reasonably pertinent, one should consider the problem faced by the inventor, as reflected either explicitly or implicitly, in the specification. I believe that the documents I considered in forming my opinions in this IPR are well within the range of documents a POSITA would have consulted to address the type of problems described in the Challenged Claims.

20. I have been informed that to establish that a claimed invention was obvious based on a combination of prior art elements, an articulation of the reason(s) why a claimed invention would have been obvious must be provided. Specifically, I

have been informed that the prior art, either as a single reference or a combination of multiple items of prior art, renders a patent claim obvious when there was an apparent reason for a POSITA, at the time of the invention, to combine or modify the prior art. Rationales for combining or modifying the prior art include, but are not limited to, any of the following: (A) combining prior art methods according to known methods to yield predictable results; (B) substituting one known element for another to obtain predictable results; (C) using a known technique to improve a similar device in the same way; (D) applying a known technique to a known device ready for improvement to yield predictable results; (E) trying a finite number of identified, predictable potential solutions, with a reasonable expectation of success; (F) identifying that known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; or (G) identifying an explicit teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine the prior art references to arrive at the claimed invention.

21. I have also been informed that where there is a motivation to combine, claims may be rejected as obvious provided a POSITA would have had a reasonable expectation of success regarding the proposed combination. I have also been informed that common sense may be considered. Common sense teaches that

familiar items may have obvious uses beyond their primary purposes. I have been informed that if the combination was obvious to try (regardless of whether it was actually tried) or leads to anticipated success, then it is likely the result of ordinary skill and common sense rather than non-obvious innovation.

22. I have been informed that the existence of an explicit teaching, suggestion, or motivation to combine known elements of the prior art is a sufficient, but not a necessary, condition to a finding of obviousness. In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose described in the patent-in-suit controls. I have been further informed that the obviousness analysis may consider the effects of demands known to the technological community or present in the marketplace and the background knowledge possessed by a POSITA. These issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent.

23. I have been informed that it is improper to combine references where the references teach away from their combination. A reference may be said to teach away when a POSITA, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the patent applicant. I have also been informed that a reference does not teach away if it merely expresses a general preference for an

alternative invention but does not criticize, discredit, or otherwise discourage investigation into the invention claimed.

24. I am informed that even if a case of obviousness is established, the final determination of obviousness must also consider "secondary considerations" if presented. Secondary considerations include: (a) commercial success of a product due to the merits of the claimed invention; (b) a long-felt, but unsatisfied need for the invention; (c) failure of others to find the solution provided by the claimed invention; (d) deliberate copying of the invention by others; (e) unexpected results achieved by the invention; (f) praise of the invention by others skilled in the art; (g) lack of independent simultaneous invention within a comparatively short space of time; and (h) teaching away from the invention in the prior art.

25. I have been further informed that secondary considerations evidence is only relevant if the offering party establishes a connection, or nexus, between the evidence and the claimed invention. The nexus cannot be based on prior art features. The establishment of a nexus is a question of fact. While I understand that Patent Owner here has not offered any secondary considerations at this time, I will supplement my opinions should Patent Owner raise secondary considerations during the course of this proceeding.

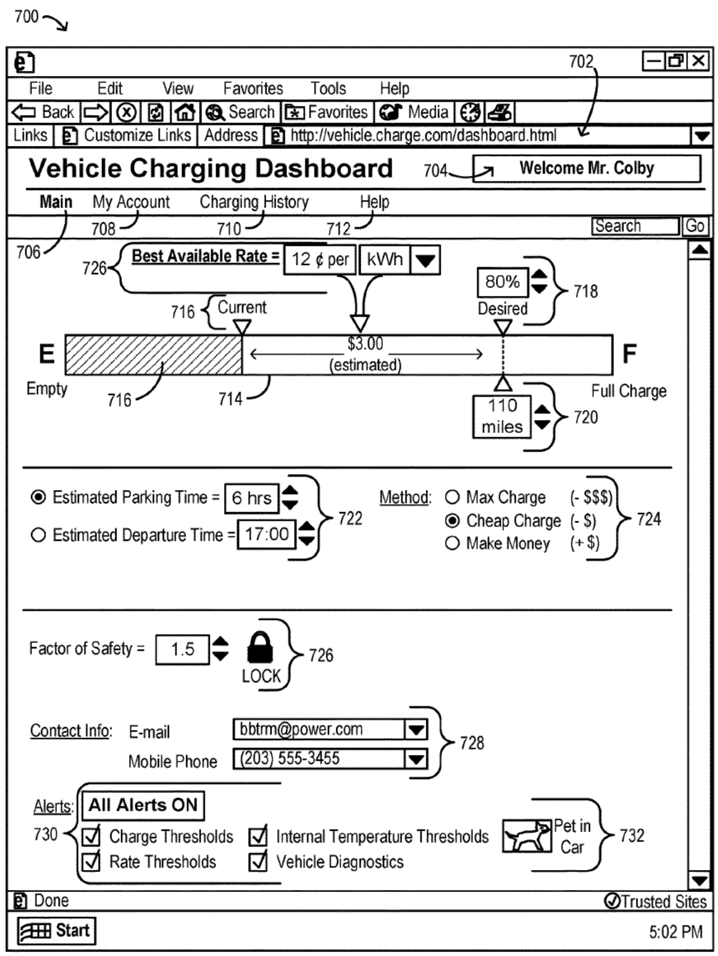
C. Claim Construction

26. I understand that the claim terms in an IPR proceeding are construed according to their plain and ordinary meaning as understood in light of the claim language, the patent's description, and the prosecution history viewed from the perspective of a POSITA. I further understand that where a patent defines claim language, the definition of the patent controls, even if there are other definitions that might be understood by those working in the art.

1. Unitary vehicle charge indicator (Claims 1, 6, and 11)

27. I have been instructed to adopt the following construction for purposes of this proceeding:

> **"unitary vehicle charge indicator"** at least includes a bar graph comprising the charged, uncharged, and slider portions, such as illustrated in FIG. 7 of the '788 Patent, depicting vehicle charge indicator 714.



'788 Patent at FIG. 7; *see also, id.* at 14:63-15:7.

2. Determining . . . a charging schedule (Claims 2, 7, and 12)

28. I have been instructed to provide an opinion of whether the limitation *determining . . . a charging schedule for the electric vehicle* in Claims 2, 7, and 12 is met by the prior art. I have been informed that Petitioner contends that this limitation is not means-plus-function. However, I have also been instructed to apply the following alternative means-plus-function construction:

Claim Term	***Support at Least includes:***	***Structure and Function***
Claims 2, 7, 12: "determining . . . a charging schedule for the electric vehicle"	*'788 Patent* at 10:52–55, 11:3–11, 17:6–20, 20:13–21	Structure: a processor executing computer program instructions for performing the disclosed algorithm of "calculating an estimated time to achieve the desired charge and identifying when during the available charging window would be the most cost-effective to acquire the desired estimated charge." *'788 Patent* at 11:3–11, 20:13–21. Function: determining, based at least on the desired charge level, a charging schedule for the electric vehicle

IV. LEVEL OF A PERSON OF ORDINARY SKILL

29. Based on my review and analysis of the '788 Patent and the cited prior art, a POSITA at the time of the '788 Patent would have been knowledgeable regarding the field of automotive systems, including electric vehicle power management. In my experience working in this field, most workers of ordinary skill in the art as of the earliest possible priority date of July 13, 2009, would have had at least a bachelor's degree in electrical or mechanical engineering, or a similar technical field and at least two years of experience involving automotive systems,

including electric vehicle power management. Additional industry experience or technical training may offset less formal education, while advanced degrees or additional formal education may offset lesser levels of industry experience. When I refer to the understanding of a POSITA, I am referring to the understanding of such a person as of July 13, 2009.

30. As of July 13, 2009, I had more than ordinary skill in the art. I am, however, familiar with the skills and knowledge possessed by those I would have considered to be of ordinary skill in the art as of that date. For example, I worked at Toyota Motor Corporation from 1996 to 2000, where I conceptualized and developed new technology products and services for Toyota's future passenger vehicles. Such technology products included a heavy emphasis on vehicle electronic systems, vehicle information systems, hybrid/electric vehicle systems, and vehicle and mobile device based user interface systems. I also supported technology acquisition for hybrid vehicle control systems, and established the Automotive Multimedia Interface Collaboration (AMI-C), which is a partnership of the world's car makers to develop a uniform computing architecture for vehicle multimedia systems.

31. My opinions provided in this declaration would not change in view of minor modifications to this level of ordinary skill.

V. OVERVIEW OF THE ’788 PATENT

A. Summary

32. The ’788 Patent describes “[s]ystems and methods for charging electric vehicles utilizing Graphical User Interface (GUI) elements.” *’788 Patent* at Abstract. The charging system uses charging preferences, including a desired charge level, to determine a charging schedule for the vehicle. *Id.* at 10:31-39, 11:3-11. A user enters the charging preferences via an “interface.” *Id.* at 14:63-15:35.

1. Field of Endeavor

33. I have been informed that the field of endeavor of the claimed invention can be determined by reference to explanations of the invention’s subject matter in the patent application, including the embodiments, function, and structure of the claimed invention.

34. The ’788 Patent relates to “[s]ystems and methods for charging electric vehicles” to “provide the potential of economically viable electric-powered modes of transportation[.]” *’788 Patent* at Abstract, 1:45-47. The ’788 Patent is directed to managing a charging system of an electric vehicle by creating a “charging schedule” using information such as preferences and energy costs. *Id.* at 8:25-52, 17:6-20. The ’788 Patent defines an electric vehicle broadly as being “any vehicle that utilizes, stores, and/or provides electrical power[,]” including, e.g., “buses, trains, cars[.]” *Id.* at 3:36-40. The ’788 Patent also defines a “hybrid” vehicle as an electric vehicle. *Id.* at 3:58-59. Furthermore, “[a]lmost all typical vehicles comprise a battery, for

example, and would thus qualify as 'electric vehicles'." *Id.* at 3:41-43. The '788 Patent further defines an electric charging system as "any combination of hardware, software," etc. that conducts or otherwise facilitates charging of a vehicle. *Id.* at 3:22-35. Thus, the '788 Patent is directed to managing vehicle systems, including EV charging.

35. The '788 Patent is also directed to the management of other vehicle systems, such as EV control interfaces. For example, the '788 Patent describes "Electric Car Charging Interfaces" for setting up, defining, storing, and/or updating preferences or information utilized by the charging system. *Id.* at 13:38, 13:53-57. An exemplary interface by which charging parameters are established and changed includes a vehicle charge indicator indicating a current charge level. *Id.* at 14:40-41, 14:63-15:1. The interface also includes a desired charge percent level that a user may alter to indicate their desired charge. *Id.* at 15:2-7. The interface includes a desired charge range level that expresses the desired charge level "in terms of distance capable of being traveled." *Id.* at 15:8-18. Thus, the '788 Patent is also directed to EV control interfaces.

36. Furthermore, the '788 Patent is also directed to a user's personal device communicating with the vehicle's information system. The '788 Patent describes the electric car charging interfaces being provided by a "user device 680[,]" which is depicted in FIG. 6 as a phone. *Id.* at 14:29-35, 11:45-60 (describing a cellular

telephone communicating with the vehicle), 20:1-12 (describing using an iPhone® interface to communicate information "into the automobile"). Thus, the '788 Patent is also directed to managing communication of a user's personal device with the vehicle's information system.

37. For these reasons, a POSITA would understand that the field of endeavor of the '788 Patent includes managing vehicle systems, such as EV charging, EV control interfaces, and communication with a user's personal device.

2. Problem Solved by the Inventor

38. I have been informed that a prior art reference is "reasonably pertinent" if a POSITA would have consulted it and applied its teachings when faced with the problems that the inventor was trying to solve. As such, I have been asked to analyze the '788 Patent and determine the problems that the inventors were trying to solve.

39. The '788 Patent recognizes it is desirable for charging an electric vehicle to be user-friendly and convenient. *'788 Patent* at 23:30-33. The '788 Patent recognizes it is necessary to "regularly" charge an electric vehicle which may require the owner to "adhere to a schedule of charging that renders the automobile unusable for protracted stretches of time." *Id.* at 1:52-55. "[T]he need to plug [electric vehicles] in regularly to replenish their electrical charge" was seen as a drawback. *Id.* at 1:48-50. To solve the problems of inconvenient charging schedules making the vehicle "unusable" and a user having to make their own decisions on charging their

vehicle, the ’788 Patent describes a system for intelligent charging. *Id.* at 2:22-23. The intelligent charging system receives “information” and determines a “charging schedule for the vehicle[.]” *Id.* at 2:27-32. The information includes “[p]reference data” indicating “desired vehicle charging parameters,” which is then used by the charging system to determine “a charging schedule for the vehicle[.]” *Id.* at 10:31-39, 10:52-55. The charging schedule “permit[s] a vehicle to recharge, generally, throughout the day at times most convenient to the owner/operator of the vehicle.” *Id.* at 23:30-33. Thus, a POSITA would have understood the ’788 Patent is directed to solving the problem of generating charging schedules based on user preferences and a user’s desired charging parameters, that is, charging schedules that are user-friendly.

40. The ’788 Patent also describes the charging system receiving information indicating the “presence” of a vehicle in a parking space. *Id.* at 2:23-26. The system may include a “vehicle sensor” that detects the proximity and/or presence of the vehicle to the charging system. *Id.* at 10:1-14, 16:48-60. The vehicle sensor facilitates user-friendly charging by detecting when the vehicle is parked at a charging system. Thus, a POSITA would have understood the ’788 Patent is also directed to solving the problem of facilitating user-friendly EV charging.

41. The ’788 Patent also provides the benefit of presenting user-friendly EV control interfaces, such as interfaces that allow a user to view the charging status,

as well as input preferences that are used in managing charging. *Id.* at 23:41-45, 14:63-15:7, FIG. 7. Thus, the ’788 Patent is also directed to solving the problem of presenting user-friendly EV control interfaces, such as presenting charging level and allowing input of user-selected preferences for charging.

42. The ’788 Patent also recognizes that a user employing their own personal device provides a simple way to control vehicle systems. For example, the ’788 Patent describes using a “cellular phone” for communicating a user’s charging preferences to the charging system. *Id.* at 11:45-60, 20:1-12 (describing information being communicated from, e.g., an iPhone to the charging system). Thus, a POSITA would have understood the ’788 Patent is also directed to solving the problem of facilitating user-friendly communication with the vehicle’s information system by allowing a user to use their own personal device.

43. The ’788 Patent also understands it is desirable to reduce the complexity and user-burden in systems that provide electric vehicle charging. *Id.* at 2:22-32, 11:45–12:26, 18:51–20:26, 23:26-28. Thus, a POSITA would have understood the ’788 Patent is also directed to solving the problem of avoiding overcomplexity and reducing the burden on the user in vehicle systems that provide EV charging.

B. Prosecution History

44. I have reviewed the prosecution history for the ’788 Patent. The ’788 Patent did not face any rejections during prosecution. A Notice of Allowance was issued on January 24, 2024. *’788 File History* at 301. In the reasons for allowance, the Examiner stated that the “best prior art of record, *Hafner et al.,* US 2009/0313174 A1, *Pryor* US 7,402,978; *Pollack et al.* US 2008/0039989 A1, and Straubel US 2009/0139781 A1, neither anticipates, nor, alone or combined, renders obvious as a whole, the specific combination of the inventive features as currently recited in the independent claims.” *Id.* at 307. However, the Examiner never stated what he or she considered to be the alleged “inventive features[.]” *Id.* As I show below, the Challenged Claims of the ’788 Patent are plainly obvious in view of the prior art.

C. Priority

45. I have been asked to review if the ’646 Provisional discloses the vehicle charge indicator as claimed in the ’788 Patent Claims. All independent claims of the ’788 Patent require:

> …a unitary vehicle charge indicator comprising … (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) **a third portion comprising a**

> **slider by which an amount of charge may be specified**[1];….

'788 Patent at Claims 1[b][iii], 6[b][iii], 11[b][iii].

46. In reviewing the '646 Provisional, I found no disclosure or description of a *slider*. The '646 Provisional describes charging information "may be entered" using "[a]ny other well known method incorporating a graphical user interface (GUI)[,]" such as "an iPhone® interface[.]" *'646 Provisional* (Ex. 1023) at 11. However, the '646 Provisional has no disclosure to any graphical user interface having a *slider*, let alone any *slider by which an amount of charge may be specified*.

VI. OVERVIEW OF THE TECHNOLOGY

47. I was asked to briefly summarize the background of the prior art from the standpoint of a person having ordinary skill in the art prior to July 13, 2009. As explained below, the charging of electric-powered vehicles described in the '788 Patent was based on well-known intelligent charging systems and technologies used for vehicles with electric drive systems. Thus, all the functionalities encompassed by the Challenged Claims were well-known and conventional prior to the invention of the '788 Patent.

---

[1] All bold or italicizing is added, unless otherwise disclosed.

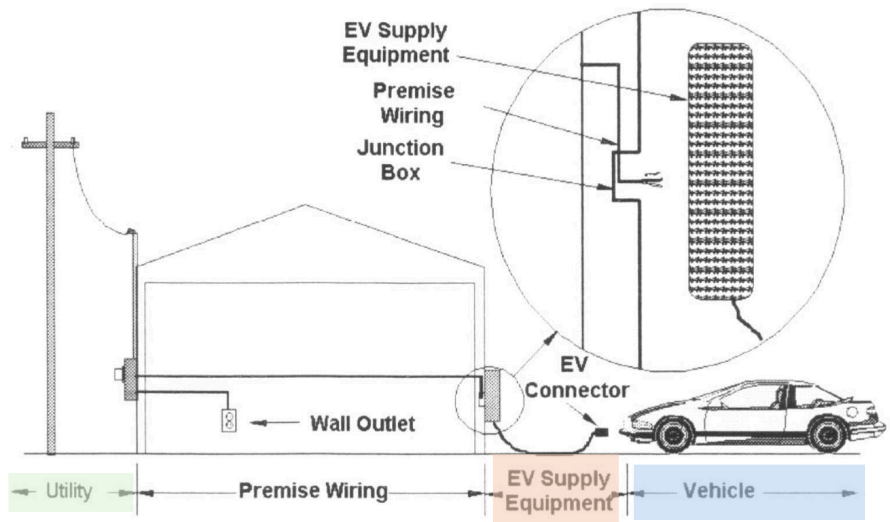
A. Electric Vehicles

48. Electric vehicles (EV) "use an electric motor to provide all or part of the mechanical drive power." *Kempton 2005 – Revenue* (Ex. 1012), 269, Section 3. "EVs may include battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), and fuel-cell electric vehicles (FCEVs)." *Chan* (Ex. 1013), 247, Section I. The "EV was invented in 1834" and "[b]y the mid-1970s, oil shortages led to aggressive development of EV programs[,]" with EVs being leased and sold in the USA starting in 1996. *Chan,* 248, Section III.A; *Sandeep* (Ex. 1014), 4; *see also, Chan*, 255 at Table 2. Thus, electric vehicles, such as hybrid vehicles and fully electric vehicles, were readily available and well-known prior to the '788 Patent.

B. Charging Systems

49. Electric vehicles were known to require some form of charging to maintain the electric power source. *Ross* (Ex. 1015), 2:10-15. For this reason, charging infrastructures for EVs were developed and in use before the '788 Patent. *Weed* (Ex. 1016), 3 (describing how "both conductive and inductive charging are commercially available for EV's" by 1998). Generally, "[d]uring EV charging, the charger transforms electricity from the utility into energy compatible with the vehicle's battery pack." *Sandeep*, 155. For an EV to exchange power with the grid for charging and discharging the battery, the EV requires "(1) a connection to the grid for electrical energy flow, (2) control or logical connection" to communicate

with the grid, and (3) "controls and metering on-board the vehicle." *Kempton 2005 - Revenue*, 269, Section 2. Below is an example EV charging infrastructure and details the "interface" between the utility provider, vehicle, and supply equipment:



Rawson (Ex. 1017) at FIG 2 (annotated).

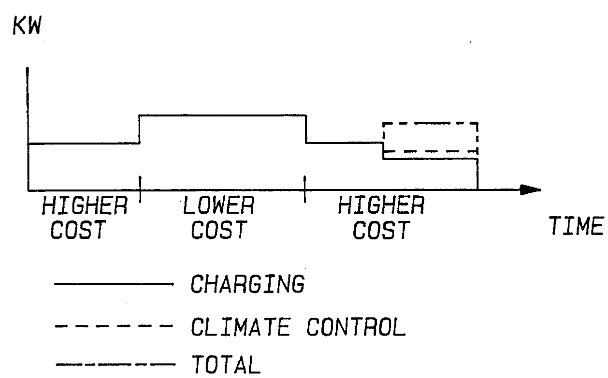
50. Charging infrastructure fundamentally required an EV being "connected to the EV supply equipment (EVSE), which, in turn, is connected to the local utility." *Sandeep*, 88. A meter is an example of an EVSE that is "configured to control the flow of electrical power between the receptacle and the battery." *Kressner* (Ex. 1018), 2:18-20. The meter itself may have a processor which "includes means for connecting and disconnecting electrical power[.]" *Kressner*, 2:52-53.

1. Charge Rates and Schedules

51. Energy utility services and charging stations both provide energy to the vehicle at a certain cost. The cost of electricity fluctuates, being "controlled in real-time by either an integrated electric utility or an Independent System Operator[.]" *Kempton 2005 - Revenue*, 270, Section 4. For example, "expensive peak power—electric power delivered during periods of peak demand—can cost substantially more than off-peak power." *Pollack* (Ex. 1020), [0004]. Specifically, "during peak daytime hours (8 a.m. - 6 p.m., generally) the rates are considerably higher than regular residential rates" for "recharging an EV[.]" *Massachusetts Division of Energy Resources* (Ex. 1021)*,* 17.

52. Thus, for an EV user, it is "desirable to optimize the battery charging of an electric vehicle to take maximum advantage of reduced cost time of day energy rates and to insure *[sic]* the battery is sufficiently charged for the next anticipated use of the vehicle." *Sims* (Ex. 1022), 1:36-39. For example, "EVs can be recharged at significant discounts by using off-peak electricity under optional Time-of-Use (TOU) rates." *Massachusetts Division of Energy Resources*, 16. To optimize battery charging, charging systems were known to schedule the charging of electric vehicles. *See, e.g., Kressner*, 7:65-8:6 (describing "[o]ne example of a recharge schedule" where the charging of "vehicles is arranged to maintain a constant electrical demand between 23:30 and 06:00[.]"). Through a charging schedule, "the

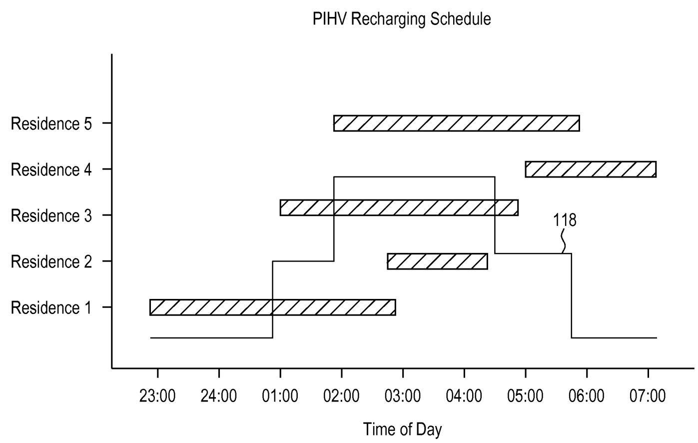
vehicle is scheduled for a recharging period" and the schedule is based on factors including "the expected itinerary of the vehicle 152, the state of charge of each of the batteries 154, the recharge electrical consumption data 156, [and] the cost of electrical energy 158[.]" *Kressner*, 8:51-9:2. An example of a charging schedule where charging power fluctuates in response to the "cost of electrical energy" is provided below where charging power is greatest when the cost is lowest and vice versa:



Sims, FIG. 3C, 4:22-24 ("FIG. 3c illustrates charging at a lower power during the high cost energy rate and then increasing the charging power to a higher current during the period of lower cost.").

53. An EV may have a charging schedule designed to "offset the reduction in base demand from the end users" through "biasing of the PIH [(plug-in hybrid)] vehicle demand[.]" *Kressner*, 8:10-13. This type of EV charging schedule is used to generate "vehicle electrical demand as illustrated by line 118[:]"

FIG. 8



Kressner, FIG 8 (showing offsetting the scheduled charging of various electric vehicles to optimize overall load on the utility when user demand is low).

54. Scheduling the charge of an EV based on factors such as the cost and demand of electricity was desirable for both users and utility providers. *Sutardja* (Ex. 1011), [0231], [0235]. Additionally, certain other factors were known to be customizable by the user to make a personalized charging schedule for their EV. *Id.,* [0262] (describing a "user may use the user interface module 108 to generate charging parameters comprising the time at which the battery 14 may be charged, etc. For example, the user may request a full charge daily between 9 pm and 6 am."). The user may further customize

> [p]references [that] may include, without limitation, a maximum price per kilowatt hour to be paid by a party for electricity, a location where charging may occur, a location where charging may not occur, a rate of charging the electric vehicle, a minimum amount of charge, or any other preferences associated with charging the electric vehicle.

Hafner (Ex. 1024), [0049].

55. Further, "[d]epending on the number of users simultaneously requesting charge and depending on the load on the distribution system, the utility company 23 may supply power in a staggered manner to multiple users requesting charging" within the same time frame. *Sutardja*, [0263]. Sutardja's system also provides negotiation of charging, by "users and utility companies" creating "alternate charging parameters by interactively negotiating costs and/or alternate times for charging the batteries." *Id.*, [0236] ("For example, utility companies may offer discounts to users when the users are willing to accept receiving power at other times.").

56. Kressner discloses generating an EV charging schedule that "may provide advantages to the account holder." For example, "if the utility has different tariff [(e.g. cost of electricity)] rates for different days, weekdays versus weekends for example, by programming the meter 60 to skip a day if cost of energy data 158 indicates that the electricity will be less expensive on an alternate day." *Kressner*, 9:56-60.

57. Thus, using the fluctuating price of energy and user charging preferences to optimize scheduled charging of EVs (e.g., keep charging cost and demand on the energy network low) was well-known prior to the '788 Patent.

2. Parking Detection

58. It was desirable to include vehicle parking sensors within the EV charging infrastructure to detect the presence of a vehicle available for charging. For example, a parking meter "system 10 may also include a vehicle presence sensor 61 in the parking space adjacent the meter." *Williams* (Ex. 1025), 5:38-39. Vehicle parking sensors may signal a charging station to initiate charging by "locating the vehicle sufficiently proximate to a charging station having an optical reader unit to allow the vehicle to be connected thereto, connecting the vehicle to the charging station, and displaying the coded element [associated with the vehicle] to the charging station optical reader unit so as to initiate flow of power from a power supply to charge the vehicle." *Pellegrino,* (Ex. 1026) 2:21-27.

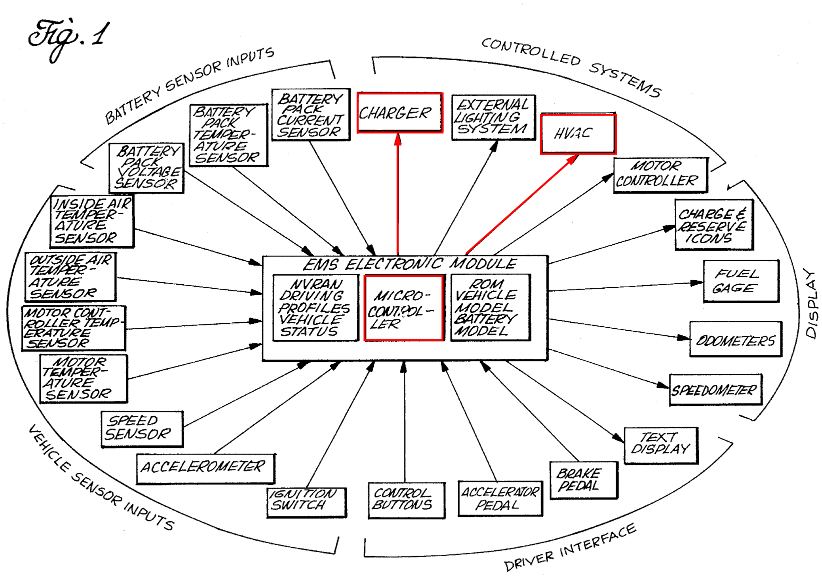
59. Thus, vehicle sensors were known to be included as part of the EV charging infrastructure to identify when a vehicle is parked and ready for charging prior to the '788 Patent.

3. Charging Control

60. Managing EV charging within the vehicle itself was known, as infrastructure for "[m]easuring and keeping track of the vehicle-to-grid services" should be "on the vehicle side." *Brooks* (Ex. 1027), 7-8, Section 4.3, 4.5. Thus, EVs were known to include a "vehicle communication interface that is capable of

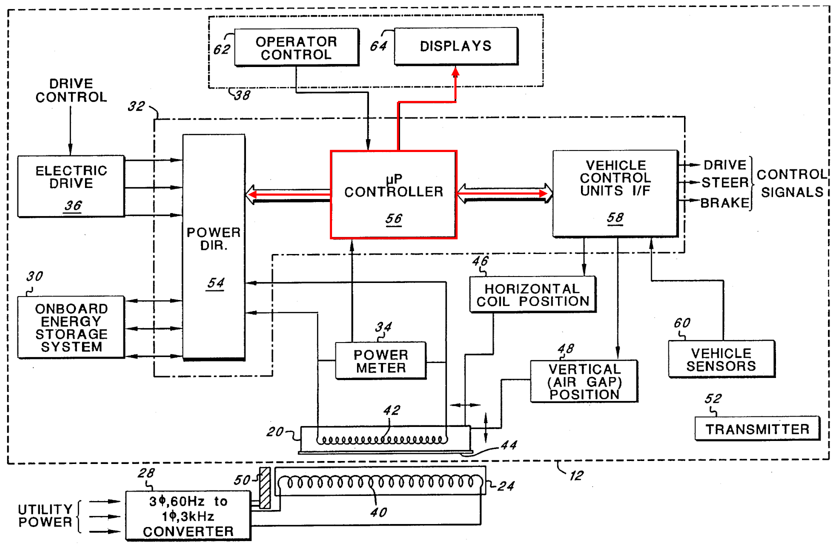
communicating predetermined instructions from the user to the electric vehicle regarding the battery and charging thereof." *Berdichevsky* (Ex 1028), [0008].

61. Some EV systems had a processor on-board the vehicle for controlling charging of the batteries among other vehicle functions; for instance, Diller (Ex. 1029) describes an EV with a singular processor where "[t]he energy management system electronic module 10 incorporates a micro-controller 12 as a calculation engine and means for controlling the various systems of the electric vehicle" wherein "an Intel Model 196KR processor is employed." *Diller*, 3:29-33. Further, this "energy management system through its microcontroller *[sic]* provides active control of vehicle systems including the charging system for the battery pack, internal and external lighting systems, heating, ventilating and air conditioning systems[.]" *Id.*, 2:53-58. Diller's on-board micro-controller 12 and its control of various vehicle systems, including battery charging and the HVAC, is shown below:



Diller, FIG 1 (annotated), 3:26-29 ("FIG. 1 shows the relationship of the energy management system (EMS) to the various sensor inputs, controlled system outputs, driver interface and display for the vehicle.").

62. Ross describes a roadway-powered EV that includes a "microprocessor controller 56, which is realized using a conventional processor-based system" as part of an on-board "power control unit 32." *Ross*, 9:16-22 (describing the power control unit 32 on-board the vehicle directing charge to the "energy storage system"), 13:6-20, 18:20-21. The microprocessor controller 56 controls charging by "directing the power to and from the energy storage system[,]" among other vehicle functions (e.g., "monitoring onboard vehicle sensors 60" and "receiving appropriate commands from the operator control devices 38". *Id.*, 13:26-35 (describing many "tasks" carried out by the microprocessor "are the same as are carried out with the operation of any EV"). Ross's on-board microprocessor 56 and its regulation of various vehicle components is shown below:



Ross, FIG 2 (annotated).

C. Displays and Interfaces for Vehicles

63. Displays and interfaces, including GUIs provided on displays, were known, and their inclusion in vehicles was also known prior to the ’788 Patent. For example, vehicles were known to have “a basic vehicle dashboard” comprising “tactile displays and/or touch screens 10-14” which “can be used for the basic control functions of the vehicle[.]” *Pryor*, 2:37-38, 13:19-21.

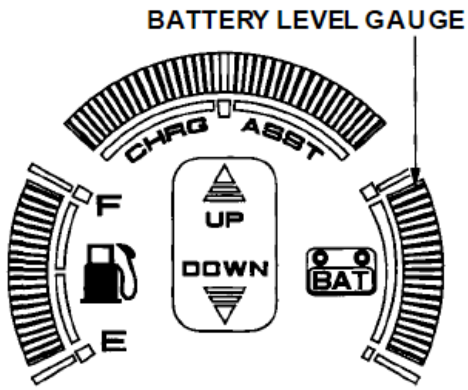
1. Battery Charge Status and Vehicle Displays

64. Instrument panels to display vehicle-related information to the user have been employed in vehicles well before the ’788 Patent. *See, e.g., Drummond* (Ex. 1030), 2:27-31 (right column) (describing “instrument panel 10” found “on the dashboard of the automobile immediately in front of the driver so that it will attract his attention without any effort on his part” in 1943). An on-board vehicle display was known to be beneficial “for displaying information for the driver[,]” as vehicle

displays "improve[d] occupant safety, environmental friendliness, ergonomics, and compatibility to modify, add, or upgrade vehicle features." *Cramer* (Ex. 1031) at [0307].

65. It is essential for any system relying on a battery for power to have "[a]n accurate battery monitor" so as "to avoid the complete discharge of the batteries" and further "prevent a user from being stranded and avoid damaging the cells in the long run." *Aylor* (Ex. 1032), 398. Therefore, it was known to include a "battery charge indicator" in electric vehicles that includes "[a] miles-to-go indicator or a fuel gauge" along with "[a] warning light or an audible signal for a battery in a dangerous or faulty condition requiring immediate servicing as a 'maintenance required' command[.]" *Sandeep*, 144-145. For example, "instrument panels on the [electric] vehicle dashboard and center console contain [] digital meter displays, status and warning indicator lights" so that the user may "monitor the fuel cell." *Nadal* (Ex. 1033), 501-502. Electric vehicles were known to have the battery status displayed, as shown below:

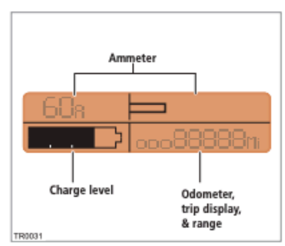
Battery Level Gauge



See, *e.g.*, *2006 Honda Civic Manual* (Ex. 1034), 69; *2000 Honda Insight Manual* (Ex. 1035), 54. Tesla's 2008 model of the Roadster contained an LCD showing the battery "charge level":

LCD panel

The Liquid Crystal Display (LCD) panel in the instrument panel operates whenever the starter switch is in the ON position. The LCD displays three types of information.



Ammeter

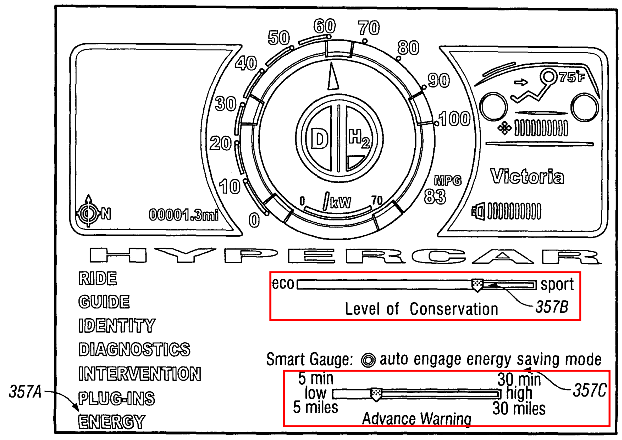
The ammeter displays information about the electrical current either entering or leaving the Battery.

The numbers at the top left of the LCD indicates the current (in amps).

2008 Tesla Roadster Manual (Ex. 1036), 6-11.

66. It was further known to make these displays interactive; namely, including touch screen displays within vehicles to show such battery information. Tesla's 2008 Roadster LCD contained touch screens which a user could interact with to, for example, select the "Charging" setting. *2008 Tesla Roadster Manual,* 10-13.

Cramer discusses a "driver display 265" within a hybrid-electric vehicle, which includes an "energy settings control panel 357A" for adjusting vehicle parameters like "set[ting] the powertrain control strategy between economy and sport modes using a slider bar 357B" as shown below:



Cramer, FIG 22D (annotated), [0390]-[0391] (describing an "exemplary user interface" as including a "display screen" that includes a "multi-functional control panel" on the screen), [0401] (describing the display screens having slider bars that are "user-settable"), [0403].

67. Therefore, using displays to show battery status within vehicles and using such displays as touch screens a user can manipulate was well-known prior to the '788 Patent.

2. *Vehicle User Interfaces*

68. "The Graphical User Interface (GUI) has been in existence since the 1970s[.]" *Ishii* (Ex. 1037) at 470. "[T]he GUI has become the standard paradigm for Human Computer Interaction" and "is widespread[.]" *Id.*, 470, 472. GUIs are

favorable since a "GUI makes an application easy, practical, and efficient to use" and it "allow[s] the user to concentrate on the task at hand." *Jansen* (Ex. 1038) at 1, 8. Thus, using graphical user interfaces was well-known and known to be beneficial prior to the '788 Patent.

69. "All of the leading GUI platforms" were known to include "the following widgets: check boxes, scroll bars, radio buttons, pop-up menus, and sliders[,]" where sliders can be used for "setting a value within a range[.]" *Johnsgard* (Ex. 1039) at 287, 290. Sliders were a known type of "display object" that provides "a computational linkage between input values and output parameters[.]" *Olsen* (Ex. 1040), 195 (describing how a user moves a slider "up and down" between the "upper and lower bounds" set by "the application" which "read[s] the current value of the slider.").

70. Vehicles were known to include a "multifunction display interface 102b [that] is installed on the dashboard" which "provides the user with **graphic display** and control of selected functions using well-known touch screen technology" including "navigation, phone, radio and climate control[.]" *Obradovich* (Ex. 1041), 6:19-25. Vehicles used "programmable forms" of "touch screens and displays employing tactile physical selection or adjustment means[.]" *Pryor*, Abstract. For example, a driver may use a "[t]ouch screen 301 located on a vehicle dashboard 302" for "[c]limate control optimization" by touching "a virtual slider

1360 for heat control[.]" *Pryor*, 14:5, 39:1-2; *see also*, *id*., Fig. 13B. A touch screen display with input, such as a slider, was beneficial for use in a vehicle over alternative input options like a "keyboard—which is generally too cumbersome, switch filled, and space consuming for a car dash, armrest, or other interior location. And a mouse is pretty much impossible as well." *Pryor*, 4:2-5.

71. Thus, using graphical user interfaces on touchscreens within vehicles and inputting various EV-related parameters using sliders on such GUIs was also well-known prior to the '788 Patent.

D. Battery Level Notification

72. Notifying a user when a battery was at low charge was known to be an important feature of any battery-powered device, as over-discharging a battery was known to result in "permanent[] damage" to batteries. *Proper Care* (Ex. 1046), 9; *see also*, *Proper Handling* (Ex. 1045), 1 (describing that too much discharge or charge may "reduc[e] battery life or destroy[] the battery and its surroundings"). Further, if the user is not notified, their device may run out of battery power completely. In the case of electric vehicles that rely exclusively on battery for power, this would be a huge issue and could leave someone stranded. Users wanted to be notified of "how much energy is available in their batteries" as "conveniently as possible." *Kallfelz* (Ex. 1047), 1.

73. For these reasons, electric vehicles were known to include low battery alerts. "[m]any modern day electronic or electro-mechanical devices[,]" such as "electric vehicles" were known to need some way of allowing a user to know when "the battery power of such a device may run out[.]" *Mitchell* (Ex. 1048), [0004]. "[D]isplaying a low battery warning" was an understood way of alerting the user when the battery power gets too low. *Id.,* [0007]. Indeed, "low voltage warnings" were known to be displayed to users of electric vehicles as early as 1997. *Baer* (Ex. 1049), 2:66-3:2 (describing a "battery management system intended to provide power to an electric vehicle"), 13:53-63 (describing the CPU of the system, among other things, "display[ing] a warning" of low battery voltage "on the operator display").

74. Thus, it was known to alert a user when batteries reach too low of a charge prior to the '788 Patent.

VII. SUMMARY OF THE PRIOR ART REFERENCES

A. Sutardja

75. I have been instructed by counsel that Sutardja is prior art to the challenged patent.

76. Sutardja discloses "systems and methods for charging batteries in vehicles", including electric vehicles, in which "charging parameters for charging a battery" are employed. *Sutardja* (Ex. 1011) at [0002], [0004], [0008]. Sutardja notes

that "an increasing number of users of vehicles may attempt to simultaneously recharge batteries in vehicles as use of vehicles with rechargeable batteries and electric motors proliferates" such that "the demand for power may exceed the available supply". *Id.* at [0229].

77. To address this problem, Sutardja discloses a "charge management system (CMS) to coordinate charging of batteries in vehicles at multiple locations." *Id.* at [0230]. The CMS enables users to "plug in their vehicles at 6 pm and request recharging by 6 am." *Id*. Sutardja further teaches that "vehicles may be equipped with a charge management module (CMM) that may communicate with utility companies"; namely, the CMM may communicate "charging parameters for charging batteries" that are generated by "[u]sers of the vehicles." *Id.* at [0232]-[0233]. Users use "user interface modules to generate default and/or custom charging parameters," and the charging parameters "may specify a time of the day to charge the batteries, a charge completion time, a priority at which the batteries may be charged, and an expected time when the vehicles will be used next." *Id.* at [0235]. Thus, Sutardja's charging system provides the advantage of "allow[ing] user entry of" charging parameters. *Id.* at [0015]. As a specific example, Sutardja teaches that "in the default charging parameters, users may indicate that the utility company may choose the time to charge the batteries when the cost is lowest." *Id.* Additionally, "users and utility companies may create alternate charging parameters

by interactively negotiating costs and/or alternate times for charging the batteries." *Id.* at [0236].

78. FIG. 3A of Sutardja illustrates a charge management system 100-1 including a vehicle 102-1 that "is charged at a location such as a home or work location" where the vehicle includes "the electric motor 13, the battery 14, [and] a CMM 104-1", which "communicate[s] with the battery 14 and the power receptacle 18 and may manage the amount of charge in the battery 14." *Id.* at [0239].

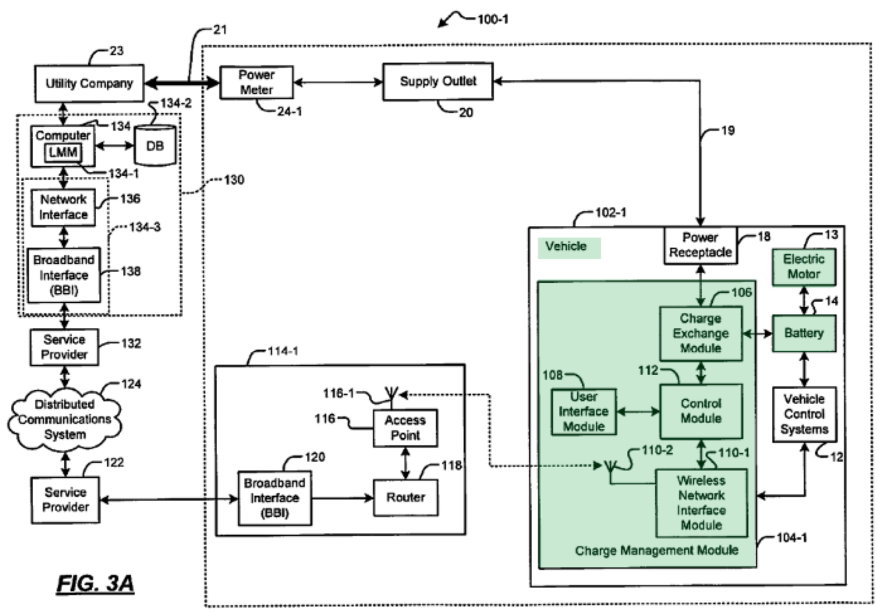


FIG. 3A

Id. at FIG. 3A.

79. The CMM 104-1 "includes a charge exchange module 106, a user interface module 108, a wireless network interface module 110-1, and a control module 112." *Id.* at [0242]. The user interface module 108 may comprise a "display", which a "user of the vehicle 102-1 may use…to set charging parameters for charging

the battery 14[.]" *Id.* at [0243]. Sutardja further teaches the "user may use the user interface module 108 to generate charging parameters comprising the time at which the battery 14 may be charged", providing an example in which "the user may request a full charge daily between 9 pm and 6 am." *Id.* at [0262]. In addition to disclosing charging by a specified time, Sutardja teaches both (1) a "minimum charge level (e.g., 25%)" may be set by the user "via the charging parameters", and (2) a "predetermined level" of charge "may be indicated in the charging parameters." *Id.* at [0266], [0270].

80. Along with charging the battery to a specified level, Sutardja teaches "the user may use the user interface module 108 to interact with the utility company 23 and input requests for charging the battery 14 at times other than default times." *Id.* at [0264]. Sutardja provides an example where "the user may input a request for charging at 5 pm on a given day," rather than their default daily charging request "between 9 pm and 6 am." *Id.* at [0262]-[0264]. When the utility company receives the 5 pm charging time request, the utility company may find that they cannot supply power to the user at the requested time. *Id.* at [0264]. In this case, the utility company 23 "may respond with an alternate schedule," such as "inform[ing] the user of any extra cost the user may incur" or a "discount the user may receive if the user accepts power at a different time." *Id.* at [0264] (disclosing the alternate schedule including alternate charging parameters, such as "alternate charging times, additional costs,

discounts, etc.”). The user may respond to the alternate charging parameters “interactively,” by, e.g., “negotiat[ing] the additional cost and/or alternate charging times suggested by the utility company 23.” *Id.* at [0265], [0236] (“[U]sers and utility companies may create alternate charging parameters by interactively negotiating costs and/or alternative times for charging the batteries.”). The alternate negotiated charging parameters are then used to “control the charging of the battery.” *Id.* at [0267]; *see also, id.* at [0275]-[0278], FIG. 8A (generally disclosing how the user inputs their charging parameters (step 204), the utility company determines if the charge can be provided based on the charging parameters (steps 208), alternate charging parameters are provided to user if the charging parameters cannot be met (step 210), user interactively negotiates the alternate charging parameters (step 212), and then these alternate negotiated charging parameters are used to supply charge to vehicle (step 222)).

81. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be “analogous art” to the claimed invention. I have been informed that a prior art reference is analogous to the claimed invention if the reference is from the same field of endeavor as the claimed invention or if it is reasonably pertinent to the particular problem that the inventor was trying to solve.

82. As discussed above, the field of endeavor of the claimed invention of the ’788 Patent includes managing vehicle systems, including EV charging. *See* ¶¶ 34-37. As demonstrated above, Sutardja is directed to a “system for charging batteries in vehicles” and the system is a charge management system that manages charging an electric vehicle by basing the charging on user-defined parameters and electricity costs. Thus, Sutardja is directed to managing vehicle systems, including EV charging, and accordingly is in the same field of endeavor as the claimed invention of the ’788 Patent.

83. Sutardja is also reasonably pertinent to the problems solved by the inventors of the ’788 Patent. As discussed above, the ’788 Patent is directed to solving the problem of generating charging schedules that are user-friendly. *See* ¶ 39. As demonstrated above, Sutardja proposes the use of a charge management system that manages charging between a utility company and vehicles to charge vehicles according to user preferences, including allowing a user to negotiate the charging parameters when their preferences cannot be met. Thus, a POSITA would have consulted Sutardja and applied its teachings when faced with the problem of generating charging schedules that are user-friendly.

B. Donnelly

84. I have been instructed by counsel that Donnelly is prior art to the challenged patent.

85. Donnelly discloses a "locomotive comprising energy storage units, such as batteries…and an energy conversion device, such as a generator" and "an integrated method for monitoring, controlling, and/or optimizing an electrically powered locomotive." *Donnelly* (Ex. 1006) at Abstract, 2:5-7. Donnelly additionally discloses a controller that provides "information and warnings…by a computer console that can access a variety of control and informational screens." *Id.* at 3:49-54. Donnelly discloses the "inventive features" may be applied to "vehicles other than locomotives, such as cars." *Id.* at 26:6-8. Thus, the "integrated method for monitoring, controlling, and/or optimizing" applies for an electrically powered car, such as a "hybrid" vehicle. *Id.* at 2:5-7, 1:36-38.

86. Donnelly teaches the "energy storage unit 1003" in the hybrid vehicle "is preferably an electrical energy storage battery pack." *Id.* at 8:34-41, 10:40-42. The energy storage unit 1003 (i.e., batteries) provides "most of the power for the" motors of the vehicle. *Id.* at 5:34-37. A logic unit 1011, such as a "microcontroller," sends out "instructions to co-ordinate the operation of," e.g., "the charging and discharging of the energy storage unit." *Id.* at 6:29-32, 6:66-7:1, 8:22-27 (disclosing a "charging system 1002" that "provide[s] the proper driving voltage to charge the

energy storage unit 1003" from an external source, such as a "utility grid"). For example, the controller controls "the charging unit that charges the main energy storage apparatus," by measuring the "battery volts or the state of charge of the battery to determine if the charging generator needs to be on or off." *Id.* at 18:50-54, 18:56-62. Thus, because Donnelly's integrated method includes controlling the charging of the hybrid vehicle, Donnelly discloses an electric vehicle charging system.

87. Donnelly discloses a "control system for the various components" of the hybrid vehicle requires a GUI, explaining:

> As will be appreciated, the control system for the various components of the locomotive requires a Graphical User Interface display ("GUI") to provide a user interface for viewing the various monitored parameters and the operational states of the various components and providing operational commands to the various components. This GUI is preferably implemented using a series of related display screens which are configured to receive touch screen commands. This system of screens allows the operator and maintenance crew to monitor and control, for example, the state of the charging generator, the battery pack, the individual drive axles and other functions.

Id. at 21:47-58. One of the "display screens" is a "Battery Status Screen" that "displays details about the electrical state" of the battery and includes "Battery State of Charge 28004, which depicts, in a bar graph format, the state of charge of the energy storage unit." *Id.* at 23:16-20, 23:31-33.

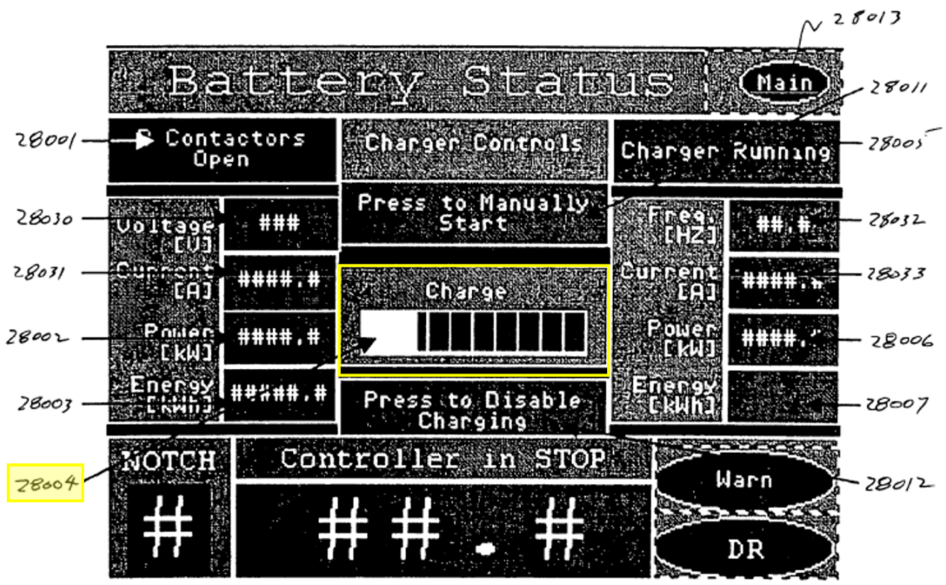


FIG. 28

Id. at FIG. 28 (annotated).

88. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be "analogous art" to the claimed invention. I have been informed that a prior art reference is analogous to the claimed invention if the reference is from the same field of endeavor as the claimed invention or if it is reasonably pertinent to the particular problem that the inventor was trying to solve.

89. As discussed above, the field of endeavor of the claimed invention of the '788 Patent includes managing vehicle systems, including EV charging and EV

control interfaces. *See* ¶¶ 34-37. As demonstrated above, Donnelly is directed to managing EV charging, by disclosing the system controlling the charging of the batteries of the hybrid vehicle. Additionally, Donnelly is directed to EV control interfaces, as Donnelly teaches GUI screens where users can view charging information. Thus, Donnelly is in the same field of endeavor as the claimed invention of the ’788 Patent.

90. Donnelly is also reasonably pertinent to the problems solved by the inventors of the ’788 Patent. As discussed above, the ’788 Patent is directed to solving the problem of presenting user-friendly EV control interfaces, such as by presenting the charging level. *See* ¶ 41. As demonstrated above, Donnelly proposes the use of a GUI with a bar graph that depicts the state of charge of the hybrid vehicle battery. Additionally, the ’788 Patent describes trains (i.e., locomotives) as an exemplary “electric vehicle.” *’788 Patent* at 3:36-40. Thus, a POSITA would have consulted Donnelly and applied its teachings when faced with the problem of presenting user-friendly EV control interfaces.

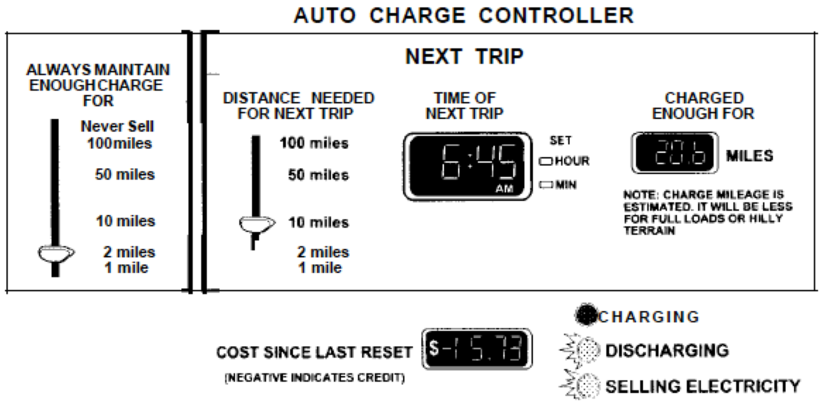
C. Letendre

91. I have been instructed by counsel that Letendre is prior art to the challenged patent.

92. Letendre describes the "Vehicle-to-Grid" (V2G) concept where "vehicle power is fed into the grid." *Letendre* (Ex. 1007), 16. Per Letendre, three elements are required for V2G:

> 1) power connection for electrical energy to flow from vehicle to grid, 2) control or logical connection, needed for the grid operator to determine available capacity, request ancillary services or power from the vehicle, and to meter the result, and 3) precision certified metering on board the vehicle.

Letendre at 18. The first element is already common, as "[b]attery vehicles must already be connected to the grid in order to recharge their batteries." *Letendre,* 18. Letendre discloses an "auto charge controller" that "the driver sets according to driving needs." *Id.* at 18-19. The controller allows the driver to "limit any draw down so travel is not affected." *Id.* at 19. FIG. 1 depicts an "example control panel" showing the "auto charge controller":



Id. at FIG. 1, 18-19.

93. The control panel, which can be implemented "physical[ly], on the [vehicle] dash, or on a Web page" provides the driver with "two parameters to set – the length of the expected next trip (in the case shown in Figure 1, 10 miles at 6:45 the next morning), and the minimum range that must always be maintained, e.g. for an emergency room trip, two miles." *Id.* at 19-20. These two parameters are set via sliders that the user slides to their desired mileage value, as shown in FIG. 1. The vehicle is then charged and discharged based on the user-selected parameters. In the exemplary control panel of FIG. 1, the vehicle is currently "CHARGING." Because the auto charge controller manages the charging (and discharging) of the electric vehicle based on the user-chosen parameters, Letendre discloses managing the charging of the electric vehicle.

94. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be "analogous art" to the claimed invention. I have been informed that a prior art reference is analogous to the claimed

invention if the reference is from the same field of endeavor as the claimed invention or if it is reasonably pertinent to the particular problem that the inventor was trying to solve.

95. As discussed above, the field of endeavor of the claimed invention of the ’788 Patent includes managing vehicle systems, including EV charging and EV control interfaces. *See* ¶¶ 34-37. As demonstrated above, Letendre is directed to managing the charging (and discharging) of an electric vehicle. Namely, the user-selected parameters on the control panel are used by the charging system to manage charging of the electric vehicle. Additionally, Letendre is directed to a control panel interface where a user inputs the parameters for controlling charging, as demonstrated above. Letendre’s control panel may be implemented through a web page, similar to the ’788 Patent disclosing the preferences may be entered using a web page. *Letendre* at 19-20;*’788 Patent* at 20:1-12. Thus, Letendre is in the same field of endeavor as the claimed invention of the ’788 Patent: managing vehicle systems, including EV charging and EV control interfaces.

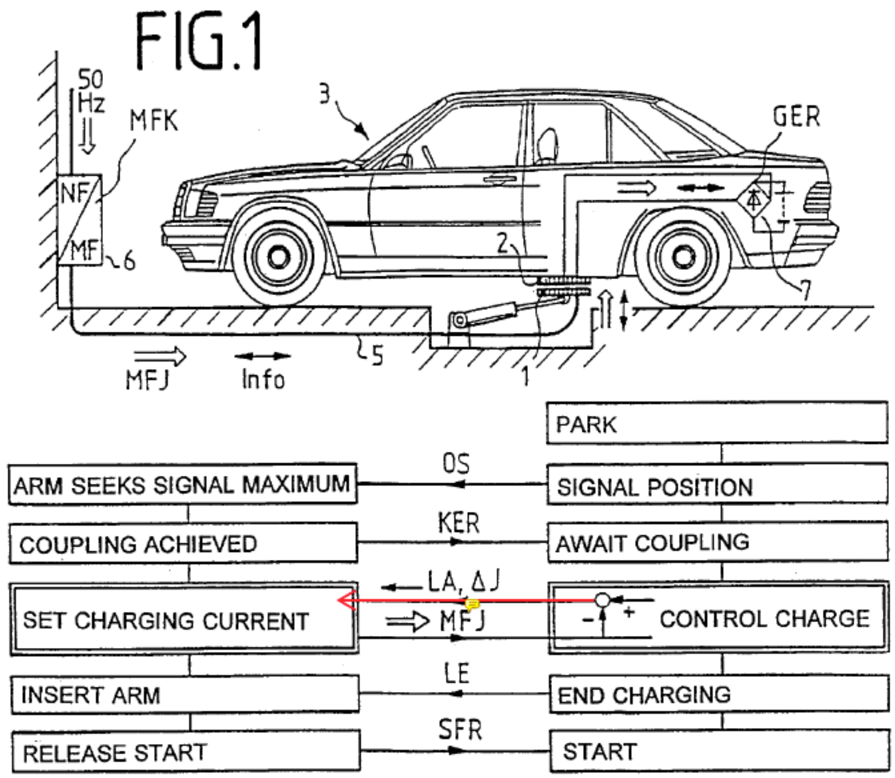
96. Letendre is also reasonably pertinent to the problems solved by the inventors of the ’788 Patent. As discussed above, the ’788 Patent is directed to solving the problem of presenting user-friendly EV control interfaces, including inputting user-selected preferences for charging. *See* ¶ 41. As demonstrated above, Letendre proposes the use of a control panel with a slider for selecting a desired

distance to charge to and an amount of charge to always keep so as to maintain a certain drivable distance. Thus, a POSITA would have consulted Letendre and applied its teachings when faced with the problem of presenting user-friendly EV control interfaces, including inputting user-selected preferences for charging.

D. Seelig

97. I have been instructed by counsel that Seelig is prior art to the challenged patent.

98. U.S. Patent No. 5,654,621 to Seelig describes a system and method for wirelessly charging an electric vehicle. *Seelig* at Abstract. More specifically, Seelig teaches "contactless energy transmission in charging the battery of a vehicle, in particular in electric car, by means of an inductive transmitter having a primary element (1) and a secondary element (2) which is attached to the vehicle[.]" *Id.* at Abstract, 2:19-24, 2:42-44 ("[E]lectrical energy can be transmitted from primary element 1 to secondary element 2 via an air gap of a magnitude of up to approximately 1 cm."). Seelig teaches the invention provides advantages over inductive charging stations that are "oriented toward conventional fueling of a gasoline-powered car" and therefore are "rather awkward in terms of handling." *Id.* at 1:17-22.



Id. at FIG. 1. Seelig additionally teaches that "[c]ontactless transmission of information takes place between the charging current setter 310 of a[n] inverter 7 and the charging current controller of the battery." *Id.* at 3:51-54, FIG. 3.

99. Again referencing FIG. 1, Seelig teaches "a method…for contactless energy transmission," which involves the transmission of a "charging initiation signal LA transmitted to the charging apparatus" that "switches on the charging operation memory LBS and thus switches on the inverter." *Id.* at 6:29-32, FIG. 1.

100. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be "analogous art" to the claimed

invention. I have been informed that a prior art reference is analogous to the claimed invention if the reference is from the same field of endeavor as the claimed invention.

101. As discussed above, the field of endeavor of the claimed invention of the '788 Patent includes electric vehicle charging systems, as well as managing charging of the electric vehicle. *See* ¶¶ 34-37. As demonstrated above, Seelig is directed to managing charging an electric vehicle using wireless electric vehicle charging. Thus, Seelig is in the same field of endeavor as the claimed invention of the '788 Patent.

102. Seelig is also reasonably pertinent to the problems solved by the inventors of the '788 Patent. As discussed above, the '788 Patent is directed to solving the problem of avoiding overcomplexity and reducing the burden on the user in vehicle systems that provide EV charging. *See* ¶ 43. As demonstrated above, Seelig proposes a wireless charging system that eliminates the need for the user to exit and plug in their vehicle for charging, and also relieves the user from physically attaching the vehicle to the charging apparatus. Thus, a POSITA would have consulted Seelig and applied its teachings when faced with the problem of avoiding overcomplexity and reducing the burden on the user in vehicle systems that provide EV charging.

E. Knockeart

103. I have been instructed by counsel that Knockeart is prior art to the challenged patent.

104. Knockeart discloses "a removable device, such as a PDA, cellphone or similar device, in conjunction with a driver information system." *Knockeart* (Ex. 1010) at Abstract, 1:39-42. Knockeart further teaches the "removable personal device 160 provides an input/output interface between in-vehicle system 105 and an operator of the vehicle." *Id.* at 4:49-67. The removable personal device 160 may couple and communicate with the in-vehicle system 105 via a wireless link. *Id.* at 3:23-28, 7:1-9, 13:57-60.

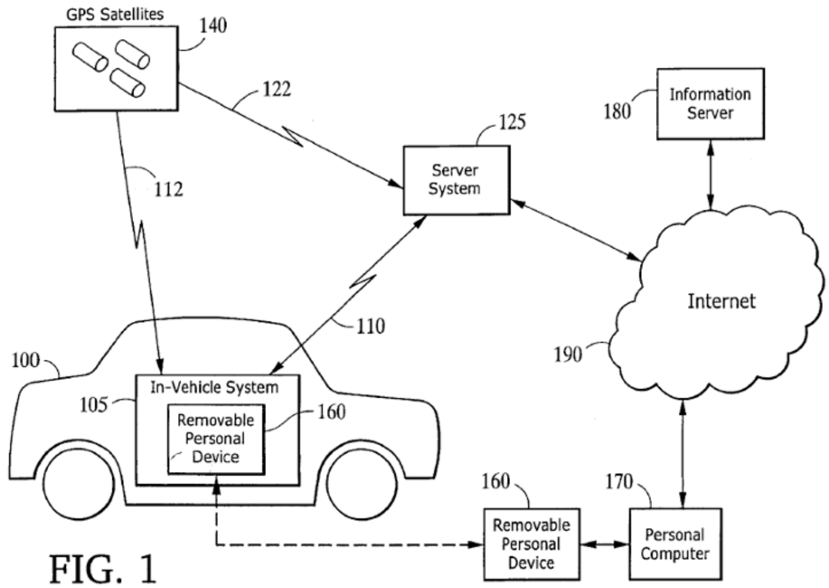


FIG. 1

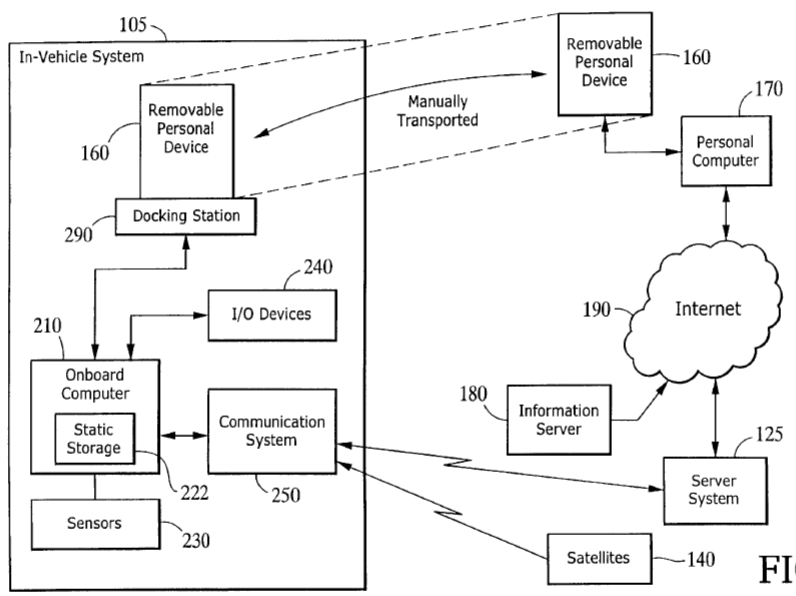


FIG. 2

Id. at FIGS. 1-2, 3:60-65 ("FIG. 1 is a block diagram of the vehicle information system; FIG. 2 is a block diagram of components of an in-vehicle system."). The removable device 160 further "includes a graphical display and that display is used to provide visual information to the operator of the vehicle." *Id.* at 4:53-57. The graphical display can be a "touch-screen that is used by the operator for manual input to the system." *Id.* at 4:57-59.

105. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be "analogous art" to the claimed invention. I have been informed that a prior art reference is analogous to the claimed invention if the reference is from the same field of endeavor as the claimed invention or if it is reasonably pertinent to the particular problem that the inventor was trying to solve.

106. As discussed above, the field of endeavor of the claimed invention of the '788 Patent includes managing vehicle systems, including managing communication of a user's personal device with the vehicle's information system. *See* ¶¶ 36-37. As demonstrated above, Knockeart is directed to a user's personal device (e.g., phone, PDA, etc.) that communicates with the in-vehicle system. Thus, Knockeart is in the same field of endeavor as the claimed invention of the '788 Patent.

107. Knockeart is also reasonably pertinent to the problems solved by the inventors of the '788 Patent. As discussed above, the '788 Patent is directed to solving the problem of facilitating user-friendly communication with the vehicle's information system, by allowing a user to use their own personal device. *See* ¶ 42. As demonstrated above, Knockeart proposes the use of a user's own removable

device that interfaces with a vehicle's in-vehicle system. Thus, a POSITA would have consulted Knockeart and applied its teachings when faced with the problem of facilitating user-friendly communication with the vehicle's information system, by allowing a user to use their own personal device.

VIII. GROUNDS OF UNPATENTABILITY

Proposed Grounds of Unpatentability
Ground 1: Claims 1-4, 6-9, and 11-14 Are Obvious Under § 103 Over Sutardja, Donnelly, and Letendre
Ground 2: Claims 5, 10, and 15 Are Obvious Under § 103 Over Sutardja, Donnelly, Letendre, and Seelig
Ground 3: Claims 16-17 Are Obvious Under § 103 Over Sutardja, Donnelly, Letendre, and Knockeart

IX. OPINIONS REGARDING GROUND 1: OBVIOUSNESS OF CLAIMS 1-4, 6-9, AND 11-14

A. Claim 1 Is Obvious Over Sutardja in Combination with Donnelly and Letendre

1. Claim 1[Pre]: "An electrical charging system, comprising:"

108. Sutardja teaches *an electrical charging system*[2] used "for charging batteries in vehicles." *Sutardja* at [0002]. Sutardja describes vehicles "powered at least partially by electric motors," including "purely electric vehicles" that "rely solely on electric motors and batteries" and "[h]ybrid vehicles" that "include a first

---

[2] Claim terms are italicized.

propulsion source such as an engine or fuel cell and a second propulsion source such as an electric motor." *Id.* at [0004]. As a result of the increased demand for electric vehicles (EVs), "an increasing number of users of vehicles may attempt to simultaneously recharge batteries in vehicles as use of vehicles with rechargeable batteries and electric motors proliferates." *Id.* at [0229]. "If a significant number of these people plug in their vehicles for recharging batteries at the same time, the demand for power may exceed the available supply." *Id.* "Furthermore, the utility may still experience relatively high demand from other users for other purposes until 9 pm or 10 pm and relatively low demand from approximately 11 pm until 6 am." *Id.*

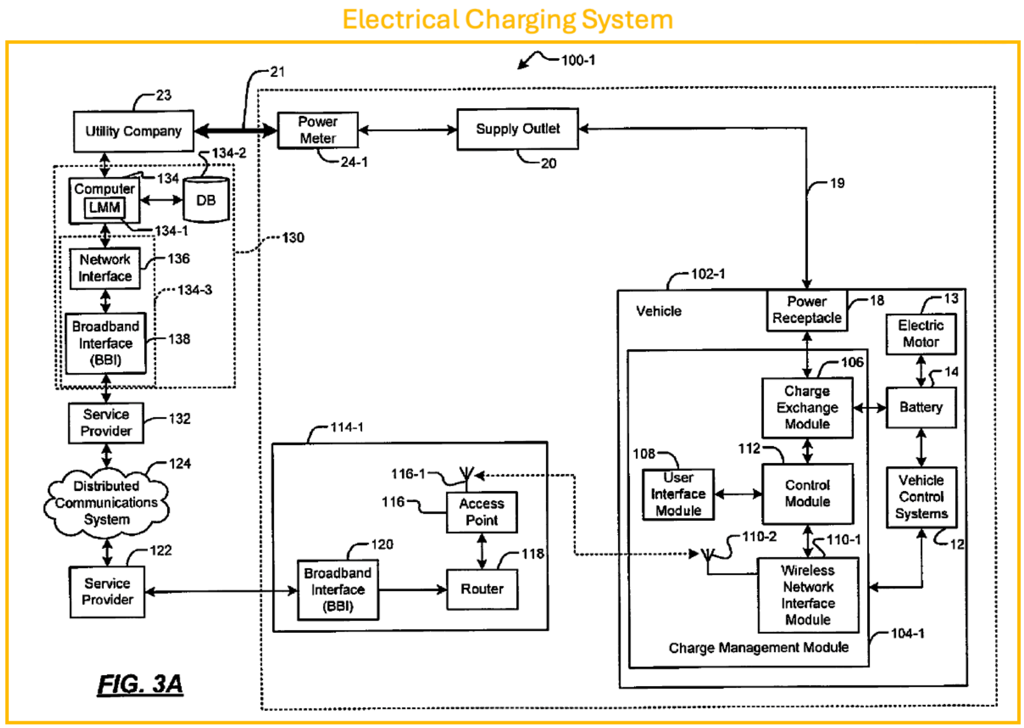
109. To solve this problem, Sutardja proposes *an electrical charging system* that allows a utility company "to coordinate charging of batteries in vehicles at multiple locations." *Id.* at [0231]. The system includes a charge management system (CMS) 100 installed at a home or work location, having an electric vehicle 102 and a charge management module (CMM) 104 that communicates with a utility company 23 via a LAN 130. *Id.* at [0239] ("In FIG. 3A, a CMS 100-1 is shown. A vehicle 102-1 is charged at a location such as a home or work location. The vehicle 102-1 includes the vehicle control systems 12, the electric motor 13, the battery 14, a CMM 104-1, and the power receptacle 18."), [0252] ("Referring now to FIGS. 3A-

4B, the utility company 23 may communicate with the CMM 104 in the vehicle 102 via a LAN 130."), FIGS. 3A-B, 4A-B.

110. The LAN 130 includes "at least one computer 134 with a load management module (LMM) 134-1." *Id.* at [0252]. The CMM 104 communicates the user's charging parameters to the LAN 130, and the LMM 134-1 determines a charging schedule for the user's vehicle based on the user's charging parameters and the load on the power distribution system. *Id.* at [0256] ("The LMM 134-1 may receive the charging parameters transmitted by the CMM 104-5 and/or the user."), [0253] ("The LMM 134-1 may analyze the load on the distribution system based on the requested charging parameters from multiple customers. The LMM 134-1 may determine a schedule for charging batteries in multiple vehicles.").

111. The utility company 23 supplies power via power distribution line 21, which is received at CMS 100 and provided to vehicle 102 via supply outlet 20. *Id.* at [0240] ("The location may include the supply outlet 20 that may receive power from the utility company 23 via the power distribution line 21. . . The vehicle 102-1 may draw power from the supply outlet 20 to charge the battery 14…").

112. For these reasons, Sutardja teaches *an electrical charging system*, including a CMS 100 communicating with a utility company via LAN 130:



Id. at FIG. 3A (annotated); *see also, id.* at FIGS. 3B, 4A-B.

2. *Claim 1[a]: "one or more processing devices; and"*

113. Sutardja's system includes one or more processing devices, at least including "computer 134 with a load management module (LMM)" and control module 112. *Sutardja* at [0252]; *see also, id.* at [0243]-[0244] (describing control module 112).

114. Regarding computer 134, a POSITA would have understood that a computer is a type of *processing device*. *See e.g., Microsoft Computer Dictionary* (Ex. 1094) at 118 (defining "computer" as "Any device capable of processing information to produce a desired result."). I note that this is also consistent with the '788 Patent, which discloses that "[a] 'processor' means any one or

more…computing devices," which would unequivocally include computers. *'788 Patent* at 27:23-27. For these reasons, computer 134 qualifies as a *processing device*.

115. Control module 112 controls the operation of the CMM 104 in vehicle 102. *Sutardja* at [0241] ("The CMM 104-1 includes a charge exchange module 106, a user interface module 108, a wireless network interface module 110-1, and a control module 112."), [0243] ("The control module 112 may communicate with the charge exchange module 106, the user interface module 108, and the wireless network interface module 110-1 and may control the operation of the CMM 104-1."). Sutardja teaches that the term "module…refers to an Application Specific Integrated Circuit (ASIC), an electronic circuit, **a processor (shared, dedicated, or group) and memory that execute one or more software or firmware programs**, a combinational logic circuit, and/or other suitable components that provide the described functionality." *Id.* at [0228]. Sutardja further teaches that the system is implemented using "a computer program executed by one or more processors" where the computer program "reside[s] on a computer readable medium such as but not limited to memory, non-volatile data storage and/or other suitable tangible storage mediums." *Id.* at [0208].

116. Multiple aspects of Sutardja's description of control module 112 confirm to a POSITA that it is implemented via a *processing device*, such as a processor executing software or firmware programs. First, control module 112

handles input/output (I/O) operations with other components, including user interface module 108 and charge exchange module 106. For instance, control module 112 "receive[s] data input by the user for charging the battery 14 … from the user interface module 108" and outputs "data to the user via the user interface module 108." *Id.* at [0241], [0244], [0257]. Likewise, control module 112 also "receive[s] data relating to the amount of charge present in the battery 14 (i.e., a charge level of the battery 14) from the charge exchange module 106" and outputs "charging parameters to the charge exchange module 106." *Id.* at [0244], [0267]. It was well known to skilled artisans that performing I/O operations were (and still are) tasks performed by processing devices, such as computers. *See e.g., Microsoft Computer Dictionary* at 274 (defining "input/output" as "The complementary tasks of gathering data for a computer or a program to work with, and of making the results of the computer's activities available to the user or other computer processes.").

117. Second, Sutardja teaches that control module 112 controls the operation of the CMM. *Sutardja* at [0243] ("The control module 112 . . . may control the operation of the CMM 104-1."). For example, the control module 112 "control[s] the charging of the battery 14 and returning of the charge from the battery 14 based on the charging parameters and/or the alternate charging parameters." *Id*. at [0267]. Specifically, the control module 112 "generate[s] a charge control signal based on the charging parameters based on which the charging module 152 may charge the

battery 14." *Id.* at [0269]. This shows that the control module 112 processes the charging parameters, which are received as input, to generate the charge control signal, which is output to the charging module 152 to charge the EV's battery 14. A POSITA would understand that processing input data to produce an output is the hallmark of a processing device, such as a computer. *See e.g., Microsoft Computer Dictionary* at 423 (defining "processing" as "The manipulation of data within a computer system. Processing is the vital step between receiving data (input) and producing results (output) – the task for which computers are designed.").

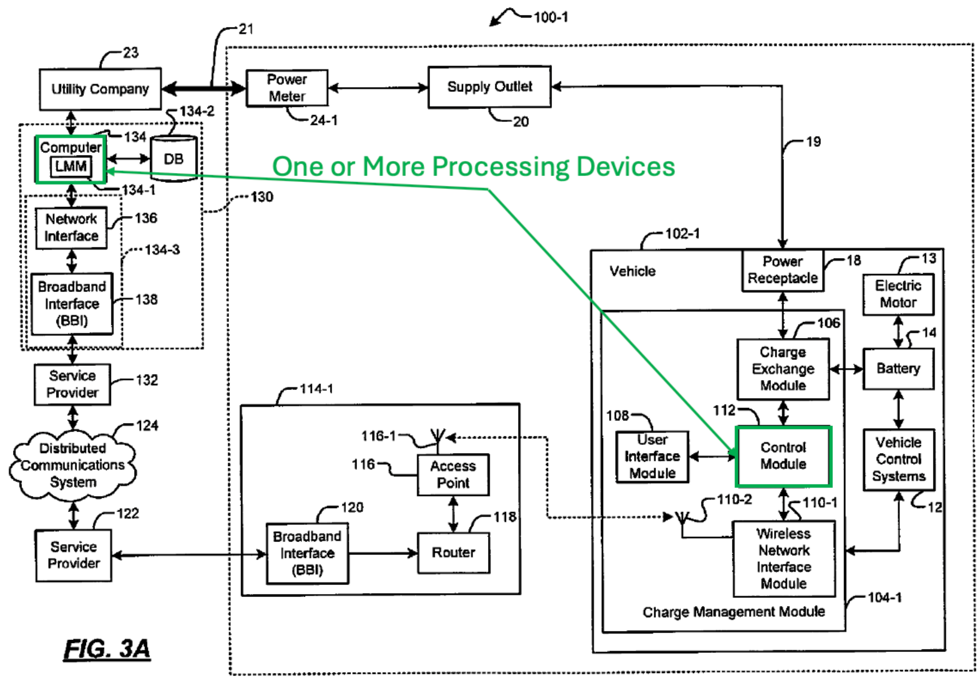
118. Thus, Sutardja's teaching of implementing modules within the system using processors executing computer programs stored in memory (Sutardja at [0208], [0228]) coupled with Sutardja's description of the operation of the control module 112 performing I/O and processing operations confirms that Sutardja's control module 112 is a processing device.

119. Alternatively and to the extent it is determined that Sutardja does not expressly or inherently disclose that control module 112 is a *processing device*, it would have been obvious to a POSITA. Specifically, it would have been obvious to implement control module 112 using "a processor (shared, dedicated, or group) and memory that execute one or more software or firmware programs," as expressly suggested by Sutardja. *Sutardja* at [0228]. Indeed, general-purpose, commercial processing devices that were programmed to perform tasks were known long before

the alleged invention of the ’788 Patent. *See, e.g., Leibson* (Ex. 1095) at 149 (describing the first commercial general-purpose microprocessor chip sold by Intel in 1971). By the late 2000s, utilizing general-purpose processors was “thoroughly engrained in the conventional design methodology.” *Id.* As I discussed above, control module 112 performs I/O operations and processes the charging parameters to generate a charge control signal. *See* ¶¶ 116-117. Because processors are typically programmed to perform these types of operations, it would have been obvious to use a processor and memory that execute one or more software or firmware programs to carry out these functions.

120. Thus, a POSITA would have been motivated to implement control module 112 as a processor and memory that executes software, per Sutardja, thus representing a combination of prior art elements according to known methods to yield predictable results and with a reasonable expectation of success given the ubiquity of processors.

121. For these reasons, Sutardja teaches *one or more processing devices*, including control module 112 and LMM/computer 134:



Sutardja at FIG. 3A (annotated); *see also, id.* at FIGS. 3B, 4A-B.

3. Claim 1[b]: "a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:"

122. I have been informed that *a non-transitory memory device* should be interpreted as a concrete structure, such as RAM or another tangible device/machine, and must not be fleeting like an electrical signal or carrier wave. I have also been informed that "a" should be interpreted as "one or more." For the reasons discussed below, each of Sutardja's one or more processing devices (i.e., computer 134 and control module 112) is *in communication* with *a non-transitory memory device* that stores *instructions* executed by the processing device.

123. As I discussed above, Sutardja teaches at least two processing devices, including computer 134 and control module 112. *See* Claim 1[a]. For the reasons discussed above, Sutardja teaches and/or renders obvious implementing control module 112 as a processor and memory that executes software. *See* Claim 1[a].

124. Computer 134 includes a load management module 134-1. *Sutardja* at [0252] ("The LAN 130 may include at least one computer 134 with a load management module (LMM) 134-1."), FIGS. 3A-B, 4A-B. A POSITA would understand that the LMM 131-1 residing on computer 134 would be implemented via a processor that executes software stored in memory because that is how computers operate. *See e.g., Freedman* at 161-162 (defining "computer" as "A general-purpose machine that processes data according to a set of instructions that are stored internally either temporarily or permanently."). This is also consistent with Sutardja's teaching that the system is "implemented by a computer program executed by one or more processors" where the computer program "reside[s] on a computer readable medium such as but not limited to **memory, non-volatile data storage and/or other suitable tangible storage mediums**." *Id.* at [0208].

125. Sutardja also teaches that "the term module…refers to…a processor (shared, dedicated, or group) and **memory that execute one or more software or firmware programs**…" *Id.* at [0228]. Thus, a POSITA would understand that the Load Management <u>**Module**</u> 134-1 running on computer 134 would be implemented

as a computer program/software residing on a "memory, non-volatile data storage and/or other suitable tangible storage mediums" that is executed by computer 134's processor. Alternatively, it would have been obvious, and a POSITA would have been motivated to implement LMM as a computer program/software residing on a "memory, non-volatile data storage and/or other suitable tangible storage mediums" that is executed by computer 134's processor for the same reasons.

126. Therefore, computer 134 and control module 112 each have an associated *memory device* that stores computer programs/software.

127. A POSITA would have also understood that the computer programs/software executed by computer 134 and control module 112 are *instructions*. Indeed, it was (and still is) well known that software is a computer program, and computer programs comprise sequences of instructions that are executed by a *processing device*, such as a computer. *See e.g., Microsoft Computer Dictionary* at 424 (defining "program" as "A sequence of instructions that can be executed by a computer."), 488 (defining "software" as "Computer programs.")). Thus, Sutardja's computer programs/software qualify as the claimed *instructions*.

128. Additionally, a POSITA would have understood that the processors of computer 134 and control module 112 would necessarily communicate with their respective memories to execute the instructions stored in memory. *See e.g., Microsoft Computer Dictionary* at 200 ("In programming, execution implies loading

the machine code of the program into memory and then performing the instructions."). Communication between processors and memories was routinely performed via a bus, for example. *See e.g., Microsoft Computer Dictionary* at 77 (defining "bus" as "A set of hardware lines (conductors) used for data transfer among the components of a computer system. A bus is essentially a shared highway that connects different parts of the system – including the processor, disk-drive controller, memory, and input/output ports – and enables them to transfer information."). Thus, Sutardja's teaching of the processors executing the computer program residing in the memory device inherently teaches a *memory device in communication with the one or more processing devices* because the processor would not be able to execute the program unless it were in communication with the memory device storing the program. Alternatively, it would have been obvious, and a POSITA would have been motivated to utilize memory devices in communication with each processing device for the same reasons.

129. Regarding the claimed <u>*non-transitory*</u> *memory device*, a POSITA would have understood that each *memory device* storing the computer programs/software (i.e., *instructions*) executed by computer 134 and control module 112 would be a concrete structure that persistently stores the instructions and not a transitory media, such as a carrier wave or electrical signal. Indeed, a POSITA would have understood that a computer program/software implemented as a transitory

signal would not be feasible because it would not be persistently stored and available for execution by the processor. This is also consistent with Sutardja's teaching of utilizing a "non-volatile" or "other suitable tangible" memory device to store the computer program. *Sutardja* at [0208]. Thus, a POSITA would have understood that the *memory device* associated with each of the *processing devices* (i.e., computer 134 and control module 112) would have been *a non-transitory memory device* persistently storing the instructions so that they can be executed by *the one or more processing devices.* Alternatively, it would have been obvious, and a POSITA would have been motivated to implement each memory as a *non-transitory memory device* for the same reasons.

4. Claim 1[b][i]: "receiving information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle"

130. Each of Sutardja's processing devices (i.e., control module 112 and computer 134) executes instructions resulting in receiv[ing] information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle.

131. Control module 112 "receive[s] data input by the user for charging the battery 14 … from the user interface module 108." *Sutardja* at [0244]. Specifically, the control module 112 "**receive[s] charging parameters** input by the user . . ." *Id.* at [0267]. The user interface module 108 includes "a keypad, a display, a

microphone, and/or a speaker (all not shown)," and "[a] user of the vehicle 102-1 may use the user interface module 108 to set charging parameters for charging the battery 14 . . ." *Id.* at [0243].

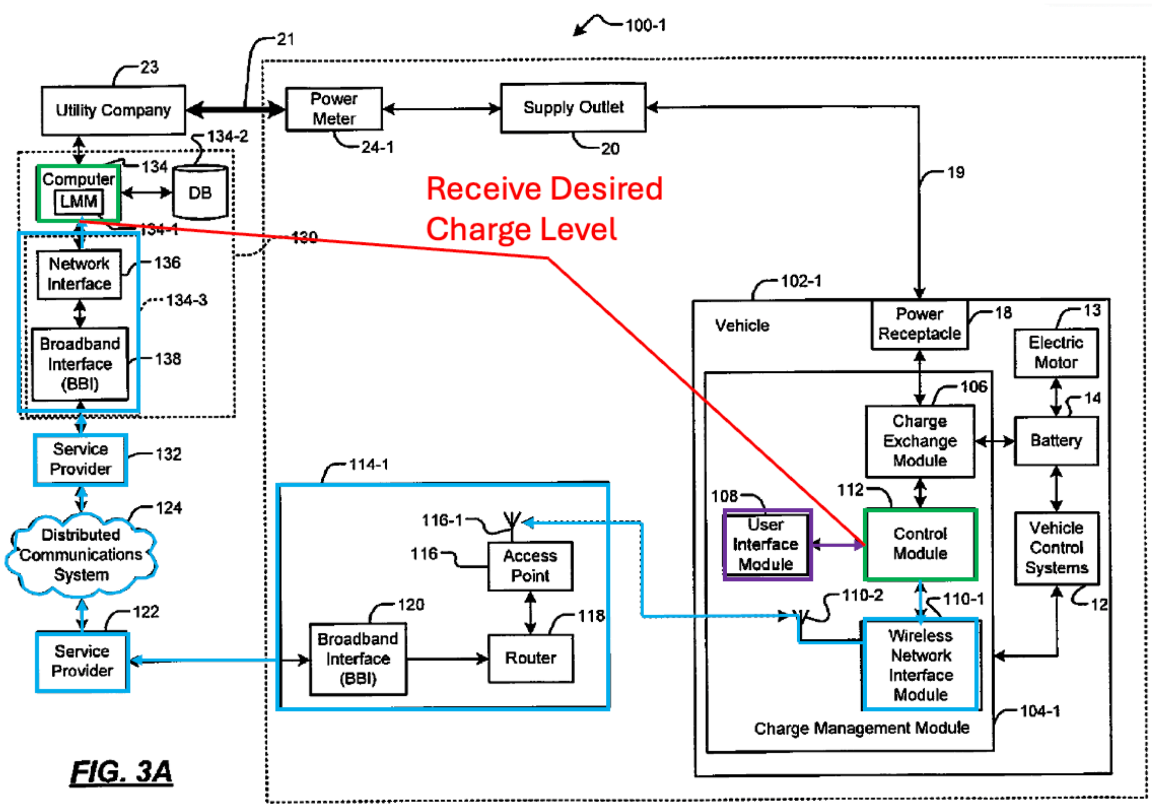
132. The user's charging parameters include *a desired charge level of a battery of an electric vehicle* (e.g., full charge) and a requested charge completion time. *Id.* at [0051] ("In another feature, the computer program further comprises monitoring a charge level of the battery and including **the charge level in the first set of charging parameters**."), [0119] ("[O]ne or more of the N first sets of **charging parameters include charge levels** and requested charge completion times for the batteries of corresponding ones of the N vehicles."), [0270] ("The charge monitoring module 150 may inform the control module 112 when the battery 14 is charged to **a predetermined level (e.g., full charge) that may be indicated in the charging parameters**."). For example, the user may enter parameters requesting "**a full charge** daily between 9 pm and 6 am." *Id.* at [0262]. Thus, control module 112 executes instructions resulting in *receiv[ing] information indicative of a desired charge level of a battery of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle* via vehicle 102's user interface module 108. *Id.* at FIGS. 3A, 4A (depicting user interface module 108 in vehicle 102).

133. After the control module 112 receives the user's charging parameter data, "[t]he CMM 104-1 may transmit the data received by the control module 112

to the utility company 23 via the wireless network interface module 110-1." *Id.* at [0244]. "The utility company 23 may receive the charging parameters generated by the user and may respond to requests for charging the battery 14." *Id.* at [0251]. As discussed, the utility company's LAN includes computer 134, which includes LMM 134-1. *Id.* at [0256] ("The computer 134 located at the utility company 23 may comprise the LMM 134-1."), FIG. 3A. "The **LMM 134-1 may receive the charging parameters** transmitted by the CMM 104-5 and/or the user." *Id.*; *see also, id.* at [0253] ("The communication module 134-3 may receive charging parameters from CMMs and/or users of multiple vehicles. The LMM 134-1 may analyze the load on the distribution system based on the requested charging parameters from multiple customers."). Because the LMM 134-1 is implemented on computer 134, computer 134 receives the charging parameters, which include the user's desired charge level. Thus, computer 134 is also programmed to *receiv[e] information indicative of a desired charge level of a battery* (i.e., a predetermined level) *of an electric vehicle wherein the desired charge level is defined by a user of the electric vehicle.*

134. Therefore, it is my opinion that Sutardja discloses limitation 1[b][i] in two ways. First, this limitation is met by control module 112 (denoted in green below), receiving the user's charging parameters from the user interface module 108 (denoted in purple below). Second, this limitation is also met by computer 134

(denoted in green below), receiving the user's charging parameters from the CMM 104 via the communications network (denoted in blue below).



Id. at FIG. 3A (annotated); *see also, id.* at FIG. 4A.

5. *Claim 1[b][ii]: "via a Graphical User Interface (GUI) forming a part of the electric vehicle and"*

135. As I discussed above, Sutardja's user interface module 108 in vehicle 102 includes "a keypad, a display, a microphone, and/or a speaker," which the user uses to enter the charging parameters, including a desired charge level, such as full charge. *Sutardja* at [0243]; *see also,* Claim 1[b][i]. Sutardja does not provide specific details regarding what the display looks like when the user enters the charging

parameters. However, Donnelly teaches a hybrid vehicle with a GUI displayed on a touchscreen that receives the user's commands. Thus, the combination of Sutardja and Donnelly renders obvious receiving the desired charge level *via a Graphical User Interface (GUI) forming a part of the electric vehicle* as described below.

a) Donnelly's Teachings

136. Donnelly discloses a "GUI" providing a "user interface" in a "locomotive" that is implemented via various "display screens" on a display and configured to receive touchscreen commands. *Donnelly* at 21:47-58. Donnelly's invention is for "monitoring, controlling, and optimizing an electrically powered locomotive[.]" *Id.* at 5:56-8. However, Donnelly also notes the inventive features, such as the GUI provided on the touchscreen, may be applied to "vehicle[s] other than locomotives, such as cars" or "trucks." *Id.* at 26:6-8, 1:36-38 (acknowledging "us[ing] energy storage batteries" in hybrid vehicles, such as "automobiles, buses," and other vehicles was known). Because Donnelly envisions (1) the features of the invention, such as the GUI touchscreen, being applied to vehicles and (2) being used in electrically powered vehicles, a POSITA would have understood or found it obvious that using Donnelly's GUI in an electric car or truck would convey similar information. The '788 Patent lists an electric "train" (i.e., locomotive) as an exemplary electric vehicle. *'788 Patent* at 3:36-40. Additionally, Donnelly's GUI touchscreen provides various parameters that would apply to an electric car, such as

the "state of" the "battery pack[.]" *Donnelly* at 21:55-58. Thus, a POSITA would have understood or found it obvious that Donnelly's GUI touchscreen would be implemented in an electric vehicle, such as a car, and would provide similar information to "monitor and control" the state of various components of the vehicle (e.g., battery).

137. Specifically, Donnelly teaches:

> [T]he **control system for the various components of the locomotive requires a Graphical User Interface display ("GUI") to provide a user interface** for viewing the various monitored parameters and the operational states of the various components and **providing operational commands** to the various components. This GUI is preferably implemented using a series of related display screens which are configured to **receive touch screen commands**. This system of screens allows the operator and maintenance crew to monitor and control, for example, the **state of the charging generator, the battery pack**, the individual drive axles and other functions.

Id. at 21:47-58.

138. Because Donnelly teaches "commands" being received from the user via "touch screen" displays of the "GUI," Donnelly teaches user input is received *via a Graphical User Interface (GUI)*, namely, Donnelly's GUI displayed on the touchscreen.

b) Motivation to Combine

139. Based on the teachings of Donnelly, it would have been obvious, and a POSITA would have been motivated to implement Sutardja's user interface module 108 in vehicle 102 with a GUI displayed on a touchscreen for receiving information input by the user, including the charging parameters. Specifically, it would have been obvious to implement Sutardja's user interface module 108 as Donnelly's touchscreen displaying a GU such that the modified user interface module displaying a GUI *form[s] a part of the electric vehicle*.

140. As I noted in my Overview of the Technology section above, graphical user interfaces were common and "standard paradigm for human computer interaction[,]" existing since the 1970s. *See* ¶ 68 (*citing Ishii*). Indeed, GUIs were known to be beneficial in facilitating user input because GUIs "make[] an application easy, practical, and efficient to use[.]" *See* ¶ 68 (*citing Jansen*). Further, implementing GUIs "allow[s] the user to concentrate on the task at hand." *Id.* Thus, given the use of GUIs was "widespread" and GUIs were known to be favorable input mechanisms, a POSITA would have found it advantageous to allow users to enter Sutardja's charging parameters via a GUI displayed on a touchscreen. Furthermore, a POSITA would have understood that setting charging parameters in a vehicle would have been easier and/or more appropriate using a touchscreen as compared to

other input options, such as a keyboard and mouse, which were not desirable for use as input devices for vehicles at the time of the '788 Patent. *See e.g., Pryor* at 2:2-5.

141. A POSITA would have been motivated to combine the prior art elements of Sutardja's user interface module 108 that allows the user to enter charging parameters with Donnelly's known method of using a GUI displayed on a touchscreen to receive user inputs to yield the predictable result of allowing the user to efficiently enter their desired charging parameters in a familiar and user-friendly manner. *See e.g., Sherrick* (Ex. 1060) at Abstract (a "Graphical User Interface (GUI) is a powerful tool that is used for simplifying a computing environment"), 2 (describing GUIs as providing "easier access to computing resources" for an end-user). As discussed above, GUIs were "widespread" and known to "make" using an application "easy, practical, and efficient." *See* ¶ 140. Thus, a POSITA would have appreciated that implementing Sutardja's user interface module 108 with a touchscreen displaying a GUI would simplify the input of charging parameters by making the inputting more efficient. *See also* ¶¶ 143-144 (discussing various motivations for using a touchscreen for presenting the GUI). Given the "widespread" use of GUIs and familiarity of users entering information via GUIs, there would have been a reasonable expectation of success when modifying Sutardja's user interface module 108 to include a touchscreen displaying a GUI for receiving charging parameters input by the user.

142. As of the priority date of the ’788 Patent, it was well-known to utilize touchscreen displays in vehicles. *See, e.g., Obradovich* at 3:55-58 (generally describing a touchscreen used in an “automobile” so the user can “select” and view various information), FIGs. 15A-15B (showing various screens on touch display which a user may interact with), 2:52-55 (describing “touch screen techniques” were “frequently mentioned” for “controlling” certain accessories in cars); *Opel* (Ex. 1061) at 2:12-17 (describing a “touch screen” as part of a “personal computer within an automobile” were known); *Jurnecka* (Ex. 1062) at 3 (describing various “Volkswagen” models already offering a “touch-screen unit” as of late 2007); *see also*, Section VI.C.

143. A POSITA would have appreciated using a touchscreen display for entering the charging parameters in a vehicle would be advantageous because “users are overwhelmed and confused with [a] large number of knobs, switches, and buttons used to control the individual vehicle parts and accessories.” *Obradovich* at 3:21-24; *Pryor* at 2:55-61 (describing the “automotive dashboard” having various switches, knobs, dials, gages, being “confus[ing] and “hard…to understand”). Furthermore, touchscreens were known to be a “useful interface” because they are “highly programmable,” unlike physical buttons. *See e.g., Colgate* (Ex. 1065) at [0154]; *Pryor* at 1:61-64 (describing dashboards with physical buttons, knobs, dials, etc. as being “inflexible, and invariant once manufactured,” and thus “cannot be

changed in its design by the user and cannot be easily changed by the manufacturer or the dealer"). A POSITA would have appreciated the programmability of touchscreens would make the interface and various selections on the GUI best suit the function being controlled or displayed, and this would also have substantially increased the flexibility in the configuration or addition of new controlled functions without the cost and design effort required to design new physical buttons, knobs, dials, etc. to the vehicle interior.

144. Additionally, touchscreens displaying GUIs in vehicles were known to provide both input of commands and output of information via a single hardware component (i.e., touchscreen displaying a GUI). *See, e.g., Obradovich* at 5:37-42 (describing the display interface 102a as being a "conventional" LCD that incorporates "well-known touch-screen circuitry"), 6:20-23 (describing the interfaces 102a providing the user with "**graphic display and control** of selected functions using-well-known touch screen technology"); *2008 Tesla Roadster Manual* at 2-4 to 2-5 (showing a single "touch screen" on the "Dashboard" of the vehicle interior). The "user is afforded a centralized control" when using a single touchscreen display implementing a GUI where they can "obtain information on and control selectable functions" of the vehicle. *Obradovich* at 3:27-28, 5:15-19, 5:49-57. Thus, a POSITA would have appreciated a user being able to focus on a single "centralized" component for both inputting and outputting information (i.e.,

input/output GUI on a touchscreen display) and thus would have been motivated to implement Sutardja's user interface module 108 as a touchscreen displaying a GUI. A POSITA would have also appreciated a single touchscreen display being used over various input/output components to decrease the cost of vehicle manufacturing. *See e.g., Pryor* at 2:59-62 (describing the dashboard having various knobs, buttons, etc. being "expensive to manufacture both in serial quantity, and in redesign and tooling for new models"). Thus, for the reasons discussed, a POSITA would have been motivated to implement Sutardja's user interface module 108 using Donnelly's touchscreen displaying a GUI. The implementation would have represented the use of a known device (touchscreen displaying a GUI) to improve similar user interfaces in EVs in a similar way (avoid using a separate input device, such as a keypad, for inputting information).

145. A POSITA modifying Sutardja's user interface module 108 would have had a reasonable expectation of success, given that touchscreens were commonly applied in vehicles and were well-known. *See* ¶ 142. Further, because touchscreens displaying GUIs were known to be used to control various parts of a vehicle, a POSITA would have had the expertise to program the GUI touchscreen for receiving Sutardja's inputs, including the charging parameters. *See, generally, Obradovich; Pryor* at 5:13-20 (describing "touch screens" being placed in a "dashboard" of a Buick Riviera as early as 1988). For example, a POSITA would simply implement

Sutardja's user interface module 108 using a touchscreen displaying a GUI by, e.g., including known touchscreen circuitry and programming control module 112 to present a GUI and interpret the user's touchscreen inputs. *See, e.g., Obradovich* at 5:37-45. A POSITA would have understood in implementing Sutardja's user interface module 108 with Donnelly's touchscreen, the touchscreen would "implement[]" "a Graphical User Interface display." *Donnelly* at 21:48-55 (describing the "**Graphical User Interface display**" being "**implemented** using" display screens that "are configured to receive **touch screen** commands").

6. Claim 1[b][iii]: "adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;"

146. For the reasons explained below, the Sutardja-Donnelly touchscreen displaying a GUI combined with Letendre renders obvious Claim 1[b][iii]. In particular, Donnelly teaches a GUI displayed on a touchscreen that includes an *output GUI element ... comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle*. Based on the teachings of Donnelly, it would have been obvious to a POSITA to modify the Sutardja-

Donnelly GUI to display an output GUI element, including the amount of charge residing in the EV's battery and the uncharged capacity of the EV's battery.

147. Additionally, Letendre teaches an EV GUI that displays an *input GUI element ... comprising a third portion comprising a slider by which an amount of charge may be specified*. Based on the teachings of Letendre, it would have been obvious to a POSITA to further modify the Sutardja-Donnelly GUI to include a slider for inputting the desired charge. Thus, the combination of Sutardja-Donnelly-Letendre renders obvious a touchscreen displaying GUI *adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising* the *first*, *second*, and *third* portions.

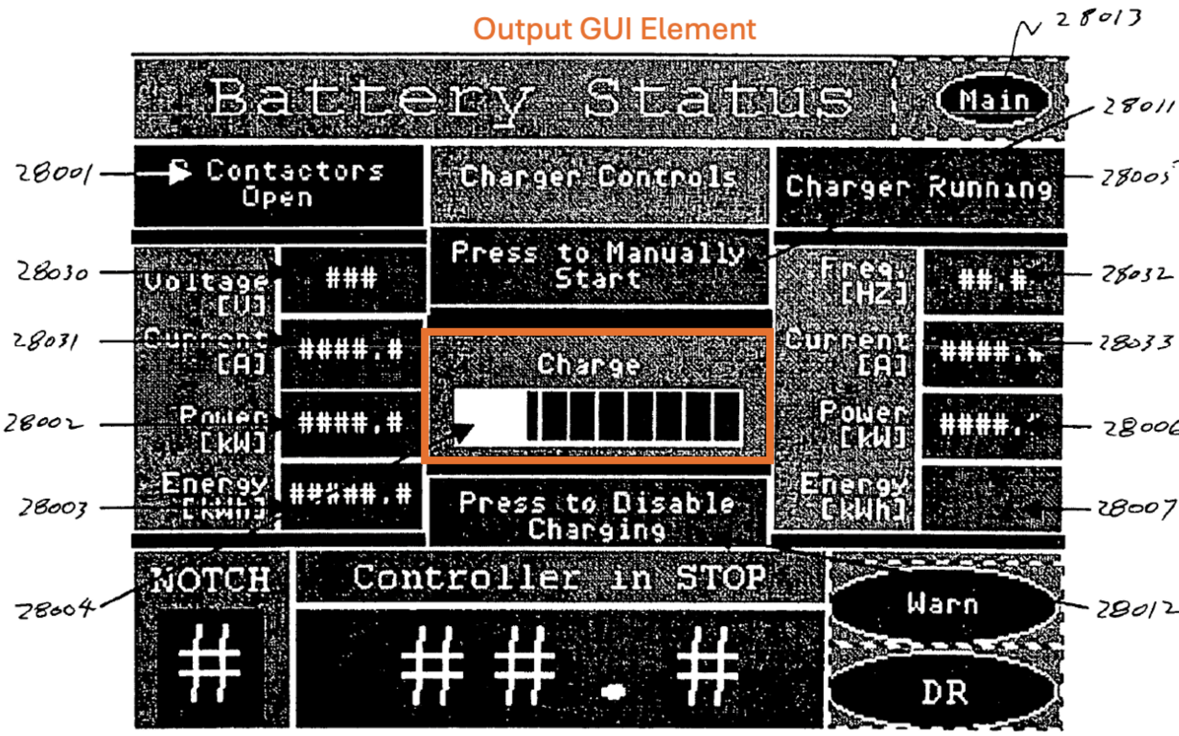
a) Output GUI Element Comprising First and Second Portions

(1) <u>Donnelly's Teachings</u>

148. As shown below, Donnelly's touchscreen GUI displays an *output GUI element . . . the GUI elements comprising (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle*.

149. Regarding the claimed *output GUI element*, Donnelly discloses the GUI displaying a bar graph 28004 depicting the state of charge of the battery. *Donnelly* at 21:47-58 (disclosing a GUI receiving touch screen commands and displaying "state of the charging generator, the battery pack"), 23:16-20, 23:31-33, FIG. 28.

Donnelly's GUI displays a "Battery Status Screen" that "displays details about the electrical state of the energy storage unit (e.g., battery)" and includes a "**Battery State of Charge 28004**, which depicts, in a bar graph format, the state of charge of the energy storage unit by measuring the amp-hours in and the amp-hours out." *Id.* at 23:16-33. Because the Battery State of Charge bar graph 28004 outputs "the state of charge of the energy storage unit," it qualifies as the claimed *output GUI element*:

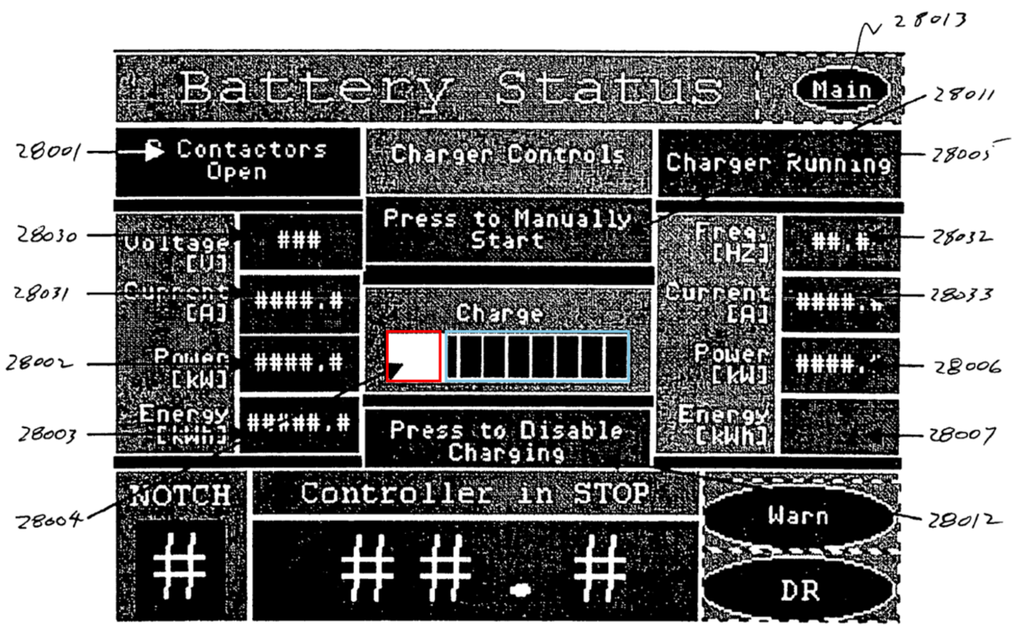


Id. at FIG. 28 (annotated).

150. As discussed above, Donnelly expressly discloses the "energy storage unit" is a battery. Furthermore, the header for FIG. 28 is "**Battery Status**[.]"

Donnelly at 23:16-19. Thus, field 28004 on the "Battery Status" GUI screen indicates the state of charge for a *battery*.

151. Donnelly's field 28004 displaying a bar graph indicating the amount of charge also *compris[es] (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; and (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle*. As shown below in annotated FIG. 28, the bar graph field 28004 illustrates two separate portions: (1) the filled-in portion comprising dark-colored rectangles (outlined blue below); and (2) the unfilled portion comprising the white space (outlined red below):



Donnelly at FIG. 28 (annotated).

152. A POSITA would have understood and/or found it obvious that one of the portions indicates *an amount of charge residing in a battery of the electric*

vehicle, and the other portion indicates *an uncharged capacity of the battery of the electric vehicle*, and the combined first and second portions representing the entire battery capacity. For example, the white portion and dark portions in Donnelly's bar graph are much like the white portions and dark portions in the exemplary "vehicle charge indicator" of the '788 Patent. *See '788 Patent* at Fig. 7.

153. Additionally, because bar graph 28004 denotes the state of charge, a POSITA would have understood one portion (e.g., dark portion) shows the current charge level (*amount of charge residing in the battery*), and the other portion (e.g., white portion) shows the uncharged amount (*uncharged capacity*). The state of charge of a battery was a commonly used term, expressing "the present battery capacity as a percentage of maximum capacity." *Electric Vehicle Team* (Ex. 1066) at 1. Thus, because the bar graph shows the percentage of current charge (dark portion) in relation to the total charge capacity (the entire bar), a POSITA would have understood the other portion within the graph (white portion) shows the uncharged percentage.

154. It was well-known to visually depict a variable level of a fillable object (e.g., the fuel level in the gas tank, the charge level of a vehicle battery) through portions of a bar graph that show filled-in vs. not filled-in. *See, e.g., 2000 Honda Insight Manual* at 49-50 (showing a "fuel gauge" as fillable sections on a bar graph and a "battery level indicator" having fillable sections on a bar graph); *Maguire* (Ex.

1071) at FIG. 6B, [0027]-[0028] (generally describing a bar graph showing an unfilled and filled portion showing the "state of EM battery charge"). Indeed, EVs commonly used a bar graph to denote battery charge levels. *See* Section VI.C.1 (*citing 2006 Honda Civic, 2000 Honda Insight, 2008 Tesla Roadster manuals* showing bar graphics for battery charge). Thus, a POSITA would have understood and/or found obvious Donnelly's dark portion and white portion of the bar graph depict an *amount of charge residing in the battery* and *an uncharged capacity*, respectively.

155. I also note Claim 1[b][iii] does not recite any visual characteristics of the *first* and *second* portions other than the information being indicated within the *unitary vehicle charge indicator*. Thus, for the reasons above, a POSITA would have found obvious that one portion of the Donnelly bar graph (dark portion) represents the charged amount of the battery (i.e., *first portion indicative of an amount of charge residing in a battery of the electric vehicle*), whereas the other portion (white portion) represents the uncharged capacity of the battery (i.e., *second portion indicative of an uncharged capacity of the battery of the electric vehicle*).

(2) <u>Motivation to Combine</u>

156. As described above, it would have been obvious, and a POSITA would have been motivated to modify Sutardja to include Donnelly's touchscreen displaying a GUI, for all of the reasons I have provided above. *See* Claim 1[b][ii].

Because Donnelly's display includes a charge indicator as described above (*see* ¶¶ 149-154) this modification would have also provided an *output GUI element comprising (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle*. In particular, Donnelly's Battery State of Charge bar graph as an output GUI element so that the user knows the current level of charge of the EV's battery (the claimed *first portion*) and the battery's uncharged capacity (the claimed *second portion*).

157. This application of Donnelly's charge display to the system of Sutardja would have also been well within the skill of a POSITA. Sutardja teaches that CMM 104 includes a charge exchange module 106 that "may monitor the amount of charge in the battery 14, may communicate data regarding the amount of charge in the battery 14 to the control module 112…" *Sutardja* at [0242]. As discussed immediately above, Donnelly teaches displaying the state of charge, including the charged amount and uncharged portions using a bar graph on the GUI. Because Sutardja's control module 112 already receives "data regarding the amount of charge in the battery 14," a POSITA would have been motivated to modify Sutardja's control module 112 to display the state of charge of the batteries in a bar graph showing the charged and uncharged portion on the GUI, as taught by Donnelly, to help the user understand how much charge is currently in the batteries, and how

much charge may be added to the battery, and the POSITA would have had a reasonable expectation of success in doing so. Moreover, a POSITA would have been motivated to look to the teachings of Donnelly's output GUI because it would have advantageously communicated to the user information already within Sutardja's control module (i.e., data regarding the amount of charge in the battery 14) and users would have found it beneficial to be able to more easily and conveniently see the information in the bar graph form taught by Donnelly (rather than for example mere words or digits on a screen that would have been more dangerous to read while driving).

158. A POSITA would have also been motivated to visually show a vehicle operator the current charge level prior to choosing the desired charge level parameter. For example, a POSITA would have appreciated being presented with the charge level information (both current charge and uncharged capacity) prior to choosing charging parameters so they do not inadvertently select more charge than the battery can hold and predict what the transaction cost would be. Seeing a high uncharged capacity and low current charge would allow the vehicle operator to prepare for a more costly transaction and more lengthy transaction when compared to a low uncharged capacity. Furthermore, the vehicle operator could use the visual charge level information to better tailor their charge level parameter, such as "full" charge, to something they know they can afford and/or have time to complete.

159. Additionally, a POSITA would have been motivated to display the state of charge of the vehicle battery via an output GUI element so the vehicle operator could better prepare for future charging of the vehicle. For example, the touchscreen displaying the GUI with Donnelly's bar graph would allow the vehicle user to track the battery charge level and thus better prepare for when the battery will need charging. A POSITA would appreciate visualizing the battery state of charge of the vehicle to better gauge when they need to charge the vehicle.

160. Such a modification would have simply required combining prior art elements (i.e., a GUI displaying a bar graph depicting the EV battery's state of charge/uncharged in visually distinct portions of the bar graph, per Donnelly) according to known methods to yield predictable results of allowing the user to view the charge level prior to charging the vehicle.

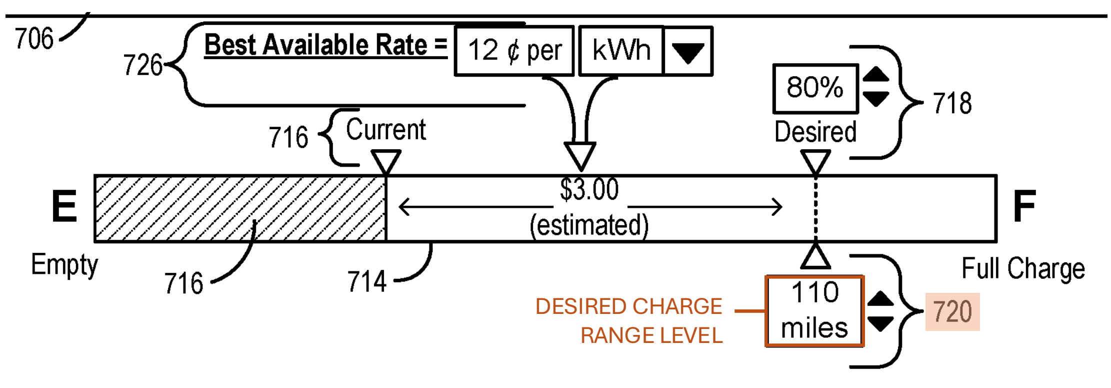
161. A POSITA making this modification would have also had a reasonable expectation of success, given the modified Sutardja already includes a touchscreen display presenting a GUI, per Donnelly. *See* Claim 1[b][ii]. Sutardja's user interface module 108 communicates with control module 112 (*Sutardja* at [0243], FIG. 3A), and control module 112 receives information about the current level of battery charge ([242]). Thus, all that is required in the modification is (1) including programming in the memory that control module 112 executes to generate a bar graph showing the uncharged and charged amount of the battery using the charge

information received from the CMM 104 and (2) programming the control module 112 to display the bar graph as part of the GUI on the touchscreen display. These modifications would not have been challenging, given touchscreens were known to be programmable (*see e.g., Colgate* at [0154]), and Sutardja's control module 112 already receives information about the current level of battery.

b) Input GUI Element Comprising a Slider for Specifying an Amount of Charge

(1) <u>'788 Patent's Description of a Slider</u>

162. As a preliminary matter, the '788 Patent describes that "a desired charging level" may be "based on a desired distance of travel."



'788 Patent at FIG. 7 (excerpt) (illustrating RN 720, desired charge level for a set range of 110 miles). Per the '788 Patent, "the user may indicate a desired charging level…based on a desired distance of travel." *Id.* at 19:59-67. The set distance may be "utilized to express the desired charge level in terms of distance[.]" *Id.* at 15:8-18 (describing setting the "desired charge range level 720 to match the desired

distance" and that distance being utilized "to express the desired charge level in terms of distance").

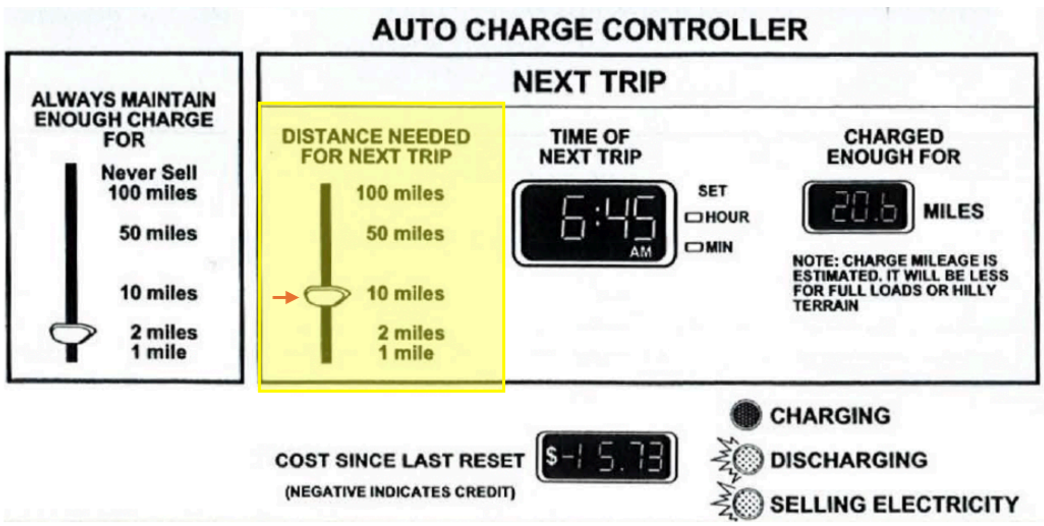
(2) Sutardja's Teachings

163. Sutardja teaches that *an amount of charge may be specified*. Specifically, Sutardja teaches that "[a] user of the vehicle 102-1 may use the user interface module 108 to set charging parameters for charging the battery 14..." *Sutardja* at [0243]. The user's charging parameters include a desired charge level (e.g., full charge) and a requested charge completion time. *Id.* at [0051] ("In another feature, the computer program further comprises monitoring a charge level of the battery and including the charge level in the first set of charging parameters."), [0119] ("[O]ne or more of the N first sets of charging parameters include charge levels and requested charge completion times for the batteries of corresponding ones of the N vehicles."), [0270] ("The charge monitoring module 150 may inform the control module 112 when the battery 14 is charged to a predetermined level (e.g., full charge) that may be indicated in the charging parameters."). For example, the user may enter parameters requesting "a full charge daily between 9 pm and 6 am." *Id.* at [0262].

(3) Letendre's Teachings

164. Letendre teaches an *input GUI element* comprising *a slider by which an amount of charge may be specified*. Namely, Letendre discloses an "auto charge

controller" GUI on a "control panel" that includes a slider the driver selects to "set[] the length of the expected next trip" (e.g., 10 miles, being the specified amount of charge):



Letendre at Figure 1 (annotated), 18 (illustrating an "auto charge controller" design for a "vehicle dashboard").

165. Letendre discloses the "driver sets" the controller "[a]ccording to driving needs." *Letendre* at 19 (disclosing auto charge controller of FIG. 1 is the "example control panel" a user may use to set charging according to driving needs). In other words, the user inputs the length of the next trip to determine the amount of charge required for the battery.

166. Letendre cites Kempton 1997 when describing the exemplary control panel of FIG. 1, as the Figure was pulled from Kempton 1997. *Letendre* at 19 (disclosing the Figure "Following Kempton and Letendre (1997)"). Kempton describes the same auto charge controller as an "intelligent charge-discharge

control." *Kempton* (Ex. 1073) at 162. Kempton discloses the "slider at left allows the operator to specify, for example, "never discharge below 2 miles." *Id.* A POSITA would have understood that because the slider on the right in FIG. 1 of Letendre looks visually the same as the one on the left, that the "distance needed for next trip" also contains a slider. Furthermore, though the slider on the right is not directly discussed, Kempton does disclose the slider performing the same function, i.e., allowing a user to "specify" the distance to charge to, given their "next trip." *Kempton* at 162. Thus, given the above, a POSITA would understand the "distance needed for next trip" control (i.e., righthand control) to be a slider.

167. Letendre teaches the control panel of FIG. 1 (including the "distance to next trip" slider) may be the "same," regardless of whether the control panel is "physical, on the dash, or on a **Web page**." *Letendre* at 19-20 (emphasis added).

168. Further, because Letendre's slider is a control element selectable by a user and is in the control panel that can be implemented on a web page, a POSITA would have understood or found obvious the slider is a visually selectable graphical input element on a GUI (i.e., *input GUI element*). Webpages were known to display graphical elements a user may click on. *See, e.g., Webster's New World Telecom Dictionary* (Ex. 1074) at 228 (defining a "web page" as containing "hypertext and navigation **buttons that allows the user to navigate the side by clicking them**"). Thus, Letendre's user-selectable slider on the web page is a *GUI input element* that

allows a user to enter charging information, e.g., the "distance needed for next trip" (i.e., a slider on a GUI by which an amount of charge may be specified).

169. Much like the '788 Patent described above, Letendre discloses a slider that is changeable (i.e., movable) by the user to set a desired charge range level (i.e., desired distance to charge the battery to – Letendre's "distance for next trip"). Thus, Letendre's slider is a selectable control implemented on a GUI to indicate a desired level of charge (an *amount of charge* based on the distance needed for travel), like the slider described in the '788 Patent.

(4) Sutardja-Donnelly-Letendre Teach Claim 1[b][iii], Including a "Unitary" Indicator

170. As I discussed in Section III.C.1, I have been instructed to construe the claimed *unitary vehicle charge indicator* as at least including a bar graph comprising the charged, uncharged, and slider portions. *See* Section III.C.1. A POSITA would have understood that Sutardja, modified with Donnelly's bar graph on a GUI, further modified to include Letendre's slider, yields a *unitary vehicle charge indicator*. This is at least because a POSITA would have understood that modifying the Donnelly unitary bar graph display to further display Letendre's slider such that a user inputs a desired charge level parameter by moving the slider along the bar graph would yield *a unitary vehicle charge indicator*. The slider would be displayed

simultaneously with the charged and uncharged portions of the battery, enabling the user to select the desired charge with a single touchscreen input.

(5) Motivation to Combine

171. A POSITA would been motivated and found it obvious to include Letendre's graphical slider on the charge level bar graph of the Sutardja-Donnelly GUI, such that the operator moves the slider to specify a desired charge level. As discussed above, in the Sutardja-Donnelly system, Sutardja's user input module 108 is implemented using Donnelly's touchscreen displaying a GUI. *See* Claim 1[b][ii]. The GUI on the touchscreen is further modified to display Donnelly's bar graph depicting the state of charge. *See* Section IX.A.6.a). A POSITA would have understood that input GUI elements would be required to allow the user to input Sutardja's charging parameters, including the desired charge level. To meet this need, the bar graph of the GUI is further modified to display a selectable slider to select Sutardja's desired level of charge or Letendre's desired miles of travel the car should be charged to provide (both serving as *an amount of charge*).

172. Letendre expressly teaches, suggests, and motivates the combination. Letendre applies the charge controller such that a vehicle may both recharge and discharge to the grid. *Letendre* at 19 (describing the controller being used to "limit the degree of battery discharge…in accordance with the **vehicle owners settings**") (emphasis added), 24 (describing Letendre's "model" being used to "charg[e] their

batteries" and "selling power [from the batteries] to the grid"). Similarly, Sutardja discloses both the charging of the EV battery and the returning charge from the battery to the utility company. *See e.g., Sutardja* at [0267] ("The control module 112 in the CMM 104 may control the charging of the battery 14 and returning of the charge from the battery 14 based on the charging parameters and/or the alternate charging parameters."). Letendre states the control panel (including the amount of charge slider) is beneficial because it allows the driver "to limit any draw down so travel is not affected." *Letendre* at 19. Sutardja teaches both charging and discharging the vehicle battery and using the user interface module 108 onboard vehicle 102 to manage charging parameters. *Sutardja* at [0102] ("In another feature, the computer program further comprises returning the charge to the utility company when the charge return request is consistent with the charge return parameters."), [0273] ("Based on the charging parameters, the charge monitoring module 150 may inform the control module 112 when the battery 14 has returned a predetermined amount of charge and/or when the charge remaining in the battery 14 is at or below the safe level indicated in the charging parameters."); *see also,* Claim 1[b][i] (discussing user entry of charging parameters via user interface module 108). Thus, a POSITA would have been motivated to include an onboard GUI with a movable slider by which the user may indicate a desired charge level, as such is "essential…so travel is not affected." *Letendre* at 19.

173. Additionally, a POSITA would have found it obvious and been motivated to combine Donnelly's bar graph and Letendre's slider into Sutardja's system to yield a *unitary* vehicle charge indicator. Specifically, a POSITA would have been motivated to combine Letendre's slider with the GUI in the Sutardja-Donnelly system to allow the user to input the charge level parameter on the same interface that shows the current charge and uncharged capacity (via the bar graph) of the battery. The slider would have the same graphical layout as the display, and thus, the user would find it easier to relate the specified amount of charge to the current charge, as compared to, for example, seeing the current charge on the bar graph display and then setting the desired charge level using a keypad or other numerical entry method. Here, the slider relates directly to the display, so the interrelationship is clear and obvious to the user. Thus, a POSITA would have been motivated to display the charged/uncharged information bar graph with a slider as an efficient use of the display screen's space and convenient display of information due to the GUI portions placed near each other.

174. A POSITA would have specifically recognized that an efficient use of space and the clearest exposition of information would have been achieved if the slider was overlaid or superimposed upon the bar graph for the user to make the selection. Such unitary vehicle charge indicators with slider elements were well-known before the '788 Patent. For example, Cramer taught a vehicle interface with

a slider element on a bar graph that was used to select a user-settable variable, such as driving mode and fuel. *Cramer* at [0403], FIG. D22. A POSITA would have recognized that, for Letendre's slider to be useful on Donnelly's bar graph, the slider would be overlaid or superimposed with the bar graph to select the desired charge level, such that the combination of the bar graph and the slider is *unitary*; otherwise, the slider would not function as taught by Letendre, i.e., to set a desired charge/mileage level. A POSITA would have recognized that stacking the slider on top of the charged and uncharged portions of the battery would have enabled the user to determine very easily and accurately the difference between the current amount of charge, the desired amount of charge, and the maximum charge capacity of the battery – all valuable information for the user when configuring the system to charge the vehicle.

175. A POSITA would have recognized the benefits of including *a unitary vehicle indicator* on the GUI to select a desired charge level as opposed to having disparate GUI elements. First, this would have been beneficial because all the information is available in a single place on the GUI such that the vehicle user does not have to scan their eyes over the entire GUI to obtain the charge information. *See, e.g., Obradovich* at 3:21-53 (describing the need for a centralized, intuitive display of information in a vehicle information system). Second, combining the portions into *a unitary vehicle indicator* would have saved space on the GUI such that additional

information and input elements, such as the user's desired charge completion time, would also be presented to the driver. A POSITA would have had a reasonable expectation of success in modifying Sutardja to include *a unitary vehicle indicator,* at least because such *unitary vehicle indicators* were well-known, such as those taught by Cramer and Letendre. *Letendre* at FIG. 1; *Cramer* at FIG. D22.

176. Thus, a POSITA would have been motivated to apply a known technique (using a slider to adjust charge settings for an electric vehicle) to a known device (GUI of an electric vehicle showing a charge bar graph) ready for improvement to yield the predictable results of easily allowing a user to choose a desired level of charge. A POSITA would have appreciated a single slider to indicate a numbered amount of charge (e.g., percentage) is "easy to use, intuitive, and provide[s] a sensitive mechanism for specifying values," whereas entering a numerical number may require multiple entries from the user, instead of just a single slide of the slider. *Eick* (Ex. 1075) at 119 (describing various benefits of using sliders). Sliders were known to be common graphic elements employed on GUIs for "selecting different…preferences." *Davis* (Ex. 1076) at 1:14-36. These graphic elements on GUIs were known to be "eas[y] to use" and quickly learnable by a user. *Id.* at 1:20-28. Thus, to provide the same benefit of easily allowing a user to indicate a charging parameter, a POSITA would have been motivated to include a movable slider with which the user interacts to easily indicate a desired charge level.

Furthermore, the Patent Owner even admitted that "sliders" were well-known in 2007, as sliders "were used in the graphical user interface of the iPhone by 2007." *Patent Owner's Preliminary Response* (Ex. 1077), IPR2022-01217 at 31. Thus, given (1) that using sliders to denote an amount of some parameter was well-known and (2) graphic elements, such as sliders, on GUIs were further known to be easy to use and quickly learnable by the user, a POSITA would have been motivated to include a slider on the bar graph to allow a user to easily indicate the amount of charge.

177. Furthermore, a POSITA would have found it obvious and been motivated to modify Sutardja to provide a unitary GUI element comprising charged, uncharged, and slider portions, as I outlined above, at least because such a modification is obvious to try. Well before the alleged invention of the '788 Patent, it was recognized that there was a need for user-friendly EV interfaces. *See* Section VI.C; *Letendre* at 18-19, Figure 1. A POSITA would have recognized there to be a finite number of solutions to creating a charging interface in which a charged capacity and an uncharged battery capacity were illustrated, along with an element (e.g., a slider) by which the charge can be selected, with the options being either (a) have the elements disparately on the GUI; or (b) combine the elements/portions into a unitary GUI element. There would have been a reasonable expectation of success

at least because vehicle GUIs were so well known before the ’788 Patent, as I described above. *See* Section VI.C.

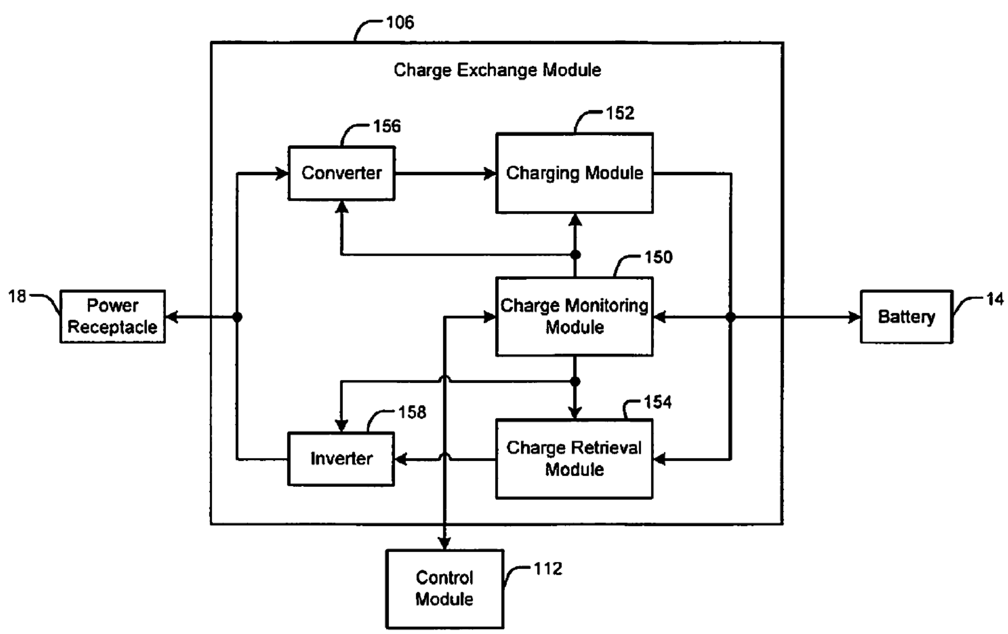
178. A POSITA implementing the modification would have had a reasonable expectation of success, given the modified Sutardja system already has a touchscreen with a GUI where a user inputs the charging parameters, and these parameters include a user indicating a level of charge of the battery. *See* Claim 1[b][i]. Additionally, applying a slider graphic on the GUI to allow a user to adjust a parameter was well-known. *See, e.g., Davis* at 1:14-36 (describing sliders as a way to “adjust” a level of a parameter on a GUI); *see* ¶ 69. Thus, the modification would simply require programming control module 112 to display a GUI with a slider on the bar graph that an operator interacts with to input Sutardja’s level of charge charging parameter or Letendre’s desired number of miles worth of charge. In this modified system, the GUI on the touchscreen display would receive the charge level, as well as Sutardja’s other charging parameters (e.g., charge completion time) from the user, which would be received by control module 112.

7. Claim 1[b][iv]: “displaying a charging status of the electric vehicle via the GUI; and”

179. For the reasons discussed below, the combination of Sutardja and Donnelly renders Claim 1[b][iv] obvious.

a) Sutardja's Teachings

180. Sutardja's CMM 104 includes a charge exchange module 106 that "may monitor the amount of charge in the battery 14, may communicate data regarding the amount of charge in the battery 14 to the control module 112, and may exchange charge between the battery 14 and the power receptacle 18." *Sutardja* at [0242], FIG. 3A. As shown in FIG. 7, "the charge exchange module 106 may comprise a charge monitoring module 150, a charging module 152, and a charge retrieval module 154." *Id.* at [0268].



Id. at FIG. 7.

181. The charge monitoring module 150 determines *a charging status of the electric vehicle* and communicates it to the control module 112. Specifically, the charge monitoring module 150 monitors "the amount of charge in the battery 14

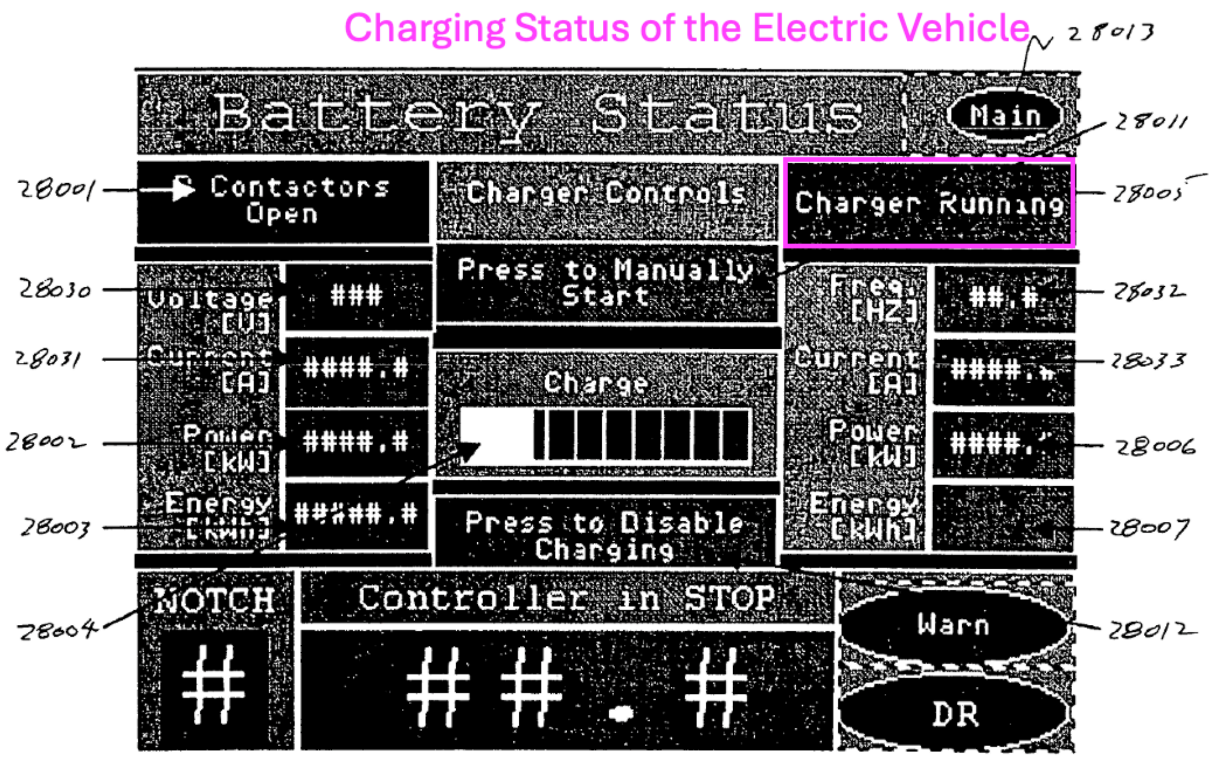
when the battery 14 is being charged and may inform the control module 112 when the charging is completed." *Id.* at [0268]. "The charge monitoring module 150 may inform the control module 112 when the battery 14 is charged to a predetermined level (e.g., full charge) that may be indicated in the charging parameters." *Id.* at [0270]. Additionally, the charge monitoring module informs the control module 112 "when the charge in the battery 14 is less than or equal to the safe level." *Id.* at [0268].

182. Thus, Sutardja's control module 112 receives *a charging status of the electric vehicle* from the charge monitoring module 150. Sutardja also more generally teaches that the control module 112 provides "data to the user via the user interface module 108." *Id.* at [0257]. However, Sutardja does not describe whether the *charging status* data is provided to the user. In related art, Donnelly teaches a GUI that *display[s] a charging status of the electric vehicle*.

b) Donnelly's Teachings

183. Donnelly's GUI includes a "Charger Status 28005" field, "which reports what the mechanical-to-electrical conversion device (e.g., charging generator) is currently doing such as, for example, mode of operation (warming up, etc), current charge, load charge, cooling status." *Donnelly* at 23:31-33. As shown in FIG. 28 below, the "Charger Status" field shows when the charger is running –

i.e., charging the battery. *Id.* at FIG. 28. Thus, Donnelly teaches *displaying a charging status of the electric vehicle via the GUI*:



Donnelly at FIG. 28 (annotated).

c) Motivation to Combine

184. It would have been obvious, and a POSITA would have been motivated to configure Sutardja's control module 112 to display the charging status of the electric vehicle via the GUI, per Donnelly. As I discussed above, Sutardja's control module 112 receives data from the charge management module 150, including the amount of charge in the battery when the battery is being charged and an indication that charging is complete when the battery has been charged to the desired charge

level (e.g., full charge). *Sutardja* at [0268], [0270]. Sutardja also teaches that the control module 112 provides data to the user via the user interface module 108.

185. A POSITA would have understood that displaying the charging status on the GUI would have provided valuable visual feedback to the user, allowing the user to know whether the battery is charging as expected or if there is some problem preventing charging, such as the power receptacle 18 not being plugged into the supply outlet 20. A POSITA would have understood that EVs have long provided visual indications to the user when they were charging. *See e.g., 2000 Honda Insight Manual* at 54 (describing "Battery Level Gauge" that "shows you the state of charge of the battery for the Integrated Motor Assist"), *2008 Tesla Roadster* at 6-11 to 6-12 (describing a visual indicator that informs the user when the vehicle is charging and discharging).

186. Thus, a POSITA would have been motivated to configure Sutardja's control module 112 to display the charging status of the electric vehicle via the GUI, per Donnelly, thus representing a combination of prior art elements according to known methods to yield predictable results. Because (1) Sutardja's control module 112 receives charging status information from the charge monitoring module 150 and (2) displaying the charging status of rechargeable devices was conventional, there would have been a reasonable expectation of success modifying the software

running on the control module 112's processor to display the charging status of the electric vehicle on the GUI.

8. Claim 1[b][v]: "increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;"

187. Sutardja's control module 112 is programmed to *increas[e], in accordance with the desired charge level, a level of charge of the battery of the electric vehicle*. Specifically, the control module 112 "control[s] the charging of the battery 14…based on the charging parameters and/or the alternate charging parameters." *Sutardja* at [0267]. The control module 112 receives "data from the charge exchange module 106 regarding the amount of charge in the battery 14" and "charging parameters input by the user and/or alternate charging parameters transmitted by the utility company 23." *Id.* Then, the control module 112 "generate[s] a charge control signal based on the charging parameters based on which the charging module 152 may charge the battery 14." *Id.* at [0269]. "Specifically, when the battery 14 is being charged, the charge monitoring module 150 may activate a converter 156 and the charging module 152 based on the charging parameters received from the control module 112." *Id*. The converter 156 receives "input power from the power receptacle 18" and converts "the input power to a direct current (DC) voltage." *Id.* Then the charging module generates "an output that is suitable to charge the battery 14." *Id*. "The charge monitoring module 150 may

inform the control module 112 when the battery 14 is charged to a predetermined level (e.g., full charge) that may be indicated in the charging parameters." *Id*. at [0270] "Subsequently, the charge monitoring module 150 may stop charging the battery 14 by deactivating the converter 156 and the charging module 152." *Id.*

188. Thus, Sutardja's control module 112 is programmed to generate a charge control signal based on the charging parameters (including the desired charge level) that causes the charge exchange module 106 to *increase[], in accordance with the desired charge level, a level of charge of the battery of the electric vehicle*.

9. Claim 1[b][vi]: "wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge."

189. As I discussed above, Sutardja's charging parameters include *a desired charge level of a battery of an electric vehicle*, which is "a predetermined level (e.g., full charge)" and therefore *represents a specific amount of charge desired to reside in the battery after increasing the level of charge*. *Sutardja* at [0270], [0051], [0119], [0262]; *see also,* Claim 1[b][i].

B. Claim 2: "The electrical charging system of claim 1, wherein executing the instructions by the one or more processing devices further results in: determining, based at least on the desired charge level, a charging schedule for the electric vehicle."

190. As I discussed in Section III.C.2, I have been informed that Petitioner does not believe that this limitation should be construed as means-plus-function but

has offered an alternative means-plus-function construction out of an abundance of caution. As shown below, Sutardja teaches Claim 2 under both constructions.

191. As I discussed above, Sutardja's computer 134 with a load management module (LMM) 134-1 is a *processing device* that executes instructions stored in memory. *See* Claims 1[a]-[b]. *Executing the instructions by* computer 134/LMM134-1 (i.e., *the one or more processing devices*) *further results in: determining, based at least on the desired charge level, a charging schedule for the electric vehicle.* The LMM "**determine[s] a schedule for charging batteries** in multiple vehicles" and "generate[s] alternate charging parameters and generate[s] replies to be transmitted to multiple users." *Sutardja* at [0253] (emphasis added); *see also, id.* at [0116] ("The load management module analyzes the N first sets of charging parameters, **determines a schedule for charging the batteries** of the N vehicles, and generates N replies for the N vehicles based on the schedule.") (emphasis added). In particular, "the load management module generates the schedule based on the charge levels and the requested charge completion times." *Id.* at [0122]. "For example, the utility company 23 may schedule charging as follows. The utility company 23 may supply power to a first set of users from 9 pm to 10 pm, to a second set of users from 10 pm to 11 pm, etc." *Id.* at [0263]. "Subsequently, the utility company 23 may supply power to the first set of users from 3 am to 4 am, etc." *Id.* "Eventually, users requesting charge by 6 am may receive the requested

charge by 6 am." *Id.* "Thus, the utility company 23 may control charging times, etc. of the batteries in multiple vehicles without loading the power distribution system." *Id*.

192. Alternatively, Sutardja also teaches Claim 2 under the means-plus-function construction. For the reasons discussed immediately above, Sutardja's LMM computer is a processor executing computer program instructions for performing the disclosed algorithm of calculating an estimated time to achieve the desired charge (e.g., 6 am). *Sutardja* at [0253], [0116], [0122], [0263]. Sutardja also teaches that the user's charging parameters "may indicate that the utility company may choose the time to charge the batteries when the cost is lowest." *Id.* at [235].

193. Because the LMM uses the user's charging parameters to generate the charging schedule, the LMM also identifies when during the available charging window would be the most cost-effective to acquire the desired estimated charge. *Id.* at [0116] ("The load management module analyzes the N first sets of charging parameters, determines a schedule for charging the batteries of the N vehicles, and generates N replies for the N vehicles based on the schedule. The network interface module transmits the N replies to the N vehicles, respectively."), [0187] ("In another feature, the load management means analyzes the N first sets of charging parameters, determines a schedule for charging of the N vehicles, and generates N replies for the N vehicles based on the schedule, respectively."), [0253] ("The LMM 134-1 may

analyze the load on the distribution system based on the requested charging parameters from multiple customers. The LMM 134-1 may determine a schedule for charging batteries in multiple vehicles."). Thus, Sutardja teaches the structure of a processor executing computer program instructions (i.e., computer 134/LMM 134-1) for performing the disclosed algorithm of "calculating an estimated time to achieve the desired charge and identifying when during the available charging window would be the most cost-effective to acquire the desired estimated charge." For all of the reasons discussed above, Sutardja's disclosed structure performs the function of *determining, based at least on the desired charge level, a charging schedule for the electric vehicle*. *See* ¶ 191.

C. Claim 3: "The electrical charging system of claim 2, wherein the increasing of the level of charge is performed in accordance with the charging schedule."

194. Sutardja teaches that *the increasing of the level of charge is performed in accordance with the charging schedule.* Namely, Sutardja's system charges the vehicle's battery based on charging time windows dictated by the charging schedule as determined by the computer 134/LMM 134-1 (*see* Claim 2):

> Depending on the number of users simultaneously requesting charge and depending on the load on the distribution system, the utility company 23 may supply power in a staggered manner to multiple users requesting charging between 9 pm and 6 am. For example, the utility company 23 may schedule charging as follows. The utility company 23 may supply power to a first set of users from 9 pm to 10 pm, to a second

set of users from 10 pm to 11 pm, etc. Subsequently, the utility company 23 may supply power to the first set of users from 3 am to 4 am, etc. Eventually, users requesting charge by 6 am may receive the requested charge by 6 am. Thus, the utility company 23 may control charging times, etc. of the batteries in multiple vehicles without loading the power distribution system.

Sutardja at [0263].

D. Claim 4: "The electrical charging system of claim 1, wherein the first portion operates to output the amount of charge residing in the battery, the second portion operates to output the uncharged capacity of the battery and the third portion is an input GUI element."

195. *See* Claim 1[b][iii].

E. Claim 6 Is Obvious Over Sutardja in Combination with Donnelly and Letendre

1. Claim 6[Pre]: "An electrical charging system, comprising:"

196. *See* Claim 1[Pre].

2. Claim 6[a]: "one or more processing devices; and"

197. *See* Claim 1[a].

3. Claim 6[b]: "a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:"

198. *See* Claim 1[b].

4. Claim 6[b][i]: "receiving information indicative of a desired charge level of a battery of an electric vehicle wherein

the desired charge level is defined by a user of the electric vehicle"

199. *See* Claim 1[b][i].

5. Claim 6[b][ii]: "via a Graphical User Interface (GUI) forming a part of the electric vehicle and"

200. *See* Claim 1[b][ii].

6. Claim 6[b][iii]: "adapted to display a unitary vehicle charge indicator comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;"

201. *See* Claim 1[b][iii].

7. Claim 6[b][iv]: "displaying a charging status of the electric vehicle via the GUI; and"

202. *See* Claim 1[b][iv].

8. Claim 6[b][v]: "increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;"

203. *See* Claim 1[b][v].

9. Claim 6[b][vi]: "wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge."

204. *See* Claim 1[b][vi].

F. Claim 7: "The electrical charging system of claim 6, wherein executing the instructions by the one or more processing devices further results in: determining, based at least on desired charge level, a charging schedule for the electric vehicle."

205. *See* Claim 2.

G. Claim 8: "The electrical charging system of claim 7, wherein the increasing of the level of charge is performed in accordance with the charging schedule."

206. *See* Claim 3.

H. Claim 9: "The electrical charging system of claim 6, wherein the first portion is an output GUI element, the second portion is an output GUI element and the third portion is an input GUI element."

207. *See* Claim 4.

I. Claim 11 Is Obvious Over Sutardja in Combination with Donnelly and Letendre

1. Claim 11[Pre]: "An electrical charging system, comprising:"

208. *See* Claim 1[Pre].

2. Claim 11[a]: "one or more processing devices; and"

209. *See* Claim 1[a].

3. Claim 11[b]: "a non-transitory memory device in communication with the one or more processing devices, the non-transitory memory storing instructions that when executed by the one or more processing devices, result in:"

210. *See* Claim 1[b].

4. Claim 11[b][i]: "receiving information indicative of a desired charge level of a battery of an electric vehicle wherein

the desired charge level is defined by a user of the electric vehicle"

211. *See* Claim 1[b][i].

5. Claim 11[b][ii]: "via a Graphical User Interface (GUI)"

212. *See* Claim 1[b][ii].

6. Claim 11[b][iii]: "adapted to display a unitary vehicle charge indicator comprising a combination of input and output GUI elements the GUI elements comprising: (i) a first portion indicative of an amount of charge residing in a battery of the electric vehicle; (ii) a second portion indicative of an uncharged capacity of the battery of the electric vehicle; and (iii) a third portion comprising a slider by which an amount of charge may be specified;"

213. *See* Claim 1[b][iii].

7. Claim 11[b][iv]: "displaying a charging status of the electric vehicle via the GUI; and"

214. *See* Claim 1[b][iv].

8. Claim 11[b][v]: "increasing, in accordance with the desired charge level, a level of charge of the battery of the electric vehicle;"

215. *See* Claim 1[b][v].

9. Claim 11[b][vi]: "wherein the desired charge level of the battery represents a specific amount of charge desired to reside in the battery after increasing the level of charge."

216. *See* Claim 1[b][vi].

J. Claim 12: "The electrical charging system of claim 11, wherein executing the instructions by the one or more processing devices further results in: determining, based at least on the desired charge level, a charging schedule for the electric vehicle."

217. *See* Claim 2.

K. Claim 13: "The electrical charging system of claim 12, wherein the increasing of the level of charge is performed in accordance with the charging schedule."

218. *See* Claim 3.

L. Claim 14: "The electrical charging system of claim 11, wherein the first portion operates to output the amount of charge residing in the battery, the second portion operates to output the uncharged capacity of the battery and the third portion is an input GUI element."

219. *See* Claim 4.

X. OPINIONS REGARDING GROUND 2: OBVIOUSNESS OF CLAIMS 5, 10, AND 15

A. Claim 5: "The electrical charging system of claim 1, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises: transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle."

220. I have been informed that the claim term *the charging schedule* lacks antecedent basis, and I have been asked to interpret "the charging schedule" as "a charging schedule." For the reasons explained below, the combination of Sutardja and Seelig renders Claim 5 obvious.

1. Sutardja's Teachings

221. Sutardja teaches that "[a] vehicle 102-1 is charged at a location such as a home or work location." *Sutardja* at [0239]. "The location may include the supply outlet 20 that may receive power from the utility company 23 via the power distribution line 21." *Id*., [0240], FIG. 3A. Because home and work locations include parking areas in the form of garages, carports, driveways, and/or parking lots, a POSITA would understand that Sutardja implicitly teaches charging vehicle 102-1 in *a parking space*. It was well-known that chargers are stationary, and thus while charging, the vehicle is stationary. A POSITA would have understood and/or found it obvious that a car that is stationary is "parked", and since the charging apparatus is in a specific location - the place where the car would be stationary while charging, the POSITA would have understood, and/or found it obvious that the car would be stationary in a "parking space" while it was being charged.

222. Sutardja also teaches *wherein the increasing of the level of charge of the battery of the electric vehicle, comprises: transmitting a control signal…that starts a charging, in accordance with the charging schedule, of the electric vehicle.* Namely, Sutardja's control module 112 controls the charging of the electric vehicle's battery based on the charging schedule received from the LMM 134-1. After the control module 112 receives the user's charging parameter data, "[t]he CMM 104-1 may transmit the data received by the control module 112 to the utility company 23

via the wireless network interface module 110-1." *Sutardja* at [0244]. "The LMM 134-1 may receive the charging parameters transmitted by the CMM 104-5 and/or the user." *Id*. at [0256]; *see also, id.* at [0253] ("The communication module 134-3 may receive charging parameters from CMMs and/or users of multiple vehicles. The LMM 134-1 may analyze the load on the distribution system based on the requested charging parameters from multiple customers."). The utility company "transmit[s] a reply to the user indicating whether power can be supplied as requested" and "may propose alternate charging parameters." *Id.* at [0251]. For example, the reply received from the utility company may include "a second time to begin charging that is different than the first time" where "the first time" is the requested start time included in the user's charging parameter data. *Id.* at [0011]. As discussed with regard to Claim 2, the charging schedule determined by the LMM includes time windows for each vehicle to start and stop charging. *See* Claim 2; *Sutardja* at [0263] ("The utility company 23 may supply power to a first set of users from 9 pm to 10 pm, to a second set of users from 10 pm to 11 pm, etc. Subsequently, the utility company 23 may supply power to the first set of users from 3 am to 4 am, etc."). Thus, the reply includes the charging schedule, including the time at which the vehicle is to start charging.

223. The control module 112 "generates **a charge control signal based on the reply** and the first set of charging parameters" and "[t]he charging module

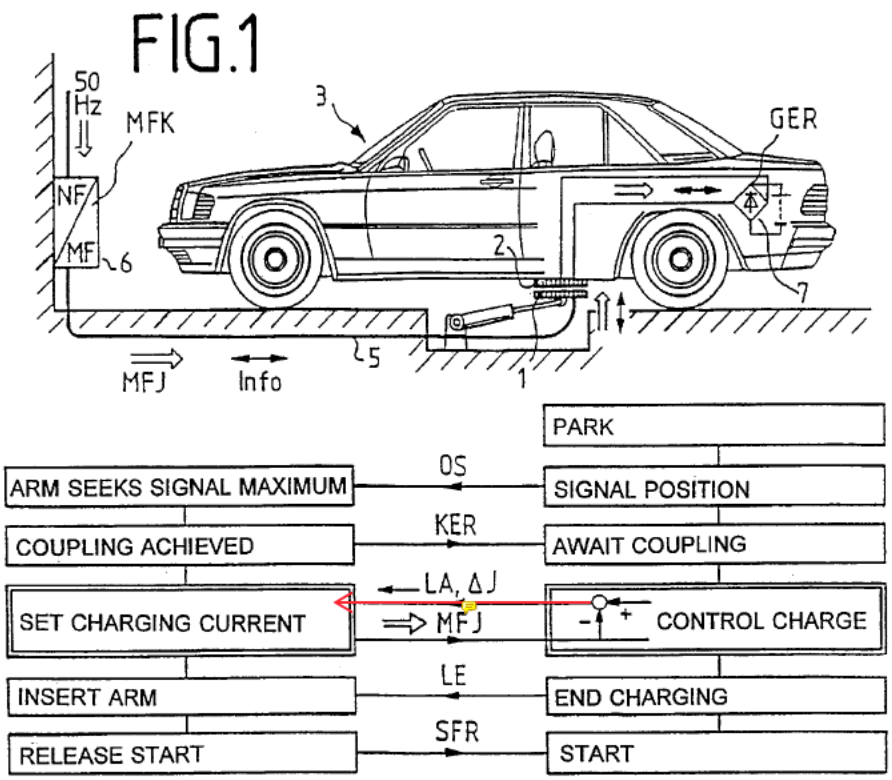
charges the battery of the vehicle **based on the charge control signal**." *Id. at* [0008] (emphasis added); *see also, id.,* at [0045], [0267]. Thus, control module 112 generates a charge control signal based on the reply, which dictates the time to start charging.

224. In Sutardja's system, the vehicle includes "a power receptacle (i.e., a plug) 18 to receive power from the supply outlet 20 via a cable and connector 19." *Sutardja* at [0006]; FIG 3A. However, a POSITA would have understood that more convenient wireless charging options were also available. *See, e.g., Seelig* at 1:11-13 ("It is already known to charge the battery of electric vehicles by means of inductive charging stations (Rhein-Main-Presse, Jul. 18, 1992)."); *Tseng* (Ex. 1050) at 1:58-2:11 (describing utilizing wireless charging to charge an "electric vehicle"); *Hyogo* (Ex. 1051) at Abstract (describing an "inductive charger" for "charging batteries of electric vehicles"). In the related art, Seelig teaches a wireless inductive electric vehicle charging system. As I explain below, Seelig's inductive charging system requires *transmitting a control signal to a parking space charge device* to start charging.

2. Seelig's Teachings

225. Seelig teaches wireless charging of an electric vehicle in which a signal is sent (**LA** in FIG. 1 below) that initiates the wireless charging. Seelig teaches "contactless energy transmission in charging the battery of a vehicle, in particular an

electric car, by means of an inductive transmitter having a primary element (1) and a secondary element (2) which is attached to the vehicle[.]" *Seelig* at Abstract, 2:19-23, 2:42-44 ("[E]lectrical energy can be transmitted from primary element 1 to secondary element 2 via an air gap of a magnitude of up to approximately 1 cm."). Seelig's FIG. 1 depicts "an apparatus" and a "method according to the invention for contactless energy transmission[.]" *Id.* at 2:1-3.



Id. at FIG. 1.

226. As shown in FIG. 1, the method includes (in part): (1) the vehicle parking; (2) coupling of the vehicle to a charging device; and (3) the vehicle sending a signal LA that is a "charging **initiation** signal" to "switch[] **on** the inverter." *Id.* at

FIG. 1, 6:29-32 (emphasis added). Seelig's apparatus includes the "primary element 1 of an inductive transmitter [that] is brought into an approach position with respect to the secondary element 2 of the transmitter, which is located on the underside of an electric car 3." *Id.* at 2:19-23. When in the correct position, "electrical energy can be transmitted from primary element 1 to secondary element 2 via an air gap[,]" teaching a wireless "transmission" of a control signal (signal LA) to "starts a charging of the vehicle[,]" as claimed. *Id.* at 2:42-44. Because primary element 1 is located in a **parking space**, which is used for **charging** the electric car 3, the primary element 1 is *a parking space charge device*.

227. Again, referring to FIG. 1, the right-hand side of the flow chart are actions taken by car 3, while the left-hand side are actions taken by the charging device. When the primary elements 1 and 2 are coupled, a "signal 'coupling achieved' KER [is] received on the vehicle…and switches on the **charging initiation signal generator** LAG[.]" *Id.* at 6:21-24 (emphasis added). Thereafter, a "**charging initiation signal LA** transmitted to the charging apparatus…switches on the charging operator memory LBS and thus switches on the inverter." *Id.* at 6:29-32 (emphasis added). FIG. 6 also illustrates the charging initiation signal LA generated by the "control apparatus GER on the vehicle 3", which is transmitted to the "coupling apparatus MFK of the charging device":

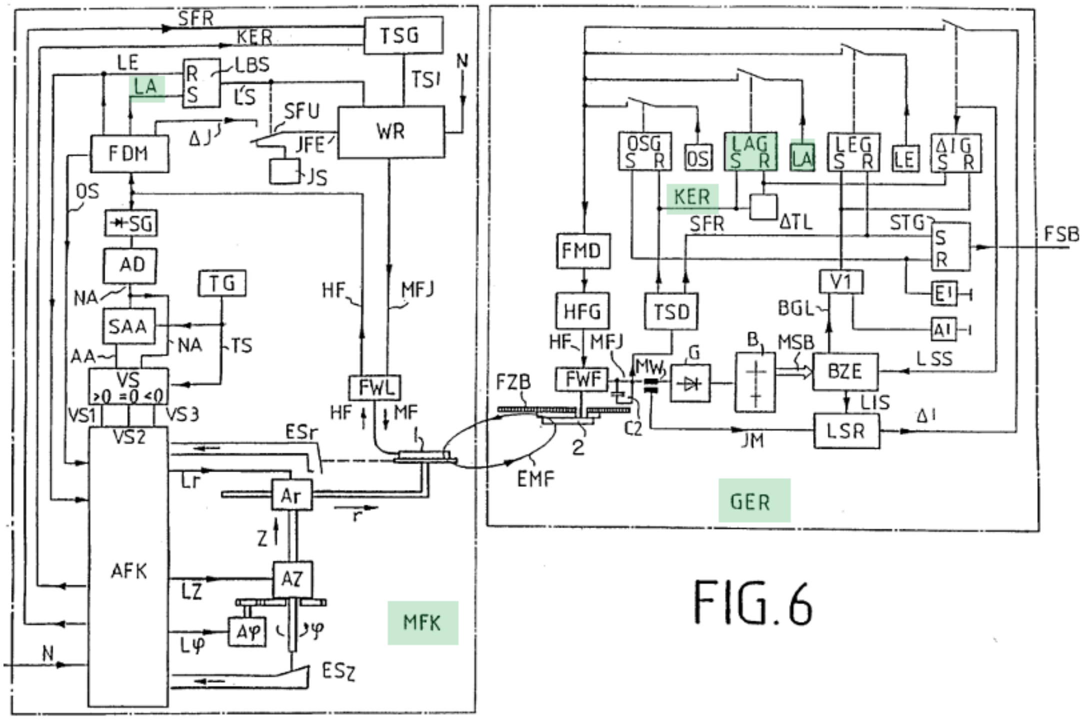


FIG.6

Id. at 4:53-55, FIG. 6.

228. Therefore, Seelig's transmission of charging initiation signal LA, sent from vehicle 3, that turns on the inverter teaches *transmitting a control signal to a parking space charge device* to start charging.

3. Motivation to Combine

229. It would have been obvious, and a POSITA would have been motivated to configure Sutardja's charge management system (CMS) 100 as a wireless charging system, as taught by Seelig. As acknowledged by Seelig, POSITAs would have appreciated that wireless charging systems that do not require users to plug the vehicle into the power supply were known to be "simple and convenient for the user with high operating reliability and safety in use." *Seelig* at 1:53-56. Seelig also

describes a number of advantages of wireless charging over wired charging, including "mechanical, aerodynamic and aesthetic", along with eliminating a "path-impairing cable" required for wired charging. *Id.* at 1:13-29.

230. A POSITA would have appreciated that because a wireless charging system only requires the user to park the Sutardja's vehicle in a parking space that includes a charging device, there would have been no need for the user to plug the vehicle into the power supply. A POSITA would appreciate that there would be less opportunity for human error preventing charging due to the user forgetting to plug the vehicle in. Thus, a POSITA would have been motivated to apply Seelig's known wireless charging technique to Sutardja's CMS 100 to improve similar electric vehicle charging systems in the same way.

231. As part of this modification, it would have also been obvious to incorporate Seelig's wireless charge initiation signal LA into Sutardja's charge control signaling protocol to transmit Sutardja's charge control signal generated by the control module 112 to the parking space charge device, per Seelig, that starts a charging according to the charging schedule, per Sutardja. Indeed, a POSITA would have understood that the only way the vehicle could indicate such a desire to begin a charging transaction would be via some type of signal. The modification combines prior art elements (wireless communication, EV charging stations) according to

known methods to yield predictable results by allowing the vehicle to initiate charging at the time dictated by the charging schedule without user intervention.

232. Wireless charging for charging EVs was well-known prior to July 13, 2009. *See, e.g., Tseng* (Ex. 1050) at 1:58-2:11 (describing utilizing wireless charging to charge an "electric vehicle"); *Hyogo* (Ex. 1051) at Abstract (describing an "inductive charger" for "charging batteries of electric vehicles"). In wireless charging, the charging station provides energy to the vehicle wirelessly, without a user having to get out of the vehicle. *Matsuo* (Ex. 1052) at 3526 (describing "[i]nductive charging" as being "safe, efficient and **easy to use for the electric vehicle (EV)**" and describing wireless inductive chargers that provide **"automatic charging at parking site**" being more "preferable and convenient" than a charger that has to be inserted "by hand"). Indeed, Seelig notes that such wireless charging stations have been known since at least the early 1990s. *Seelig* at 1:11-13. Because such wireless charging systems were well known for nearly two decades prior to the '788 Patent, there would have been a reasonable expectation of success configuring Sutardja's CMS 100 to include the necessary electrical components, such as inductive coils, a parking space charge device, etc., to accommodate wireless charging, as taught by Seelig.

B. Claim 10: "The electrical charging system of claim 6, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises: transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle."

233. I have been informed that the claim term *the charging schedule* lacks antecedent basis, and I have been asked to interpret "the charging schedule" as "a charging schedule." "*See* Claim 5.

C. Claim 15: "The electrical charging system of claim 11, wherein the increasing of the level of charge of the battery of the electric vehicle, comprises: transmitting a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle."

234. I have been informed that the claim term *the charging schedule* lacks antecedent basis, and I have been asked to interpret "the charging schedule" as "a charging schedule." *See* Claim 5.

XI. GROUND 3: OBVIOUSNESS OF CLAIMS 16-17

A. Claim 16: "The electrical charging system of claim 11, wherein the GUI is forms a part of a mobile display device."

235. I have been asked to interpret the phrase "wherein the GUI *is forms* a part of a mobile display device" as "wherein the GUI *forms* a part of a mobile display device."

236. As discussed above, Sutardja's modified charging system includes a touchscreen onboard the vehicle presenting the *GUI*. *See* Claim 1[b][ii]. Knockeart teaches a *mobile display device*, "such as a PDA, cellphone or similar device," that

communicates with a computer onboard a vehicle. *Knockeart* at Abstract, 4:32-41, 5:52-65, 6:29-31, FIGs. 1, 3-6 (FIGs. 5-6 disclosing communication with onboard computer). The mobile display device communicates with the onboard vehicle computer system through "wireless communication." *Id.* at 7:1-9 (disclosing mobile device communicates with the onboard computer via wireless communication), 13:57-60. The mobile display device "provides an input/output interface between in-vehicle system 105 and an operator of the vehicle." *Id.* at 4:49-53. The mobile display device "includes a graphical display" that provides visual information and "a touch-screen that is used by the operator for manual input to the system." *Id.* at 4:53-67, FIG. 1. When the mobile display device is "coupled" to the onboard computer, the graphical display and touchscreen are "accessible to the onboard computer." *Id.* at 7:49-58, FIG. 7.

237. A POSITA would have been motivated and found it obvious to display the GUI on a mobile display device, such as taught by Knockeart. In the modification, the control module 112 sends the GUI for display on the mobile display device's touchscreen via the wireless network interface module 110 (*Sutardja* at FIG. 3A) and is still capable of displaying the GUI on the in-car touchscreen, as discussed further. The combination is merely the use of a known technique (implementing a GUI on the touchscreen of a mobile display device) to improve similar devices (touchscreens where information is displayed and entered

for a vehicle) in the same way to increase user accessibility of the GUI. Furthermore, the combination requires combining prior art elements (Sutardja's on-board vehicle charging system and Knockeart's mobile display device) according to known methods (wirelessly connecting a mobile device to an in-vehicle computer system) to yield predictable results of allowing a user to view charging information when they are away from the vehicle.

238. Sutardja's wireless network interface module 110 allows the vehicle's charge management module 104 to wirelessly communicate with remote computers, including computer 134. *Sutardja* at FIG. 3A. In particular, the wireless network interface module 110 connects to "a distributed communication system 124 such as the Internet." *Id.* at [0246], FIG. 3A. "Thus, the CMM 104-1 in the vehicle 102-1 may communicate with the distributed communication system 124 via the wireless LAN 114-1." *Id.* at [0246]. Thus, a POSITA would recognize utilizing such wireless communication to connect a mobile display device to Sutardja's system and displaying the GUI on the mobile display device's touchscreen would provide the advantage of a user being able to view charging information (e.g., charge level, charging preferences) when they are away from the vehicle. *See e.g., Sunyama* (Ex. 1092) at Abstract (generally describing "wireless[ly] transmitting" charging information to a "portable remote unit" so the "operator can obtain information about the status of charging of the electric vehicle while at a location remote from the

electric vehicle"), 1:24-42 (describing the problem of a vehicle "operator" not being able to detect various battery charging situations (e.g., battery charging "disrupted" or when "the charging of the battery has been completed") when the operator is away from the vehicle). Though the GUI would be displayable on both the mobile display device and the in-vehicle touchscreen, a POSITA would have understood both provide advantages in various situations (i.e., when the user is in the car entering preference information or away from the car while the car is charging).

239. There would have been a reasonable expectation of success in modifying Sutardja's system to display the GUI on a mobile display device wirelessly communicated therewith. The mobile display device already includes "[a] graphical display" and "touch-screen" that receives "manual input." *Knockeart* at 2:46-50, 4:53-59. Sutardja's charge management module 104-1 already has a wireless network interface module 110 that communicates with control module 112 and the utility company's LAN 130 through distributed communications system 124. *See e.g., Sutardja* at FIG. 3A. Similarly, Knockeart's mobile display device is also already capable of communicating with an in-vehicle computer via a wireless connection. Thus, having the touchscreen of the mobile display device display the GUI for entering charging preferences would have been fairly simple.

240. The modification would only require (1) connecting the mobile display device to distributed communications system 124 so the wireless network interface

module 110 can transfer information between the control module 112 and the mobile display device and (2) programming the control module 112 to display the GUI on the graphical touchscreen of Knockeart's mobile display device. Given (1) displaying GUIs on a touchscreen was well-known (*see* Claim 1[b][ii]), and (2) wirelessly communicating information between a mobile communication device and vehicle was well-known, these modifications would have been within a POSITA's expertise. *See, e.g., Sunyama* at Abstract (describing wirelessly communicating charging information to a remote device); *Lowrey* (Ex. 1067) at 13:5-35, 13:53-56 (describing "access devices 1102," including "smart phones," that wirelessly communicate with a "telematics device 1106" via, e.g., Bluetooth, Wi-Fi, etc.), 3:17-21 (describing the "telematics device" is "in-vehicle").

B. Claim 17: "The electrical charging system of claim 16, wherein the mobile display device is a smartphone."

241. For the reasons discussed above, it would have been obvious to display the modified Sutardja's GUI on Knockeart's *mobile display device*. *See* Claim 16. Knockeart also teaches that the mobile display device may be a "cellular telephone" or "personal digital assistant" (PDA), such as Palm Computer made by Palm, Inc. *Knockeart* at 6:39-48, 12:38-41. "Smart phones" were known to "combine mobile phone capabilities with a versatile computing platform that accepts third-party software." *See e.g., Pervasive Computing: The Smart Phone* (Ex. 1080) at 82. Given Knockeart describes an "application executing on the removable personal device"

and providing a "software communication interface to the on-board computer," as well as the removable device being a cellular phone (i.e., having mobile phone capabilities), a POSITA would have understood Knockeart's "cellular phone" is a *smartphone*.

242. Additionally, the smartphone was also referred to as a "marriage between a powerful cell phone and a wireless-enabled PDA." *Zheng* (Ex. 1081) at 1. Knockeart's exemplary Palm PDA as *the mobile display device* was such a "marriage between a cell phone and a wireless PDA," even being considered a "PDA/**smart phone**." *Krakow* (Ex. 1090) at 3 (emphasis added). For example, the Palm PDA Treo 700 model was known to be capable of "wirelessly using Bluetooth or the Verizon EV-DO high-speed wireless network." *Id.* at 4; *see also, generally, PALM Treo 700P Manual* (Ex. 1091). PDAs, such as the Palm PDA Treo 700, were even known to send text messages and make cellular calls. *Krakow* at 4; *PALM Treo 700P Manual* at 11. Given a Palm PDA is an exemplary mobile display device in Knockeart, a POSITA would have understood and/or found it obvious that *the mobile display device is a smartphone*.

XII. CONCLUSION

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

Dated: November 8, 2024

By: ____________________
Scott Andrews

Scott Andrews

(650) 279-0242 scott@cogenia.com Petaluma, CA

Summary

Creative, energetic, and innovative internationally recognized technical executive experienced in general management, systems engineering, advanced product development, advanced technology, business development, strategic planning, and program management

- Location Based Technologies
- Vehicle Information Systems
- Vehicle Electrical/Electronics Systems
- ITS and Related Industries
- Communications Systems
- Mobile Information Technology
- Multimedia/Internet Computing
- Mobile Technology Test Instrumentation
- Vehicle Safety and Control Systems
- Enterprise Software

Experience

12/2001-Present Cogenia Partners, LLC

Systems engineering consulting supporting and mobile information, mobile electronics and automotive safety and entertainment systems development

Current Engagements:

- Technical consultant for connected vehicle security credential management system management concepts; Sponsored by Transport Canada
- Expert witness for:
  - Bentley Motors, related to automotive systems integration
  - Lordstown Motors, related to infotainment systems
  - Volkswagen, related to vehicle control systems
  - Toyota, related to vehicle-mobile device interfaces

Prior Engagements/Projects:

- Technical consultant for sensor supplemented message validation system for vehicle to vehicle communication based collision waring/avoidance systems. Sponsored by US DOT NHTSA
- Technical consultant for connected vehicle security credential management system deployment; Sponsored by US DOT NHTSA
- Subject matter expert and co-principle investigator on DSRC performance Measures development project for U.S.DOT NHTSA.
- Subject matter expert on communications data delivery system study to understand optimal roadside unit placements to support security credential management in connected vehicle systems; Sponsored by U.S. DOT RITA
- Developed systems engineering methodology for vehicle E/E systems; Applied methodology on project for Yazaki to reverse engineer the E/E architecture for a 2004 BMW 5 series vehicle.
- Co-Principal investigator for Integrated Advanced Transportation System; A 30+ year future technical feasibility assessment and strategy for U.S. DOT Federal Highway Admin. (FHWA).
- Technical consultant to American Association of State Highway Transportation Officials (AASHTO) for connected vehicle deployment analysis and strategy.
- Chief System Architect for the Vehicle Infrastructure Integration (VIIC) program (BMW, Chrysler, Daimler Benz, Ford, GM, Honda, Nissan, Toyota, VW); A

connected vehicle research program funded by U.S. DOT FHWA.

- Technical consultant to Michigan State DOT (Enterprise Pooled Fund) to develop a system architecture and deployment strategy for Rural ITS.
- Telematics delivery architecture development for a Fortune 100 service provider
- Technical consultant to the Vehicle Safety Consortium developing Dedicated Short Range Communications (DSRC) standards for safety systems;
- Designed novel super capacitor based high performance hybrid vehicle as part of an early stage startup company; Developed performance requirements, conceptual designs and patented integrated electrical system architecture concept.
- Toyota Motor Sales – 10 year technology survey;
- Connected Vehicle Trade Association- Transferred AMI-C specifications to ISO TC 22, TC 204 AND OSGi. Developed OSGi Vehicle Interface Specification;
- Expert witness for:
  - Orbital Sciences, related to vehicle fleet management
  - Volkswagen, related to vehicle control technologies
  - Apple, related to mobile communications device control
  - Google, related to map displays
  - Platform Sciences, related to location based fleet management
  - Unified Patents, various location based technology cases
  - Uber, related to display of multiple terminals on navigation display
  - Directed Electronics, related to vehicle remote start systems
  - ZTE, related to cell phone location and orientation systems
  - Audi, America, related to vehicle control systems
  - Club Car, related to golf cart navigation systems
  - Unified Patents, various location based technology cases
  - Toyota, related to vehicle communications systems
  - American GNC vs. LG, related to MEMS sensors
  - Dale Progress, Ltd. vs. Toyota, related to vehicle information display systems
  - Blackberry vs. SNAP, related to display of multiple terminals on navigation display
  - Location Services vs. Google, related to augmented reality displays
  - Alert Signal vs. Apple, related to cell phone messaging systems
  - AGIS vs. LG related to cell phone messaging systems
  - Maxell vs. ASUS, related to cell phone navigation systems
  - AGIS vs. HTC, related to cell phone location systems
  - AGIS vs. Huawei, related to cell phone location systems
  - AGIS vs. LG
  - Michigan Motor Technologies vs. Hyundai, related to vehicle control systems
  - Princeton Digital vs. Konami et al, related to video game display systems
  - Delphi, related to automotive safety systems
  - ATT vs. Vehicle IP relating to cell phone navigation systems
  - VW/Audi vs. Beacon, relating to traffic information systems
  - VW/Audi vs. Blitzsafe relating to mobile device integration and mobile audio systems
  - T-Mobile vs. TracBeam relating to wireless location technologies
  - VW/Audi vs. Joao relating to remote service architecturesApple Computer vs. Porto relating to cell phone navigation systems
  - Mercedes vs. Adaptive Headlamp Technologies relating to adaptive

headlamps
- Liberty Mutual, Geico and Hartford vs. Progressive Insurance relating to usage based insurance systems
- Toyota vs. American Vehicular Sciences (AVS) relating to occupant sensing systems
- Lenovo and Amazon vs. Pragmatus relating to device tracking
- Ford in a patent vs. Eagle Harbor Holdings relating to Bluetooth systems and mobile device integration in the vehicle
- Bentley vs. Cruise Control Technologies relating to adaptive cruise control
- Google vs. Walker Digital relating to 3D navigation displays
- Volkswagen/Sirius-XM vs. case relating to traffic information systems
- Volkswagen, Ford and GM in patent cases vs. Affinity Labs, relating to the iPod interface
- Honda vs. American Calcar, relating to telematics equipment and user interfaces
- Alpine, Denso and Pioneer Corporation in an International Trade Commission patent case vs. Honeywell, related to navigation systems
- BMW vs. American Calcar, relating to telematics equipment and user interfaces

4/2000 to 12/2001 Cogenia, Inc.

President and Chief Executive Officer, Founder

Founded company in 2000 to develop enterprise class data management software system. Responsibilities included development of business concept and plan, corporate administration including financial and legal management, leadership of executive team in product development, fundraising, business development, organizational development, and investor relations. Raised $2.2M between 8/00 and 5/01 from individuals and funds;

1996 to 4/2000 Toyota Motor Corporation, Japan

Project General Manager, R&D Management Division

Responsibilities included the conceptualization and development of multimedia and new technology products and services for Toyota's future generations of passenger vehicles in the United States and Europe, Heavy emphasis on strategy for information systems, and on development of technical concepts for computing and Internet oriented systems. Led automated vehicle Development program leading up to 1997 Automated Highway Systems (AHS) demonstration in Sand Diego, CA; Supported technology acquisition for hybrid vehicle control systems; Working under direction of Toyota board members, established the Automotive Multimedia Interface Collaboration (AMI-C), a partnership of the world's car makers to develop a uniform computing architecture for vehicle multimedia systems, and led all early technical, planning and legal work. Provided technical management of technical contracts with Carnegie Mellon University Robotics Lab (Image based collision warning systems), and the development of Toyota's position on the US Intelligent Vehicle Initiative.

1983 to 1996 TRW, Inc.

Held a series of increasingly responsible positions in program management, technology development and business development.

1993 to 1996 TRW Automotive Electronics Group

Director, Advanced Product Planning/Development

Specific responsibilities included leadership and overall management of advanced development programs such as Automotive Radar, Adaptive Cruise Control, Occupant Sensing, In Vehicle Information Systems, and other emerging transportation products; Managed remotely located advanced development laboratory performing approximately $6M in annual development projects.

1983 to 1993 TRW Space & Electronics Group

Manager, MMIC Products Organization

Developed TRW's commercial GaAs MMIC business. Responsibilities included development of business strategy and business plan, and overall management of customer and R&D programs. Developed extensive international business base and took operation from start-up to $5M sales per year in under two years. Developed the first single chip 94 GHz Radar (Used for automotive cruise control and anti collision systems).

1979-1983 Teledyne Microwave

Developed high reliability microwave components. Developed CAD tools.

1977-1979 Ford Aerospace, Advanced Development Operation

Designed, tested and delivered microwave radar receiver systems

Education

MSEE Stanford University, 1982

BSEE University of CA, Irvine 1977

TRW Senior Leadership Program 1992

Publications

1. Two Dimensional Vehicle Control for Obstacle Avoidance in Multi-Lane Traffic Environments; Published in the proceedings of the 1998 IEEE International Conference on Intelligent Vehicles.
2. Automotive Multimedia Interface Collaboration; Briefing Presented to the 9th VERTIS Symposium, April 1999, Tokyo Japan.
3. Privacy and Authenticity in Telematics Systems; Published in the Proceedings of the Society of Automotive Engineers World Congress, 1999
4. Automated Highway Systems Acceptance and Liability; Briefing presented to the Automated Vehicle Guidance Demo 98 Conference, Rinjwoude, The Netherlands, June1998.
5. What is Telematics? Briefing presented at IIR Telematics Conference Scottsdale, AZ, December 2001
6. Advanced Telematics Services: A Hard Look at Reality; Briefing presented at IIR Telematics Conference Scottsdale, AZ, December 2001
7. Consumer Electronics and Telematics; Briefing presented at Eye For Auto Telematics Update Conference Las Vegas, NV, January 2003
8. The Automotive Multimedia Interface Collaboration Software and Network Architecture: Extending the Concept of Platform Independent Computing;

Briefing Presented to the Future Generation Software Architectures in the Automotive Domain Conference, San Diego, CA, January 2004

9. Quality, Choice and Value: How New Architectures are Changing the Vehicle Lifecycle; Briefing presented at IEEE Convergence Conference, October 2004
10. Critical Standards for the Next Generation of Telematics Systems and Services; Briefing presented at the Telematics Update Conference, December 2004
11. VII System Overview; Briefing presented To Transportation Research Board, ITS and V-HA Committees 2007 Mid-Year Meeting; July 2007
12. Testing and Development of In-Vehicle Equipment and Private Applications (P08-1634); Briefing presented to the Transportation Research Board Annual Meeting, Washington, DC, January 2008
13. A Comparison of Communications Systems for VII; Presented at the ITS World Congress, New York, NY, October, 2008
14. Vehicle Infrastructure Integration Systems Overview; Presented at the ITS America Annual Meeting, June 1 2009, National Harbor, Maryland
15. Telematics Standards: Logical Next Steps; ITS International, August 2009
16. IntelliDrive^{SM} Overview; ITS International, May 2009
17. Time Synchronization and Positioning Accuracy in Cooperative IntelliDrive^{SM} Systems; Presented at the 2010 ITS America Annual Meeting, June 2010, Houston, Texas
18. Systematic Development of Positioning Requirements for Vehicle Applications; Presented at the 18th World Congress on Intelligent Transportation Systems , November, 2011, Orlando, Florida
19. The Interpretation of GPS Positioning Accuracy and Measurement Integrity in a Dynamic Mobile Environment; Presented at the 18th World Congress on Intelligent Transportation Systems, November, 2011, Orlando, Florida
20. Connected Vehicle Positioning Requirements and Possible Solutions; Presented at the 22nd World Congress on Intelligent Transportation Systems, October, 2015, Bordeaux, France
21. Connected Vehicle Performance Requirements; Presented at the 22nd World Congress on Intelligent Transportation Systems, October, 2015, Bordeaux, France

Patents

1. Mobile Body Reporting Device And Its System; Patent Number: JP11118902; 4/30/1999

2. Multiformat Auto-Handoff Communications Handset; Patent Number: US5,649,308; 07/15/1997

3. A Communications Terminal Device, A Communications System, And A Storing Medium For Storing A Program To Control Data Processing By The Communications Terminal Device; Patent Number: EP0867850, A3; 09/30/1998

4. Communication System For Controlling Data Processing According To A State Of A Communication Terminal Device; Patent Number: US 6,122,682 3/23/1998

5. Method And Apparatus For Controlling An Adjustable Device; Patent Number: US 5,864,105; 01/26/1999

6. Automatic Brake Device; Patent Number: JP2000108866; 4/18/2000

7. Visual Field Base Display System; Patent Number: JP2000029618; 01/28/2000

8. Intersection Warning System; Patent Number: US 5,926,114; 07/20/1999

9. Security For Anonymous Vehicular Broadcast Messages; Patent Number: US 7,742,603 3/27/2006

10. Digital Certificate Pool; Patent Number: US7,734,050 3/27/2006

11. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 7,802,263 9/21/2010

12. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 8,209,705 6/26/2012

13. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 8,566,843 10/22/2013

14. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 9,575,817 2/21/2017

15. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 9,705,765 7/11/2017

16. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 10,002,036 6/19/1028

17. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 10,031,790 7/24/1018

18. System, Method And Computer Program Product For Sharing Information In A Distributed Framework; Patent Number: US 10,248,477 4/2/1019

19. System for Location Based Triggers for Mobile Devices; Patent Number 9.973.899 5/15/2018

20. System for Location Based Triggers for Mobile Devices; Patent Number 10,194,291 1/29/2019

21. System for Location Based Triggers for Mobile Devices; Patent Number 10,194,292 1/29/2019

22. System for Location Based Triggers for Mobile Devices; Patent Number 10,349,243 7/9/2019

23. System for Location Based Triggers for Mobile Devices; Patent Number 10,499,215 12/3/2019

24. System for Location Based Triggers for Mobile Devices; Patent Number 10,631,146 4/21/2020

25. System for Location Based Triggers for Mobile Devices; Patent Number 10,735,922 8/4//2020