UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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TESLA, INC.

Petitioner

v.

CHARGE FUSION TECHNOLOGIES LLC

Patent Owner

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*Inter Partes* Review Case No. IPR2025-00153

U.S. Patent No. 11,631,987

**DECLARATION OF SCOTT ANDREWS**

**TABLE OF CONTENTS**

## CLAIM LISTING

| Claim Designation | Claim Language |
|---|---|
| Claim 1[Pre] | An electrical charging system, comprising: |
| Claim 1[a] | a vehicle sensor; |
| Claim 1[b] | a communication device; |
| Claim 1[c] | a processor in communication with the vehicle sensor and the communication device; and |
| Claim 1[d] | a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to: |
| Claim 1[e] | receive, from the vehicle sensor, information indicative of a presence of a vehicle in a parking space; |
| Claim 1[f] | receive, from the communication device, information indicative of one or more charging preferences corresponding to a desired charging of the vehicle, wherein the one or more charging preferences are defined by an operator of the vehicle; |
| Claim 1[g] | determine, based at least on the one or more charging preferences and at least one current value of a dynamic attribute of an electric charge provider, a charging schedule for the vehicle; and |
| Claim 1[h] | transmit a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the vehicle; |
| Claim 1[i] | wherein at least one of the one or more charging preferences is defined by user input received via a graphical user interface adapted to display a unitary vehicle charge indicator 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; and (iii) a third portion comprising a slider by which an amount of charge may be specified. |
| Claim 2 | The electrical charging system of claim 1, wherein the graphical user interface is adapted to display a web page. |
| Claim 3 | The electrical charging system of claim 2, wherein the graphical user interface forms a part of the vehicle. |

| Claim Designation | Claim Language |
|---|---|
| Claim 4 | The electrical charging system of claim 1, wherein the graphical user interface is adapted to receive a maintenance notification. |
| Claim 5 | The electrical charging system of claim 4, wherein the graphical user interface forms a part of a smartphone. |
| Claim 6 | The electrical charging system of claim 1, wherein the determining of the charging schedule for the vehicle is further based upon a factor of safety parameter. |
| Claim 7 | The electrical charging system of claim 6, wherein the one or more charging preferences comprise the factor of safety parameter. |
| Claim 8[Pre] | An electrical charging method, comprising: |
| Claim 8[a] | receiving, from a vehicle sensor, information indicative of a presence of an electric vehicle in a parking space; |
| Claim 8[b] | receiving, via a communication device, information indicative of one or more charging preferences corresponding to a desired charging of the electric vehicle, wherein the one or more charging preferences are defined by an operator of the electric vehicle; |
| Claim 8[c] | determining, by a processor, based at least on the one or more charging preferences and at least one current value of a dynamic attribute of an electric charge provider, a charging schedule for the electric vehicle; and |
| Claim 8[d] | transmitting, by the processor, a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle; |
| Claim 8[e] | wherein at least one of the one or more charging preferences is defined by user input received via a graphical user interface adapted to display a unitary vehicle charge indicator 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; and (iii) a third portion comprising a slider by which an amount of charge may be specified. |
| Claim 9 | The electrical charging method of claim 8, wherein the graphical user interface is adapted to display a web page. |

| Claim Designation | Claim Language |
|---|---|
| Claim 10 | The electrical charging method of claim 9, wherein the graphical user interface forms a part of the electric vehicle. |
| Claim 11 | The electrical charging method of claim 8, wherein the graphical user interface is adapted to receive a maintenance notification. |
| Claim 12 | The electrical charging method of claim 11, wherein the graphical user interface forms a part of a smartphone. |
| Claim 13 | The electrical charging method of claim 8, wherein the determining of the charging schedule for the electric vehicle is further based upon a factor of safety parameter. |
| Claim 14 | The electrical charging method of claim 13, wherein the one or more charging preferences comprise the factor of safety parameter. |
| Claim 15[Pre] | An electrical charging system, comprising: |
| Claim 15[a] | a vehicle sensor; |
| Claim 15[b] | a communication device; |
| Claim 15[c] | a processor in communication with the vehicle sensor and the communication device; and |
| Claim 15[d] | a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to: |
| Claim 15[e] | (a) receive, from the vehicle sensor, information indicative of a presence of a vehicle in a parking space; |
| Claim 15[f] | (b) receive, from the communication device, information indicative of one or more charging preferences corresponding to a desired charging of the vehicle, wherein the one or more charging preferences are defined by an operator of the vehicle; |
| Claim 15[g] | (c) determine a first value of a dynamic attribute of an electric charge provider; |
| Claim 15[h] | (d) determine, based at least on the one or more charging preferences and the first value of the dynamic attribute, a charging schedule for the vehicle; |
| Claim 15[i] | (e) transmit a control signal to a parking space charge device that starts a charging of the vehicle in accordance with the charging schedule; |
| Claim 15[j] | (f) retrieve a second value of the at least one dynamic attribute; and |

| Claim Designation | Claim Language |
|---|---|
| Claim 15[k] | (g) repeat (d) and (e), utilizing the retrieved second value of the dynamic attribute as the first value of the dynamic attribute; |
| Claim 15[l] | wherein at least one of the one or more charging preferences is defined by user input received via a graphical user interface adapted to display a unitary vehicle charge indicator 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; and (iii) a third portion comprising a slider by which an amount of charge may be specified. |
| Claim 16 | The electrical charging system of claim 15, wherein the graphical user interface is adapted to display a web page. |
| Claim 17 | The electrical charging system of claim 16, wherein the graphical user interface forms a part of the vehicle. |
| Claim 18 | The electrical charging system of claim 15 wherein the graphical user interface is adapted to receive a maintenance notification. |
| Claim 19 | The electrical charging system of claim 18, wherein the graphical user interface forms a part of a smartphone. |
| Claim 20 | The electrical charging system of claim 15, wherein the determining of the charging schedule for the vehicle is further based upon a factor of safety parameter. |
| Claim 21 | The electrical charging system of claim 20, wherein the one or more charging preferences comprise the factor of safety parameter. |
| Claim 22[Pre] | An electrical charging system, comprising: |
| Claim 22[a] | a communication device; |
| Claim 22[b] | a processor in communication with the communication device; and |
| Claim 22[c] | a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to: |

| Claim Designation | Claim Language |
|---|---|
| Claim 22[d] | provide a user interface comprising a unitary combined input/output element comprising: (i) a graphical depiction of an electric vehicle battery capacity, (ii) a graphical depiction of a current charge level of the electric vehicle battery, and (iii) a graphical input slider element that permits an operator of the vehicle to provide input defining a desired charge parameter of the electric vehicle; |
| Claim 22[e] | receive, from the communication device and via the user interface, information indicative of one or more charging preferences corresponding to a desired charging of the electric vehicle, wherein the one or more charging preferences are defined by the operator of the vehicle and include an indication of the desired charge parameter of the electric vehicle received via the graphical input element that permits the operator of the vehicle to provide input defining the desired charge parameter of the electric vehicle; |
| Claim 22[f] | determine, based at least on the one or more charging preferences and at least one current value of a dynamic attribute of an electric charge provider, a charging schedule for the vehicle; and |
| Claim 22[g] | transmit a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle. |
| Claim 23 | The electrical charging system of claim 22, wherein the desired charge parameter comprises a desired charge limit for the electric vehicle. |
| Claim 24 | The electrical charging system of claim 22, wherein the desired charge parameter comprises a time parameter governing charging of the electric vehicle. |
| Claim 25 | The electrical charging system of claim 22, wherein the user interface is adapted to display a web page. |
| Claim 26 | The electrical charging system of claim 25, wherein the user interface forms a part of the electric vehicle. |
| Claim 27 | The electrical charging system of claim 22, wherein the user interface is adapted to receive a maintenance notification. |
| Claim 28 | The electrical charging system of claim 27, wherein the user interface forms a part of a smartphone. |

| Claim Designation | Claim Language |
|---|---|
| Claim 29 | The electrical charging system of claim 22, wherein the charging schedule for the electric vehicle is further based upon a factor of safety parameter. |
| Claim 30 | The electrical charging system of claim 29, wherein the one or more charging preferences comprise the factor of safety parameter. |

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. 11,631,987 ("the '987 Patent"). I understand that the Challenged Claims are 1-30, 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. 11,631,987 (the "*'987 Patent*") |
| 1002 | File History of the '987 Patent (the "*'987 File History*") |
| 1004 | U.S. Patent Publication No. 2009/0313034 to Ferro et al. ("*Ferro*") |
| 1005 | European Patent Application No. 2009/0242288 to Oyobe et al. ("*Oyobe*") |
| 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*") |

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| 1008 | Intentionally left blank |
| 1009 | Intentionally left blank |
| 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*") |

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| 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, 39$^{th}$ 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*") |
| 1042 | *Intentionally left blank* |
| 1043 | *Intentionally left blank* |
| 1044 | *Intentionally left blank* |
| 1045 | *Intentionally left blank* |
| 1046 | *Intentionally left blank* |
| 1047 | *Intentionally left blank* |
| 1048 | *Intentionally left blank* |
| 1049 | *Intentionally left blank* |
| 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*") |
| 1053 | U.K. Patent Application No. GB 2438979 to Taylor-Haw et al. ("*Taylor-Haw*") |

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| 1054 | U.S. Patent No. 5,523,666 to Hoelzl et al. ("*Hoelzl*") |
| 1055 | *Understanding Your Motherboard's Bus System,* James McPherson, TechRepublic, December 19, 2000 ("*McPherson*") |
| 1056 | *Computer: History of Computers,* Gary Masters, Microsoft Encarta, 1994 ("*History*") |
| 1057 | *Fukuda et al., Evaluating Second Car System, an Electric Vehicle Sharing Experiment in Tama New Town District, Inagi City, Tokyo,* TRB Annual Meeting, 2003 ("*Fukuda*") |
| 1058 | *Intentionally left blank* |
| 1059 | U.S. Patent No. 8,266,075 to Ambrosio et al. ("*Ambrosio*") |
| 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*") |
| 1063 | *Geneva '08 Preview: BMW ConnectedDrive Allows Unrestricted in-car Internet,* Michael Harley, February 22, 2008 ("*Harley*") |
| 1064 | *Chicago 2008: Ford Introduces Work Solutions in-dash computer package for F-150 [w/video],* Ford, February 5, 2008, ("*Ford*") |
| 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*") |
| 1068 | *Internet Multimedia on Wheels: Connecting Cars to Cyberspace,* Jameel et al., IEEE, 1998 ("*Jameel*") |
| 1069 | U.S. Patent No. 7,285,936 to Ohnuma et al. ("*Ohnuma*") |
| 1070 | U.S. Patent No. 7,501,793 to Kadouchi et al. ("*Kadouchi*") |
| 1071 | U.S. Patent Application Publication No. 2005/0278079 to Maguire ("*Maguire*") |
| 1072 | *PowerSafe: Safety, Storage, Operating, and Maintenance Manual,* VRLA Battery Systems mSeries, EnerSys, March 2008 ("*PowerSafe*") |
| 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*") |

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| 1077 | *Patent Owner's Preliminary Response* IPR2022-01217 |
| 1078 | U.S. Patent No. 5,654,621 to Seelig ("*Seelig*") |
| 1079 | U.S. Patent No. 5,734,872 to Kelly ("*Kelly*") |
| 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*") |
| 1082 | *Intentionally left blank* |
| 1083 | *Intentionally left blank* |
| 1084 | *Intentionally left blank* |
| 1085 | IPR2022-00519 Declaration of Scott Andrews |
| 1086 | Declaration of June Ann Munford ("*Munford Dec.*") |
| 1087 | Charge Fusion Technologies, LLC v. Tesla, Inc. 1:22-cv-00488, No. 79 Plaintiff Charge Fusion Technologies, LLC's Motion for Leave to Amend Complaint (W.D.Tex. June 5, 2024) |
| 1088 | Charge Fusion Technologies, LLC v. Tesla, Inc., 1:22-cv-00488, No. 74 Order to Stay (W.D.Tex. Feb. 23, 2023) |
| 1089 | U.S. Patent No. 9,853,488 to Fincham et al. ("*the '488 Patent*") |
| 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*") |
| 1093 | Charge Fusion Technologies, LLC v. Tesla, Inc. 1:22-cv-00488, No. 100 Order Denying Plaintiff's Opposed Motion for Leave to File First Amended Complaint (W.D.Tex. Oct. 31, 2024) |

12. I have considered these materials from the viewpoint of a POSITA as of the priority date of the '987 Patent. For the purposes of this declaration, the priority date of the '987 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 '987 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 '987 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 '987 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. Opinions Regarding Related Patent No. 9,853,488

26. I previously opined in IPR2022-00519, regarding Patent No. 9,853,488 (the ’488 Patent), which is in the same family as the ’987 Patent. *Unified Patents, LLC, v. Charge Fusion Technologies, LLC,* Declaration of Scott Andrews, IPR2022-00519 (Ex. 1085). Claim 1 of the ’488 Patent includes a similar, albeit slightly different, limitation as that found in claim 1 of the ’987 Patent regarding determining a charging schedule *based at least on the one or more charging preferences* and a *dynamic attribute*. *Compare ’987 Patent* (Ex. 1001), 29:46-48 *with the ’488 Patent*

(Ex. 1089)*,* 29:21-23. In the ’488 Patent IPR, I was asked to opine on how broadly the charging schedule would have been understood to a POSITA. Ex. 1085, ¶ 58. For the present IPR proceeding, it is my opinion the charging schedule must be based on *one or more charging preferences and at least one current value of a dynamic attribute*, per claim 1. *’987 Patent,* 29:46-48; *see also,* 30:21-23, 31:5-7.

**D. Claim Construction**

27. 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. Dynamic attribute of an electric charge provider***

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

> **“dynamic attribute of an electric charge provider**” (Claims 1, 8, 15, and 22) – a changing or otherwise fluctuating cost (or price) of electricity for purchase from an electric charge provider.

***2. Determine…a charging schedule***

29. I have been instructed to provide an opinion of whether Claim 1[g]'s claim term of *determine…a charging schedule* is met by the prior art. *See* Section X.A.8. I have been instructed to apply the below construction:

| ***Claim Term*** | ***Support at Least includes:*** | ***Structure and Function*** |
|---|---|---|
| Claim 1[g]: "determine…a charging schedule for the electric vehicle"<br><br>Claim 8[c]: "determining…a charging schedule for the electric vehicle"<br><br>Claim 15[h]: "determine…a charging schedule for the vehicle"<br><br>Claim 22[f]: "determine…a charging schedule for the vehicle" | *'987 Patent,* 8:33-38, 10:41-44, 10:51-10:67, 16:62–17:8, 17:39-42. | Structure: processor executing computer program instructions for performing the disclosed algorithm of "utiliz[ing] such rate information in combination with the identification and/or preference information." *'987 Patent*, 10:54-59, 17:39-42.<br><br>Function: determine a charging schedule for the electric vehicle based at least on one or more charging preferences and at least one current (or first) value of a dynamic attribute of an electric charge provider |

### *3. "unitary vehicle charge indicator element"*

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

**"unitary vehicle charge indicator element"** at least includes a bar graph comprising the charged, uncharged, and slider portions, such as illustrated in FIG. 7 of the '987 Patent, depicting vehicle charge indicator 714. .

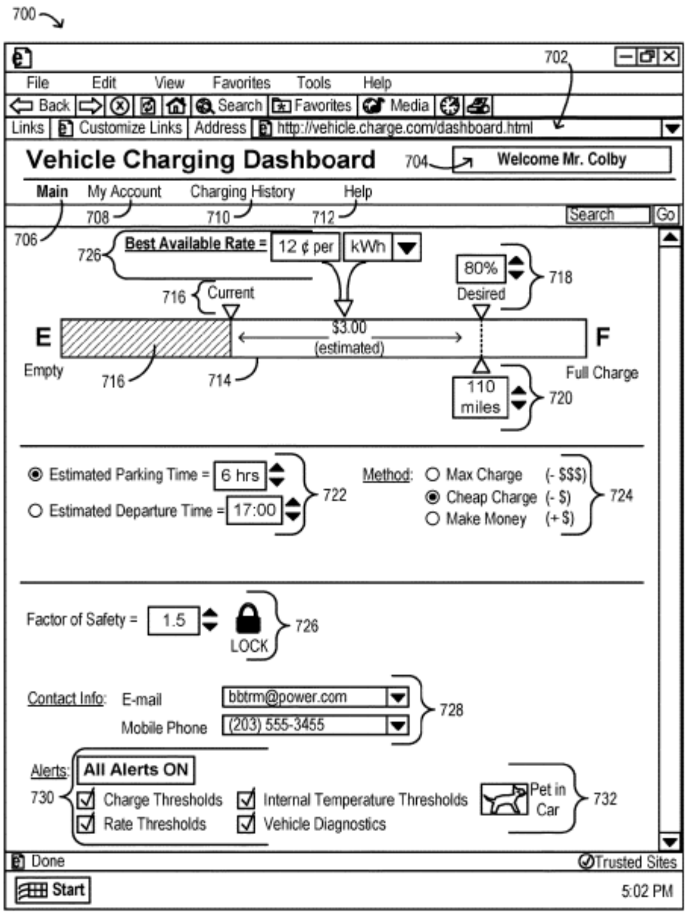



FIG. 7

*'987 Patent*, FIG. 7, 14:56-57.

## IV. LEVEL OF A PERSON OF ORDINARY SKILL

31. Based on my review and analysis of the '987 Patent and the cited prior art, a POSITA at the time of the '987 Patent would have been knowledgeable regarding the field of automotive systems, including electric vehicle power

management. In my experience working in this field, 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.

32. 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.

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

## V. OVERVIEW OF THE ’987 PATENT

### A. Summary

34. The ’987 Patent describes “systems and methods for charging electric vehicles[.]” *’987 Patent,* Abstract. The charging system uses charging preferences and electricity cost to determine a charging schedule for the vehicle. *’987 Patent,* 10:20-28, 10:51-59. The charging system may include a “vehicle sensor” that detects an “arrival, proximity, and/or presence of the vehicle” to/at a parking space charge device. *’987 Patent,* 9:48-60. A user may enter the charging preferences (e.g., “desired charge” level) via an “interface.” *’987 Patent,* 14:30-31, 14:53–15:8.

#### *1. Field of Endeavor*

35. 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.

36. The ’987 Patent relates to “[s]ystems and methods for charging electric vehicles” to “provide the potential of economically viable electric-powered modes of transportation[.]” *’987 Patent*, Abstract, 1:33-35. The ’987 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. *'987 Patent*, 8:15-42, 16:62–17:8. The '987 Patent defines an electric vehicle broadly, as being "any vehicle that utilizes, stores, and/or provides electrical power," including, e.g., "buses, trains, cars." *'987 Patent,* 3:25-29. The '987 Patent also defines a "hybrid" vehicle as an electric vehicle. *'987 Patent,* 3:46-47. Furthermore, "[a]lmost all typical vehicles comprise a battery, for example, and would thus qualify as 'electric vehicles'." *'987 Patent,* 3:29-31. The '987 Patent further defines an electric charging system as "any combination of hardware, software," etc. that conducts or otherwise facilitates charging of a vehicle. *'987 Patent,* 3:11-24. Thus, the '987 Patent is directed to managing vehicle systems, including EV charging.

37. The '987 Patent is also directed to the management of other vehicles systems, such as EV control interfaces. For example, the '987 Patent describes "Electric Car Charging Interfaces" for setting up, defining, storing, and/or updating preferences or information utilized by the charging system. *'987 Patent,* 13:28, 13:43-47. An exemplary interface by which charging parameters are established and changed includes a vehicle charge indicator indicating a current charge level. *'987 Patent,* 14:30-31, 14:53-58. The interface may also include a desired charge percent level that a user may alter to indicate their desired charge. *'987 Patent,* 14:59-64. The interface includes a desired charge range level that expresses the desired charge

level "in terms of distance capable of being traveled." *'987 Patent,* 13:65–15:8. Thus, the '987 Patent is also directed to EV control interfaces.

38. Furthermore, the '987 Patent is also directed to a user's personal device communicating with the vehicle's information system. The '987 Patent describes the electric car charging interfaces being provided by a "user device 680[,]" which is depicted in FIG. 6 as a phone. *'987 Patent,* 13:39-42, 11:43-49 (describing a cellular telephone communicating with the vehicle), 19:66–20:2 (describing using an iPhone® interface to communicate information "into the automobile"). Thus, the '987 Patent is also directed to managing communication of a user's personal device with the vehicle's information system.

39. For these reasons, a POSITA would understand that the field of endeavor of the '987 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*

40. 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 '987 Patent and determine the problems that the inventors were trying to solve.

41. The '987 Patent recognizes it is desirable for charging an electric vehicle to be user-friendly and convenient. *'987 Patent,* 23:23-26. The '987 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." *'987 Patent,* 1:40-43. "[T]he need to plug [electric vehicles] in regularly to replenish their electrical charge" was seen as a drawback. *'987 Patent,* 1:36-38. 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 '987 Patent describes a system for "intelligent charging[.]" *'987 Patent,* 2:17-18. The intelligent charging system receives "information" that may include "[p]reference data" indicating "desired vehicle charging parameters," which is then used by the charging system to determine "a charging schedule for the vehicle." *'987 Patent,* 2:17-22, 10:20-28, 10:41-44. The charging schedule "permit[s] a vehicle to recharge, generally, throughout the day at times most convenient to the owner/operator of the vehicle." *'987 Patent*, 23:23-26. Thus, a POSITA would have understood the '987 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.

42. The '987 Patent also describes the charging system receiving information indicating the "presence" of a vehicle in a parking space. *'987 Patent,* 2:12-16. The system may include a "vehicle sensor" that detects the proximity and/or presence of the vehicle to the charging system. *'987 Patent,* 9:57–10:3, 16:37-49.

The vehicle sensor facilitates user-friendly charging by detecting when the vehicle is parked at a charging system such that the vehicle operator does not have to take any action to indicate their vehicle is parked. Thus, a POSITA would have understood the ’987 Patent is also directed to solving the problem of facilitating user-friendly EV charging.

43. The ’987 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. *’987 Patent,* 23:34-38, 14:53-64, FIG. 7. Thus, the ’987 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.

44. The ’987 Patent also understands a user employing their own personal device may provide a simple way to control vehicle systems. For example, the ’987 Patent describes using a “cellular phone” for communicating a user’s charging preferences to the charging system. *’987 Patent,* 11:34-49, 19:58-20:2 (describing information being communicated from, e.g., an iPhone to the charging system). Thus, a POSITA would have understood the ’987 Patent is also directed to solving the problem of facilitating communication with the vehicle’s information system, by allowing a user to use their own personal device.

45. The ’987 Patent also understands it is desirable to reduce the complexity and user-burden in systems that provide electric vehicle charging. *’987 Patent*, 2:12-22, 11:34–12:16, 18:40–20:16, 23:19-21. Thus, a POSITA would have understood the ’987 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**

46. I have reviewed the prosecution history for the ’987 Patent. The Examiner initially issued a “Pre-interview communication.” *’987 File History* at 88-90. In the Pre-interview communication, the Examiner cited U.S. Patent Application Publication No. 2009/0313174 to Hafner, U.S. Patent No. 5,790,976 to Boll; and U.S. Patent Application No. 2009/0139781 to Straubel for teaching various limitations. *Id.* Thereafter, a Non-Final Office Action, a Final Office Action, and another Non-Final Office Action were issued rejecting the independent claims under 35 U.S.C. § 103 as obvious over Hafner in view of Boll. *’987 File History*, 127-139, 203-219, 448-466.

47. After the second Non-Final Office Action was issued, Applicant responded by cancelling the claims and adding a new set of claims that were “shifted to the claim set as allowed in the Sibling” (U.S. Patent Application No. 17/829,408, now U.S. Patent No. 11,575,275). *’987 File History*, 636-648. A Notice of

Allowance was issued on March 9, 2023 with an accompanying Examiner-Initiated Interview Summary in which the Examiner indicated the limitation of "a graphical input slider element by which an amount of charge may be specified" as allowable. *'987 File History*, 684-699. The Notice of Allowance included an Examiner's amendment to independent claim 32 (issued claim 22) to recite that the graphical input element by which an amount of charge may be specified is a <u>*slider*</u> element. *'987 File History,* 695. The Examiner stated no previously-considered art—including, e.g., Hafner—either anticipated or rendered obvious the claims, as amended. *Id.,* 699.

### C. Priority

48. I have been asked to review if the '646 Provisional discloses the vehicle charge indicator as claimed in the '987 Patent Claims. Independent claims 1, 8, and 15 of the '987 Patent require:

> …a unitary vehicle charge indicator 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; and (iii) a third portion comprising

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

*'987 Patent*, 29:53-63, 30:30-39, 31:17-27. Independent claim 22 recites substantially similar language. *'987 Patent*, 32:1-8.

49. 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), 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

50. 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 '987 Patent was based on well-known intelligent charging systems and technologies used for vehicles with electric drive systems. All the functionalities encompassed by the Challenged Claims were thus well-known and conventional prior to the invention of the '987 Patent.

---

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

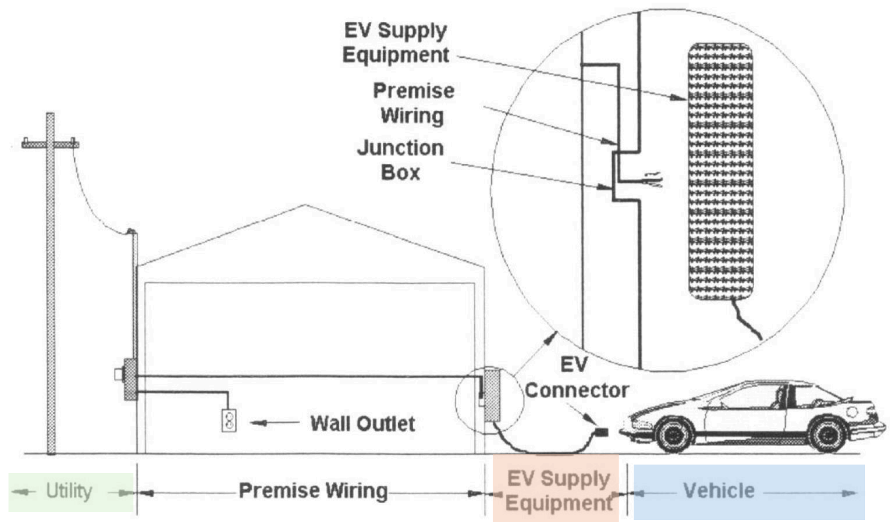
**A. Electric Vehicles**

51. 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 '987 Patent.

**B. Charging Systems**

52. 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 '987 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).

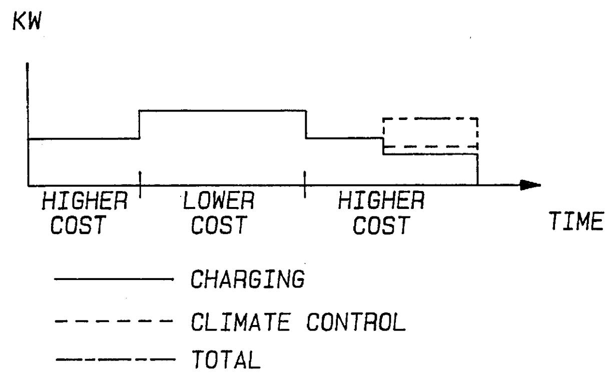
53. Charging infrastructure fundamentally required an EV being "connected to the EV supply equipment (EVSE), which, in turn, is connected to the local utility." *Sandeep*, 88. A meter is an example of an EVSE that is "configured to control the flow of electrical power between the receptacle and the battery." *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. Thus, charging systems utilized for charging electric vehicles were known prior to the '987 Patent.

### *1. Charge Rates and Schedules*

54. 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.

55. 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

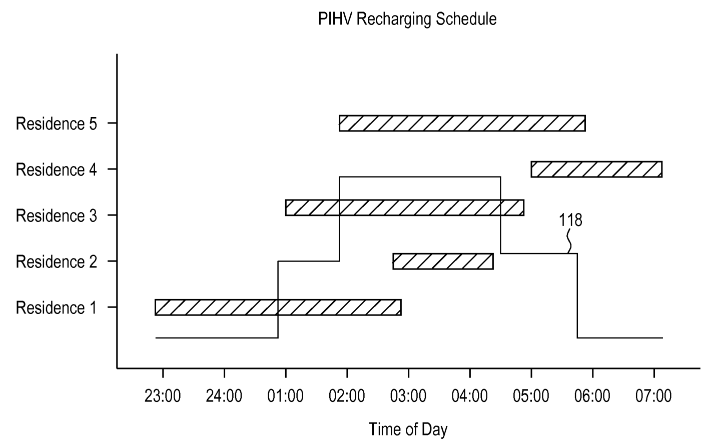
including "the expected itinerary of the vehicle 152, the state of charge of each of the batteries 154, the recharge electrical consumption data 156, [and] the cost of electrical energy 158[.]" *Kressner*, 8:51–9:2. An example of a charging schedule where charging power fluctuates in response to the "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.").

56. 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).

57. 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].

58. 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.").

59. 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.

60. 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 '987 Patent.

***2. Parking Detection***

61. 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.

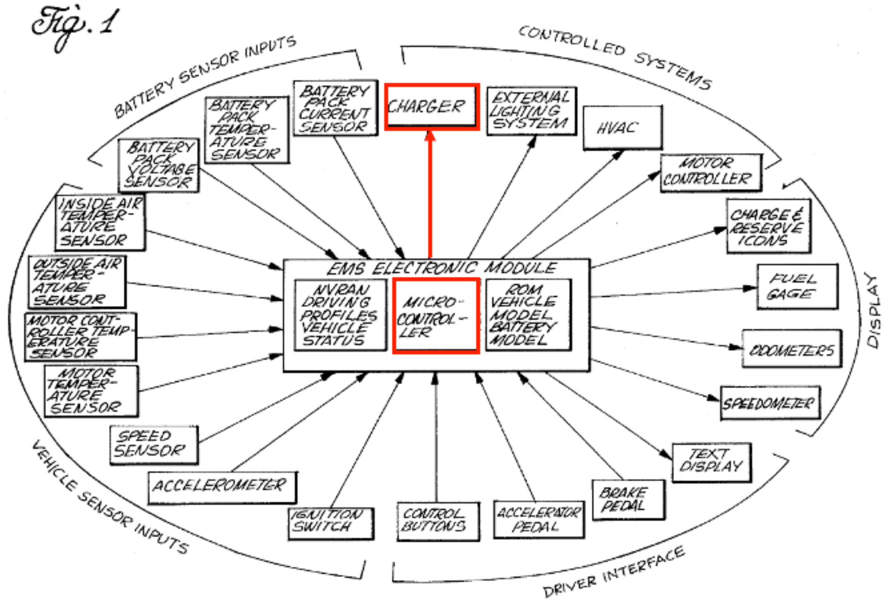
62. Thus, vehicle sensors were known to be included as part of the EV charging infrastructure to identify when a vehicle is parked and ready for charging prior to the '987 Patent.

#### *3. Charging Control*

63. 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].

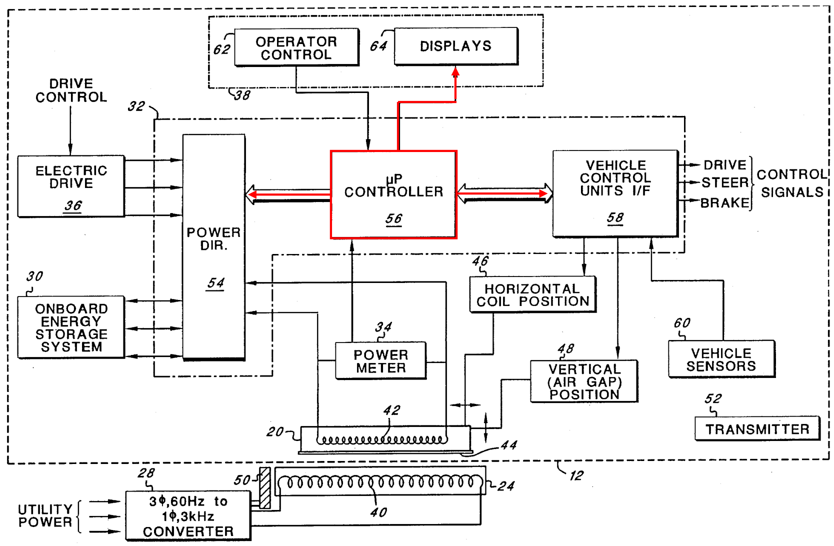
64. Some EV systems had a processor on-board the vehicle for controlling charging of the batteries among other vehicle functions; for instance, Diller (Ex. 1029) describes an EV with a singular processor where "[t]he energy management system electronic module 10 incorporates a micro-controller 12 as 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, is shown below:

Fig. 1



*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.").

65. 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

66. Displays and interfaces, including GUIs provided on displays, were known, and their inclusion in vehicles was also known prior to the '987 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.

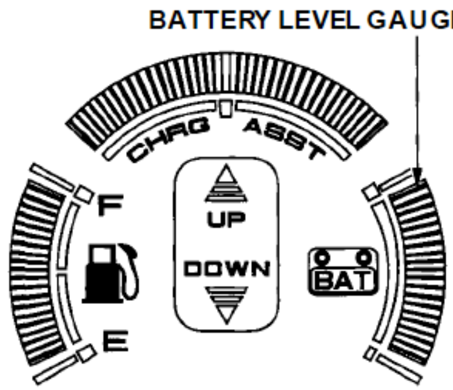
#### *1. Battery Charge Status and Vehicle Displays*

67. Instrument panels to display vehicle-related information to the user have been employed in vehicles well before the '987 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].

68. 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:

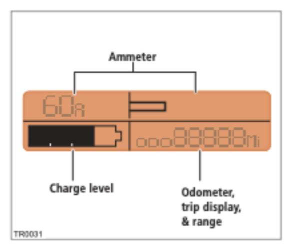
**Battery Level Gauge**




*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**

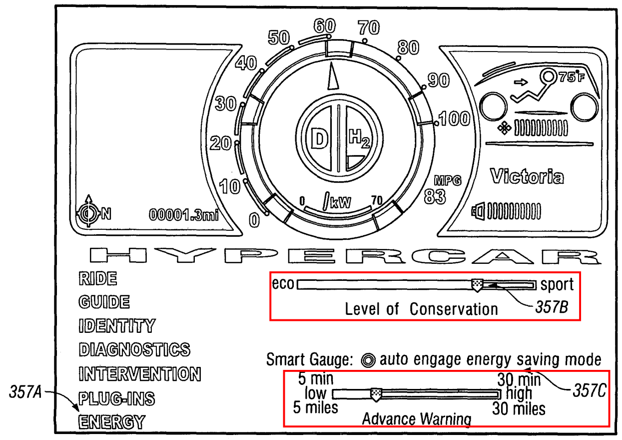
The ammeter displays information about the electrical current either entering or leaving the Battery.

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

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

69. 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].

70. 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 '987 Patent.

### 2. *Vehicle User Interfaces*

71. "The Graphical User Interface (GUI) has been in existence since the 1970s[.]" *Ishii* (Ex. 1037), 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), 1, 8. Thus, using graphical user interfaces was well-known and known to be beneficial prior to the '987 Patent.

72. "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), 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.").

73. 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.

74. 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 '987 Patent.

## VII. SUMMARY OF THE PRIOR ART REFERENCES

### A. Ferro

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

76. Ferro teaches "an improved data processing system…for managing electric vehicle charging transactions." *Ferro* (Ex. 1004), [0002], FIGs. 3-8, [0060]. Ferro discloses the regulation of electric vehicle charging using a "program code for generating dynamic energy transaction plans". *Ferro*, [0002]. Ferro further discloses energy preference service 302 as "a software component that generates, stores, and retrieves preference information associated with an electric vehicle[.]" *Ferro*, [0054]. Ferro specifies these preferences can include "a maximum price per kilowatt

hour of electricity to be paid by a party, a location where charging may occur, a location where charging may not occur, a rate of charging the electric vehicle..." *Id.*

77. The electric charging system may be implemented within a network 102 and includes an electric vehicle 116 and charging station 118. *Ferro,* [0032], [0034]-[0036], [0037] (describing the "[e]lectric vehicle 116 and charging station 118 are optionally connected to network 102"), FIG. 1. The network 102 also connects various servers 104, 106 and clients 110, 112, 114 (e.g., computers) together. *Ferro*, [0033]. Data processing system 200, is "an example of a computer, such as server 104 or client 110[,]" and may be "implemented as a computing device on-board" electric vehicle 116. *Ferro,* FIG. 2, [0039]. The processing system 200 includes a memory 206, persistent storage 208, a processor unit 204, communications unit 210, input/output unit 212, a display 214, and a "communications fabric 202, which provides communications between" these components:

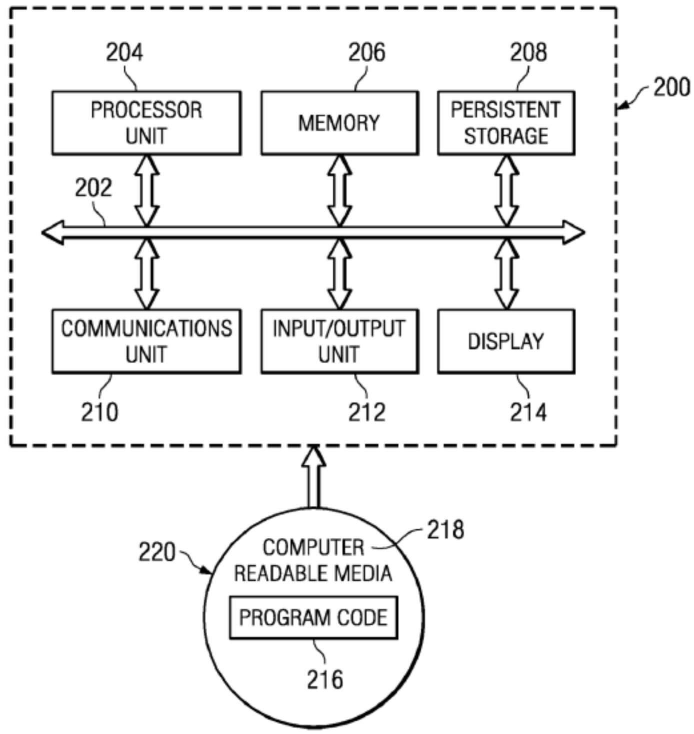



*FIG. 2*

*Ferro*, FIG. 2.

78. "[C]omputer-usable program code or instructions implementing the processes may be located" in data processing system 200 for carrying out the dynamic energy transaction plan generation. *Ferro,* [0039]. For example, "[t]he processes of the different embodiments may be performed by processor unit 204 using computer implemented instructions, which may be located in a memory, such as memory 206." *Ferro,* [0040], [0044], [0026]-[0030] (disclosing a "computer readable medium" includes "program code for carrying out operations.").

79. The "data processing system 200" may be implemented "on-board an electric vehicle[.]" *Ferro*, [0039]. The data processing system 200 input/output

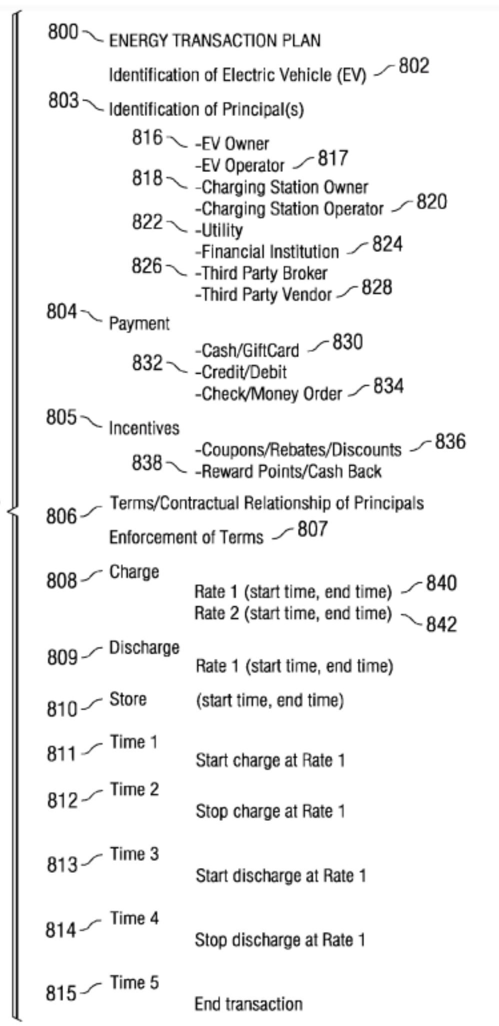
device 212 "provide[s] a connection for user input.…" *Ferro*, [0043]. A user "may use an input/output device[,]" such as I/O unit 212 of data processing system 200 when "located on-board the electric vehicle to create preferences." *Ferro,* [0093], [0139]. The on-board I/O device is used by the user "for maintaining, inputting, storing, and retrieving preferences that are used to manage the charging…of electric power associated with the electric vehicle." *Ferro,* [0039]. The user inputting the preferences is a "principal" of the charging transaction, such as a "vehicle operator[.]" *Ferro,* [0080]. These preferences may include the "[t]ime 512 preferences[,]" such as the "time of day" for charging or the "time of day to stop charging[,]" as well as "[a]mount of charge 514 preferences[,]" such as the maximum and/or minimum desired level of charge in the vehicle. *Ferro,* [0118]-[0122].

80. Ferro generates the dynamic energy transaction plans via a "[d]ynamic energy transaction planner 402," which is a "software component[.]" *Ferro*, [0076]. The planner 402 "creates a transaction plan for controlling a charging transaction for electric vehicle 400 coupled to charging station 403." *Id*. The planner 402 uses "inputs, including" the set of preferences, "device capabilities 416, and current state of device 422" to generate the dynamic energy transaction plan 424. *Ferro,* [0113], [0143]; *see also,* [0142]-[0143], FIG. 9. The current state of device 422 information comes from "energy data services 418" and includes "charging station prices" and

"present and projected energy rates, including fees[.]" *Ferro,* [0101], [0112]. Thus, planner 402 uses the current cost of electricity when generating the transaction plan. *Ferro,* [0037] (disclosing vehicle 116 sending and receiving data associated with the charging of the electric vehicle, including "the price of electricity received from a power grid").

81. Ferro provides an exemplary energy transaction plan 800 created by planner 402, which includes information for "managing an electric vehicle charging transaction[:]"

FIG. 8



*Ferro*, [0136]. For example, the plan 800 includes time fields 811-815 indicating times at which to start and stop charging and/or discharging of the electric vehicle. *Ferro,* [0136], [0138]-[0139].

82. The dynamic energy transaction planner 402 "iteratively receives updated charging transaction information and updates the updated dynamic energy transaction plan with a new set of terms[.]" *Ferro*, [0068]. For example, the dynamic energy transaction plan 424 responds to "changing conditions to maximize the benefits of charging[,]" such as "tak[ing] into account" factors like " the time of use price" so as to charge an EV "when electricity rates are lower" while still ensuring it "will have sufficient charge to return to the operators home[.]" *Ferro*, [0098], [00152]. Ferro provides an example where an operator of the vehicle indicates in their "preferences" that they will be gone for 2 weeks and want the vehicle "fully charged by 7:00 p.m. on the day the operator will return." *Ferro,* [0114]-[0115]. Using this information, the planner 402 "monitors the price of electricity and charges electric vehicle 400" when the price of electricity "is low" during the 2 week period. *Ferro,* [0115]. Thus, Ferro "modifies" the transaction plan to create an updated plan, in view of the changing and/or fluctuating price of electricity. *Ferro,* [0114]-[0115]; *see also,* [0148]-[0150], FIG. 12.

83. To improve user convenience, "an on-board system" is used for "maintaining, inputting, storing, and retrieving preferences" for "charging" the EV

in Ferro's system. *Ferro*, [0093]. Certain preferences further improve user charging convenience (e.g., "certain charging stations the user prefers to fully charge electric vehicle 400" which are in "proximity to the user's home"). *Ferro*, [0088].

84. 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.

85. As discussed above, the field of endeavor of the claimed invention of the '987 Patent includes managing vehicle systems, including EV charging. *See* ¶¶ 35-36, 39. As demonstrated above, Ferro is directed to managing vehicle systems, such as managing EV charging, by generating dynamic energy transaction plans that control the charging of the vehicle. Thus, Ferro is in the same field of endeavor as the claimed invention of the '987 Patent. Ferro is also reasonably pertinent to the problems solved by the inventors of the '987 Patent. As discussed above, the '987 Patent is directed to solving the problem of user-friendly charging schedule generation. *See* ¶ 41. As demonstrated above, Ferro proposes a system for developing dynamic transaction plans to charge an electric vehicle according to user charging preferences, which provides less expensive and customized vehicle

charging. Thus, a POSITA would have consulted Ferro and applied its teachings when faced with the problem of generating charging schedules that are user-friendly.

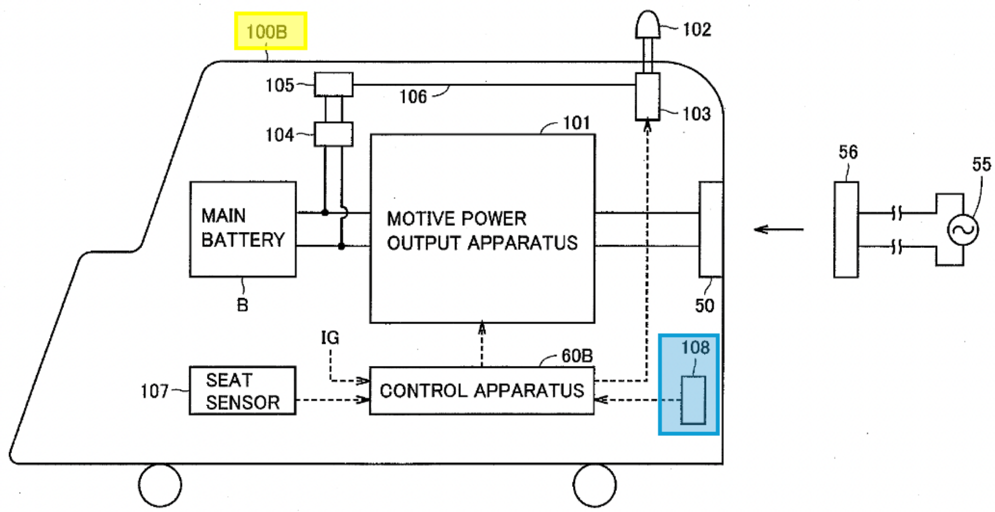
### B. Oyobe

86. I have been instructed by counsel that Oyobe is prior art to the challenged patent.

87. Oyobe describes an electric-powered vehicle. *Oyobe* (Ex. 1005), [0001]. The electric-powered vehicle includes an "information portion" on the vehicle exterior that enables the vehicle user to "easily recognize at the outside of the vehicle the necessity of charging the electric power storage apparatus." *Oyobe*, [0007]-[0008]. Oyobe teaches the electric-powered vehicle "includes a vehicle position detection portion detecting whether or not the electric-powered vehicle is parked at a location where charging equipment is installed." *Oyobe*, [0019]. A "control portion" outputs an "operation command to the information portion based on a state of charge" of the electric-powered vehicle, which is output "when the vehicle position detection portion detects that the electric-powered vehicle is parked at the [charging] location[.]" *Oyobe*, [0007], [0019].

88. FIG. 16 is "a schematic block diagram of a hybrid vehicle shown as one exemplary electric-powered vehicle", which depicts "hybrid vehicle 100B", a "vehicle position detecting apparatus 108, and a control apparatus 60B". *Oyobe*, [0141].

FIG.16




*Oyobe*, FIG. 16 (annotated). Oyobe discloses the vehicle position detecting apparatus 108 "may sense that the vehicle is parked at the location where charging equipment is installed based on the communication with a radio apparatus…provided at the location where the charging equipment is installed." *Oyobe*, [0142].

89. As shown above at FIG. 16, Oyobe's hybrid vehicle 100B also includes a main battery. The main battery "is a direct current (DC) power supply" that can be charged. *Oyobe,* [0037]. Main battery B is charged via "alternate current (AC) power that is from a commercial power supply 55 located outside the vehicle and that is received at a connector 50 into DC power[.]" *Oyobe,* [0038]-[0039]. Power supply 55 supplies power to the main battery by a "charging plug 56" that connects to connector 50 on-board the hybrid vehicle. *Oyobe,* [0039]. Oyobe discloses the control apparatus 60B on-board the vehicle "exert[ing] control" for converting the

AC power at connector 50 from "power supply 55 into DC power and to output the same to main battery B[.]" *Oyobe,* [0043]. Thus, because Oyobe discloses control 60B controlling the charging of the hybrid vehicle, Oyobe discloses managing EV charging.

90. 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.

91. As discussed above, the field of endeavor of the claimed invention of the '987 Patent includes managing vehicle systems, including EV charging. *See* ¶¶ 35-36, 39. The '987 Patent describes an "electric charging system" as referring to "any combination of hardware, software," etc. that is "operative to conduct" and/or otherwise facilitate "the charging of one or more vehicles." *'987 Patent,* 3:11-17. As demonstrated above, Oyobe discloses control 60B controlling the charging of the hybrid vehicle. The '987 Patent manages EV charging by detecting when the vehicle is near charging equipment. *'987 Patent,* 9:57-10:3, 16:37-49. Similarly, Oyobe detects when the hybrid vehicle is located near charging equipment. Thus, Oyobe is therefore in the same field of endeavor as the claimed invention of the '987 Patent.

Oyobe is also reasonably pertinent to the problems solved by the inventors of the ’987 Patent. As discussed above, the ’987 Patent is directed to solving the problem of facilitating user-friendly EV charging, by detecting when a vehicle is at charging equipment. *See* ¶ 42. As demonstrated above, Oyobe proposes the use of a detecting apparatus to determine when an electric vehicle is at a location where charging equipment is installed. Thus, a POSITA would have consulted Oyobe and applied its teachings when faced with the problem of facilitating user-friendly EV charging.

### C. Donnelly

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

93. 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), 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.” *Donnelly*, 3:49-54. Donnelly discloses the “inventive features” may be applied to “vehicles other than locomotives, such as cars[.]” *Donnelly,* 26:6-8. Thus, the “integrated method for monitoring, controlling, and/or optimizing” applies for an electrically powered car, such as a “hybrid” vehicle. *Donnelly,* 2:5-7, 1:36-38.

94. Donnelly teaches the "energy storage unit 1003" in the hybrid vehicle "is preferably an electrical energy storage battery pack." *Donnelly*, 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. *Donnelly,* 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[.]" *Donnelly,* 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 charging generator needs to be on or off[.]" *Donnelly,* 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.

95. 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.

*Donnelly*, 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[.]" *Donnelly*, 23:16-20, 23:31-33.

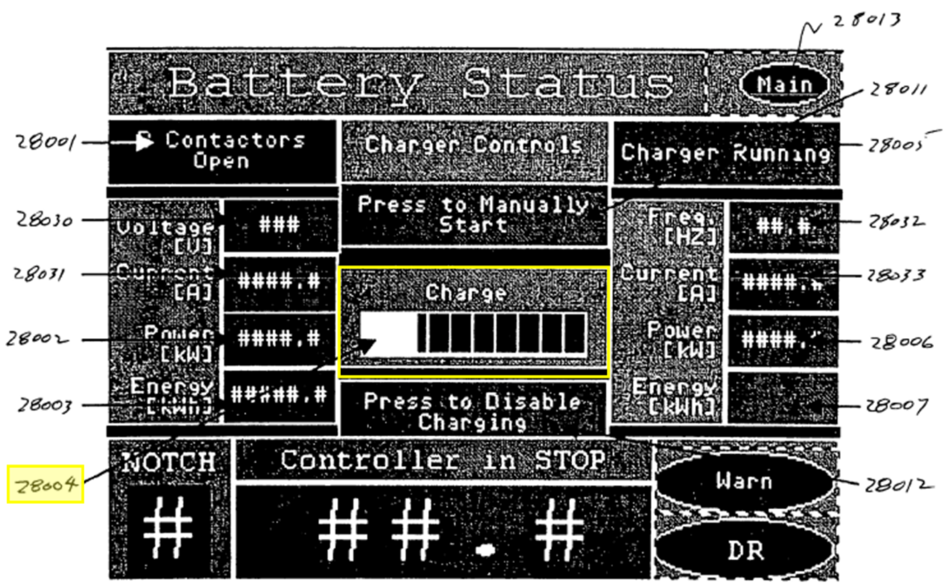



FIG. 28

*Donnelly,* FIG. 28 (annotated).

96. 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.

97. As discussed above, the field of endeavor of the claimed invention of the ’987 Patent includes managing vehicle systems, including EV charging and EV control interfaces. *See* ¶¶ 35-37, 39. 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 ’987 Patent. Donnelly is also reasonably pertinent to the problems solved by the inventors of the ’987 Patent. As discussed above, the ’987 Patent is directed to solving the problem presenting user-friendly EV control interfaces, such as by presenting the charging level. *See* ¶ 43. 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 ’987 Patent describes trains (i.e., locomotives) as an exemplary “electric vehicle.” *’987 Patent,* 3:25-31. Thus, a POSITA would have consulted Donnelly and applied its teachings when faced with the problem of presenting user-friendly EV control interfaces.

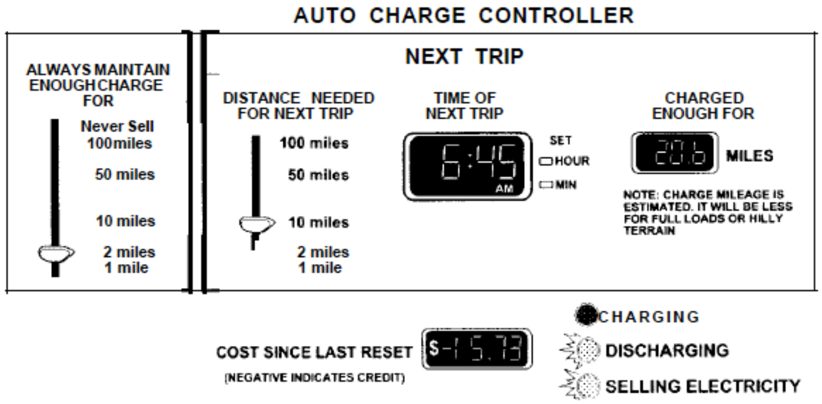
### D. Letendre

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

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

> 1) power connection for electrical energy 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*, 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." *Letendre*, 18-19. The controller allows the driver to "limit any draw down so travel is not affected." *Letendre,* 19. FIG. 1 depicts an "example control panel" showing the "auto charge controller":




*Letendre*, FIG. 1, 18-19.

100. 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." *Letendre*, 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.

101. 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.

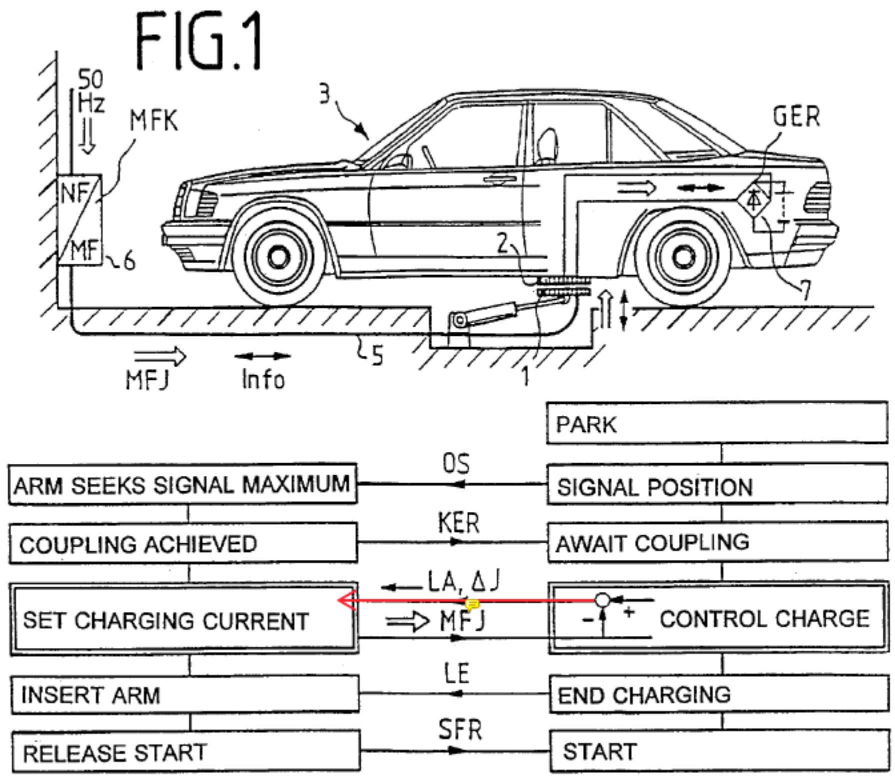
102. As discussed above, the field of endeavor of the claimed invention of the ’987 Patent includes managing vehicle systems, including EV charging and EV control interfaces. *See* ¶¶ 35-36, 39. As demonstrated above, Letendre is directed to managing the charging (and discharging) of an electric vehicle. 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 ’987 Patent disclosing the preferences may be entered using a web page. *Letendre,* 19-20; *’987 Patent,* 19:58-20:2. Thus, Letendre is in the same field of endeavor as the claimed invention of the ’987 Patent: managing vehicle systems, including EV charging and EV control interfaces. Letendre is also reasonably pertinent to the problems solved by the inventors of the ’987 Patent. As discussed above, the ’987 Patent is directed to solving the problem of presenting user-friendly EV control interfaces, including inputting user-selected preferences for charging. *See* ¶ 43. 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.

**E. Seelig**

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

104. U.S. Patent No. 5,654,621 to Seelig describes a system and method for wirelessly charging an electric vehicle. *Seelig*, Abstract. More specifically, 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*, 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." *Seelig*, 1:17-22.




*Seelig,* 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 300 of the battery." *Seelig*, 3:51-54, FIG. 3.

105. Again referencing FIG. 1, Seelig teaches "a method…for contactless energy transmission" which involves 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." *Seelig*, 6:29-32, FIG. 1.

106. 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.

107. As discussed above, the field of endeavor of the claimed invention of the ’987 Patent includes electric vehicle charging systems, as well as managing charging of the electric vehicle. *See* ¶¶ 35-36, 39. 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 ’987 Patent.

108. Seelig is also reasonably pertinent to the problems solved by the inventors of the ’987 Patent. As discussed above, the ’987 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* ¶ 45. As demonstrated above, Seelig proposes a wireless charging system, which eliminates the need for the user to exit 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.

**F. Knockeart**

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

110. Knockeart discloses "a removable device, such as a PDA, cellphone or similar device, in conjunction with a driver information system." *Knockeart* (Ex. 1010), 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[.]" *Knockeart*, 4:49-67. The removable personal device 160 may couple and communicate with the in-vehicle system 105 via a wireless link. *Knockeart,* 3:23-28, 7:1-9, 13:57-60.

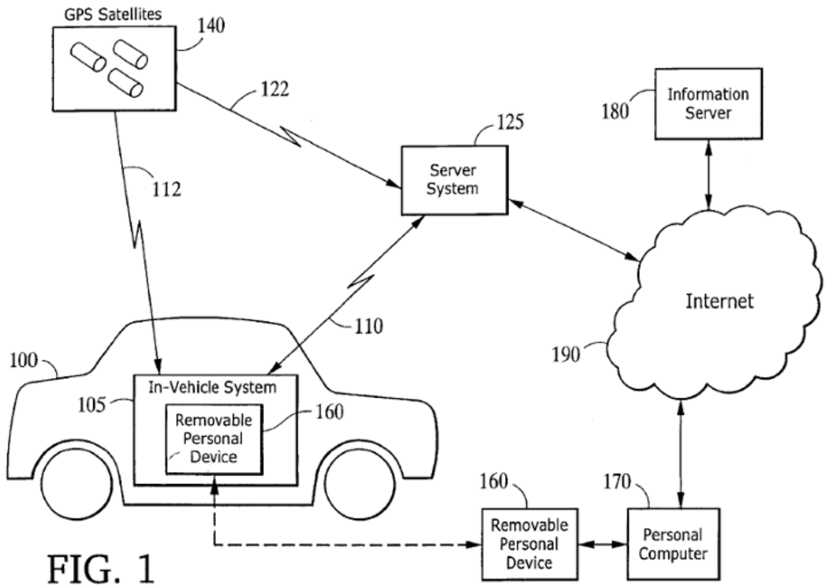



FIG. 1

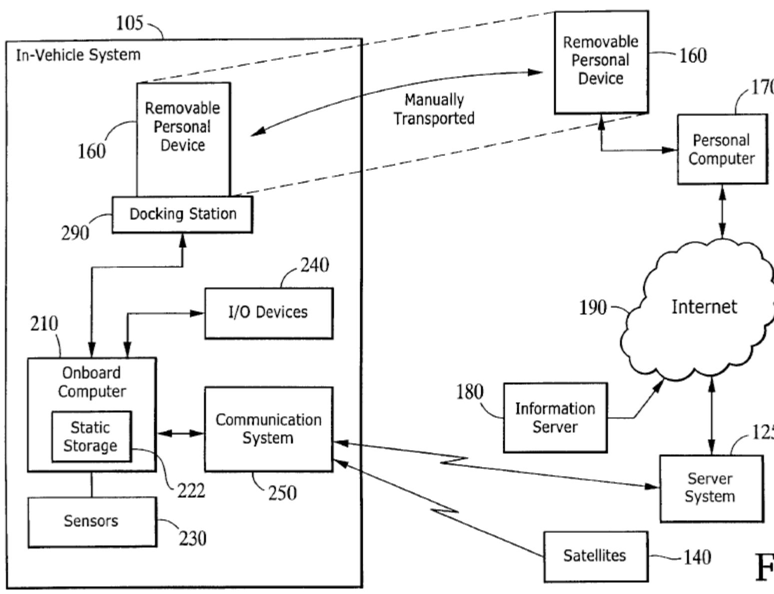



FIG. 2

*Knockeart*, 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." *Knockeart*, 4:53-57.

The graphical display can be a "touch-screen that is used by the operator for manual input to the system." *Knockeart*, 4:57-59.

111. 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.

112. As discussed above, the field of endeavor of the claimed invention of the '987 Patent includes managing vehicle systems, including managing communication of a user's personal device with the vehicle's information system. *See* ¶¶ 38-39. 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 '987 Patent. Knockeart is also reasonably pertinent to the problems solved by the inventors of the '987 Patent. As discussed above, the '987 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* ¶ 44. 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** |
|---|
| **<u>Ground 1</u>:** Claims 1-4, 6-11, 13-18, 20-27, and 29-30 Are Obvious Under § 103 Over Ferro, Oyobe, Donnelly, Letendre, and Seelig |
| **<u>Ground 2</u>:** Claims 5, 12, 19, and 28 Are Obvious Under § 103 Over Ferro-Oyobe-Donnelly-Letendre-Seelig and further in view of Knockeart |

## IX. OVERVIEW OF FERRO'S ARCHITECTURE

113. In my opinion, Ferro's Figures 1-4 disclose various hardware and software components, including logical components, of the electric vehicle charging transaction. Figure 1 of Ferro outlines an exemplary "network of data processing system[s]" carrying out the dynamic energy transaction plan system:

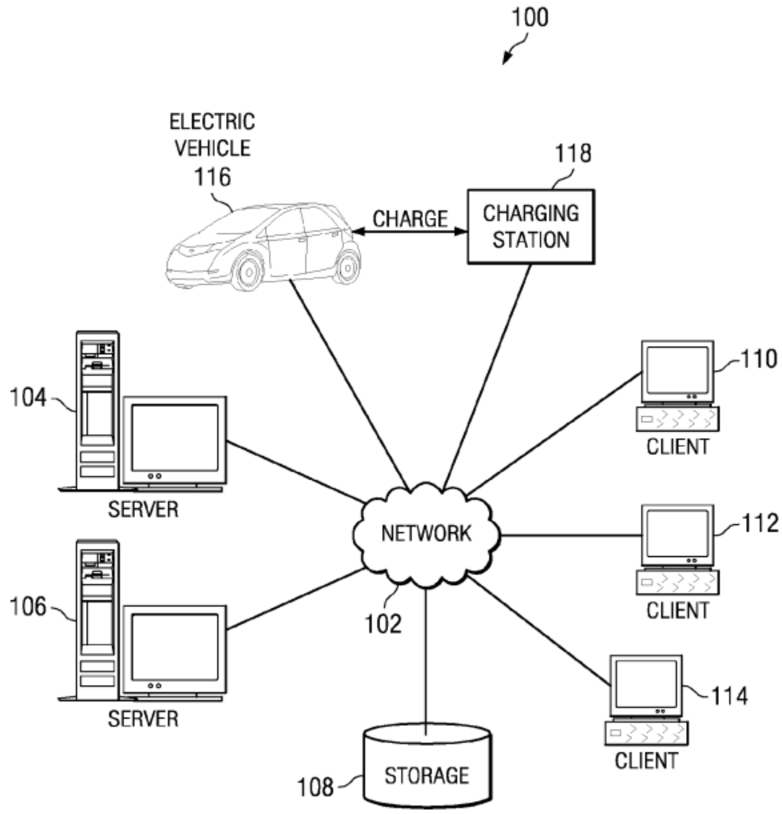



*FIG. 1*

*Ferro,* [0032], FIG. 1. As shown in the figure, the network system 100 is "a network of computers in which the illustrative embodiments may be implemented[,]" and contains network 102 that provides communications links between various devices/data systems within the network 100. *Ferro,* [0032]. The network system 100 includes charging station 118 and electric vehicle 116, among other devices, and charging station 118 provides electric "CHARGE" to vehicle 116. *Ferro,* [0035].

114. Fig. 2 illustrates an exemplary data processing system 200 in network 102, which is "an example of a computer, such as server 104 or client 110 in FIG. 1":

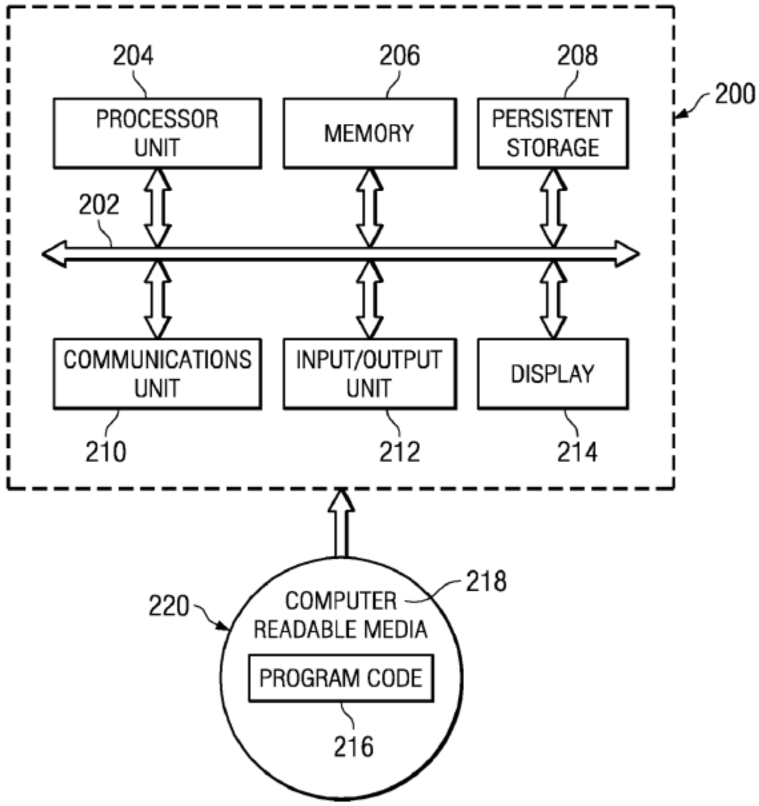



*FIG. 2*

*Ferro,* [0039], FIG. 2. Data processing system 200 may be "implemented as a computing device on-board" electric vehicle 116. *Ferro,* [0039]. Thus, Fig. 2 illustrates various hardware of an exemplary data processing system 200 within network 102 and the data processing system may be on-board the electric vehicle. *Ferro,* FIG. 2.

115. Ferro's FIG. 3 illustrates an energy transaction infrastructure 300 that is a "charging infrastructure for managing all phases of an electric vehicle charging transaction":

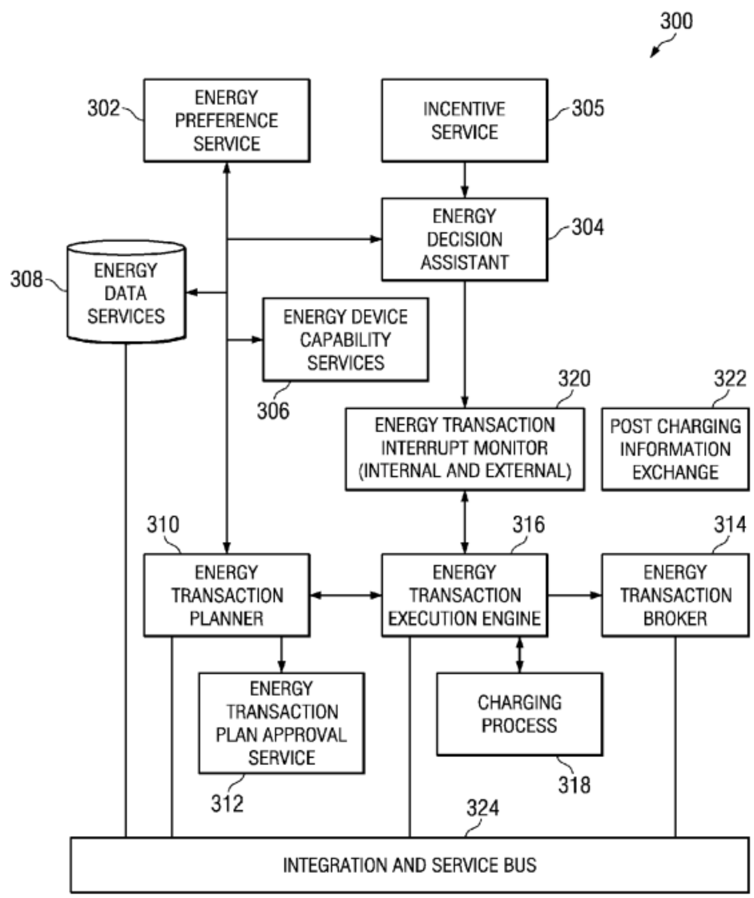



*FIG. 3*

*Ferro,* [0052], FIG. 3. The infrastructure includes an energy transaction planner 310. *Ferro,* [0059]. Ferro discloses the "components shown in FIG. 3 **may be implemented on a <u>data processing system</u>** associated with an electric vehicle." *Ferro,* [0064].

116. Because Ferro teaches that "[t]he present invention is described below with reference" to the Figure's various flowcharts and block diagrams, and further because Ferro teaches that "[i]t will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks…can be

implemented by computer program instructions," (*see* [0028]) it is my opinion that data processing system 200 discussed for Ferro's FIG. 2 is an exemplary "data processing system" that may implement the components of FIG. 3, per Ferro, [0064]. Because the data processing system 200 may be implemented as a computing device "on-board" electric vehicle 116, data processing system 200 is associated with electric vehicle and implements the infrastructure 300 of FIG. 3. *Ferro,* [0039].

117. Ferro's FIG. 4 provides specific examples of components of infrastructure 300, such as dynamic energy transaction planner, being "on-board an electric vehicle[.]" *Ferro,* [0076]. Ferro refers to electric vehicle 400 of FIG. 4 as an electric vehicle, "such as" vehicle 116 in FIG. 1. *Id.* Ferro further discloses dynamic energy transaction planner 402 of FIG. 4 is a "software component[,]" such as "dynamic energy transaction planner 310 in FIG. 3." *Id.* Other FIG. 4 components are exemplary of components in FIG. 3, such as "energy device capability service 412" to energy device capability services 306 and "energy data services 418" to energy data services 308:

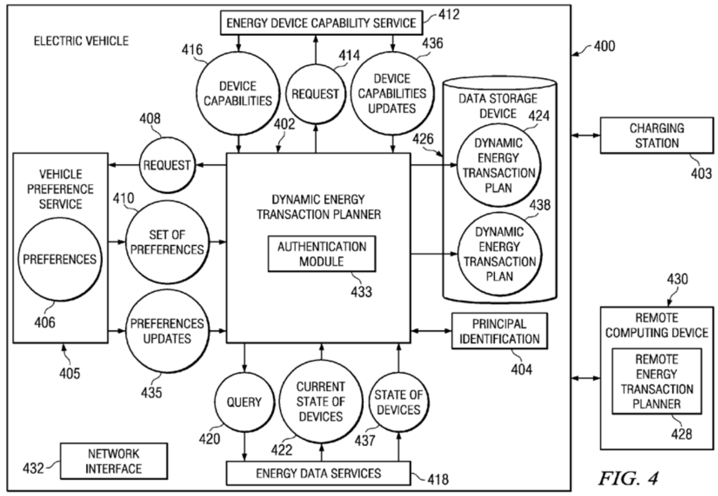


FIG. 4

*Ferro,* FIG. 4.

118. Given (1) Ferro's data processing system 200 implements the components in infrastructure 300 and may be implemented on-board electric vehicle 116 and (2) FIG. 4 provides a specific example of infrastructure from FIG. 3 being applied on-board vehicle 400, a POSITA would have understood data processing system 200 implements the energy transaction infrastructure inside vehicle 400, as shown in FIG. 4, including the dynamic energy transaction planner 402. Thus, data processing system 200 is an exemplary data processing system that implements the exemplary infrastructure components of vehicle 400, as shown in FIG. 4.

119. FIG. 4 also shows various "preferences 406" managed by "vehicle preference service 405," which is on-board vehicle 400. *Ferro,* [0082], [0084], FIG. 4. Given data processing system 200 implements the infrastructure of FIG. 4, data processing system 200 implements the vehicle preference service 405 of vehicle 400. FIG. 5 illustrates examples of "electric vehicle charging preferences[,]" and the

preferences 500 of FIG. 5 are "types of preferences that may be included within preferences for one or more users, such as preferences 406 in FIG. 4." *Ferro,* [0118]. Thus, preferences 500 are exemplary preferences of preferences 406.

120. Thus, data processing system 200 is connected to network 102 and implements the energy transaction infrastructure 300 on-board the vehicle, as shown in FIG. 4.

# X. OPINIONS REGARDING GROUND 1: OBVIOUSNESS OF CLAIMS 1-4, 6-11, 13-18, 20-27, 29-30

## A. Claim 1 Is Obvious Over Ferro in Combination with Oyobe, Donnelly, Letendre, and Seelig

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

121. Ferro teaches an *electrical charging system*[2]; namely, a "method, apparatus, and computer program product for generating a dynamic energy transaction plan to manage an electric vehicle charging transaction" that is implemented via data processing system 200 of FIG. 2 within vehicle 116/400 and charging station 118/403. *Ferro,* Abstract, [0008], [0025] (describing the "invention may be embodied **as a system**"), [0028] (describing "apparatus" as "systems"). The vehicle 116/400 is charged according to the transaction plan generated via transaction planner 402, using charging station 118/403:

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[2] Claim terms are italicized.

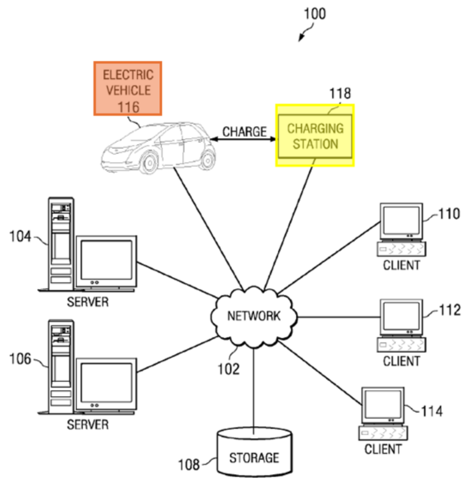



FIG. 1

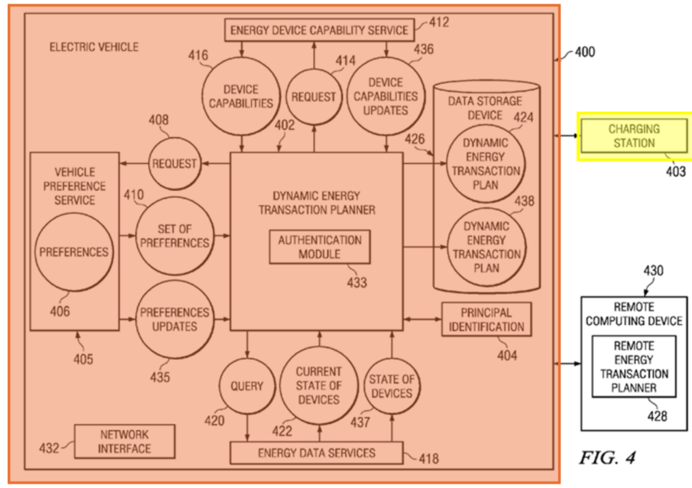



FIG. 4

*Ferro,* FIG. 1,4 (annotated to show vehicle 116/400 (orange) and charging station 118/403 (yellow)).

122. Ferro's data processing system 200 is "implemented as a computing device on-board an electric vehicle":

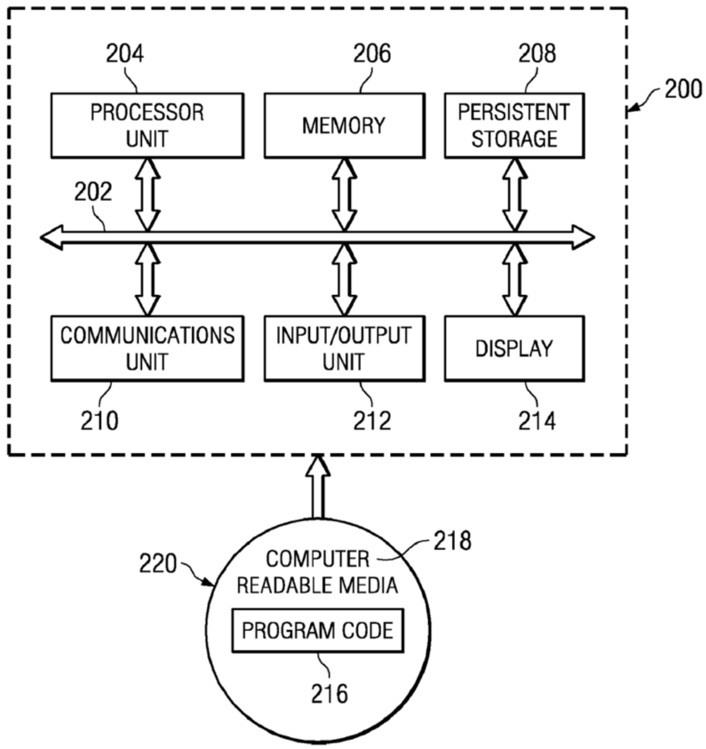



*FIG. 2*

*Ferro,* FIG. 2, [0039].

### *2. Claim 1[a]: "a vehicle sensor"*

123. Ferro, as modified by Oyobe, renders *a vehicle sensor* obvious, as discussed below. Namely, Ferro's transaction system is modified to include Oyobe's wireless detector 108 in the vehicle 116/400 to wirelessly interrogate a radio apparatus at the charging station 118/403 to detect when the vehicle is parked near the charging station 118/403.

#### a) Ferro's Teachings

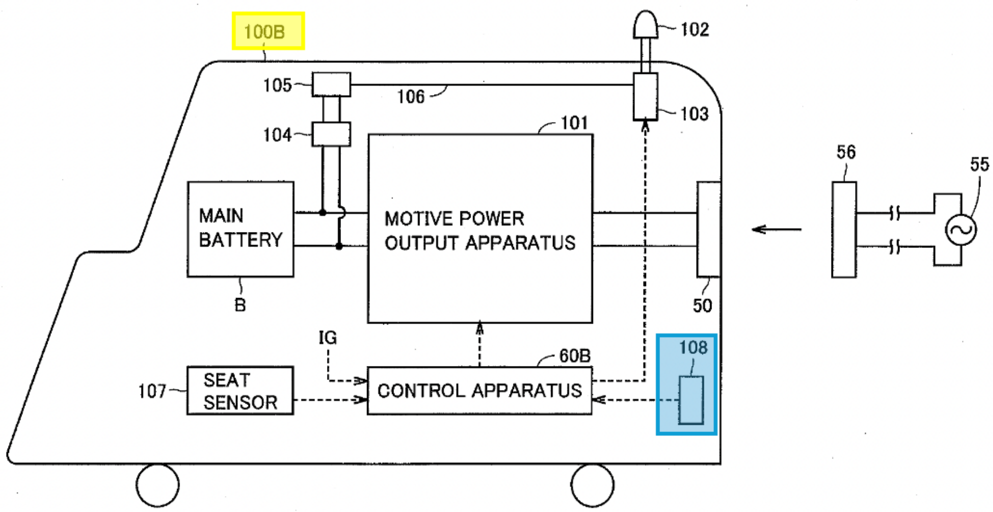
124. Ferro teaches electric vehicle 116/400 being charged via charging station 118/403. *Ferro,* [0035], [0076]. The vehicle 400 may indicate "an intention

to charge" when it arrives at charging station 403. *Ferro,* [0109]. For example, the vehicle 400 may indicate intention to charge by "plugging into an electric outlet" at the charging station 403, selecting a charging option input to the station 403, informing the operator of station 403, or otherwise indicating a desire to "begin a charging transaction." *Id.* The vehicle 116 and station 118 may connect to network 102 and "send and receive data associated with the charging of electric vehicle[.]" *Ferro,* [0037]. A vehicle user may provide "preferences" indicating "any time the **electric vehicle is parked at a charging station** that is at a specified location, the electric vehicle is…to be fully charged." *Ferro,* [0121]. Given the transaction system may utilize user preferences to charge the vehicle when the vehicle is parked at a certain charging station, and Ferro teaches methods for indicating an intention to charge when parked at the charging station, it would have been obvious to modify Ferro to automatically detect that it is at a charging station via a vehicle sensor, for example, as described in Oyobe discussed below.

**b) Oyobe's Teachings**

125. Oyobe teaches a *vehicle sensor*; namely, vehicle position detecting apparatus 108 located on "hybrid vehicle 100B[.]" *Oyobe,* [0141]. As shown below, Oyobe's vehicle position detecting apparatus 108 is internal to the hybrid vehicle 100B:

FIG.16




*Oyobe,* FIG. 16 (annotated to show detecting apparatus 108 (blue) inside hybrid vehicle 100B (yellow)).

126. The detecting apparatus 108 "detects whether or not hybrid vehicle 100B is **parked at the location where charging equipment is installed**." *Oyobe,* [0142]. Detecting apparatus 108 "may sense that the vehicle is parked at the location where charging equipment is installed based on the communication with a radio apparatus (not shown) provided at the location" of the charging equipment. *Id.* When the detecting apparatus 108 detects "the vehicle is parked at" the charging equipment location, the detecting apparatus 108 "outputs a signal of H level to control apparatus 60B[,]" which also forms part of the hybrid vehicle 100B. *Oyobe,* [0141], [0143], FIG. 16.

127. Oyobe's wireless radio communication between the vehicle and charging equipment location is like the '987 Patent's example of a vehicle sensor

being a “communication device” that utilizes “wireless interrogation” to “detect an arrival, proximity, and/or presence of the vehicle.” *’987 Patent,* 9:57-60, 9:66–10:3; *see also,* 16:37-42 (describing the vehicle sensor detecting a proximity of the vehicle via “wireless electronic transmission sensing”). Thus, Oyobe’s wireless interrogation via the detecting apparatus 108 teaches a *vehicle sensor*.

**c) Motivation to Combine**

128. Ferro teaches methods of indicating an intention to charge and already discloses communication of information between the charging station and vehicle. Oyobe provides a specific way of implementing the communication between the vehicle and charging station. A POSITA would have found it obvious and been motivated to include Oyobe’s detecting apparatus 108 in Ferro’s electric vehicle 116/400 to detect when the vehicle is parked at a charging station, as taught in Oyobe. The modification combines prior art elements (wireless interrogation, EV charging stations, EVs) according to known methods to yield predictable results of allowing the vehicle to indicate “an intention to charge” without operator intervention. *Ferro,* [0109]. For example, Ferro provides various examples of the vehicle indicating an intention to charge, all requiring some level of user interaction: getting out of the vehicle to provide an input to a charging station, physically plugging the vehicle in to the external outlet, talking to the station operator, or inputting user preferences indicating at which station to charge the vehicle. *Ferro,*

[0109], [0121]. A POSITA would appreciate the increased accessibility and efficiency provided by employing wireless interrogation to detect when the vehicle is parked to indicate an intention to charge the vehicle. In this way, an intention to charge the vehicle would be automatic, thus requiring no or limited user interaction to initiate the charging process.

129. Furthermore, Ferro discloses employing "wireless" charging to charge the vehicle 116/400. *Ferro,* [0036]. Wireless charging for charging EVs was well-known prior to July 13, 2009. *See, e.g., Tseng* (Ex. 1050), 1:58-2:11 (describing utilizing wireless charging to charge an "electric vehicle"); *Hyogo* (Ex. 1051), 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), 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"). Thus, a POSITA would have also appreciated limiting user interaction to indicate an "intention to charge" would simplify and make the process more efficient during wireless charging. A user would desire a simplified charging process relying on wireless interrogation and that does not require exiting the vehicle, such as during inclement weather or at night. Thus,

a POSITA would have been motivated to apply Oyobe's wireless interrogation via apparatus 108 to detect when the vehicle is parked at the charging station to advantageously allow a user to charge without having to exit the vehicle and without having to manually interact with the external charging station.

130. Because Ferro's vehicle 116 sends the "current charge" to the station 118, a POSITA would have appreciated including wireless interrogation in Ferro to detect when the vehicle was actually parked at a charging station to ensure the vehicle only sent charging information when necessary. Furthermore, automatically detecting when vehicle 116/400 is near charging station 118/403 to indicate an intention to charge would make the user aware they are parked at charging equipment, even if the user does not know initially. For example, a user may park at a gas station for another purpose and be unaware that there is charging equipment at the parking spot. A POSITA would appreciate Oyobe's wireless interrogation automatically detecting that the vehicle is parked near charging equipment to increase charging accessibility, when a user does not know they have parked near charging equipment.

131. The modification would have had a reasonable expectation of success, as Ferro already teaches the charging station and vehicle being "connected to network 102" to "send and receive data associated with the charging of electric vehicle[.]" *Ferro,* [0037]. Because the network 102 may be wireless, a POSITA

would understand the charging station 118/403 and vehicle 116/400 are wirelessly connected via network 102. Furthermore, vehicle 116/400 includes a network interface 432 for allowing vehicle 116/400 to connect to network 102. *Ferro,* [0106], FIG. 4. Thus, network interface 432 allows vehicle 116/400 to access/communicate with station 118/403 via network 102. *Ferro,* [0037], [0106]. A POSITA would not have found it challenging to connect Oyobe's detecting apparatus 108 with network 102 to thereby send/receive information with the station 118/403. *See, e.g., Sutardja,* [0232] (describing using network connections, such as local area networks (LANs) to allow components on vehicles to "communicate with utility companies"), [0244]-[0245], [0260] (describing a "power meter" having a "wireless network interface module" that allows the meter to communicate via a LAN).

132. Because Ferro teaches the charging station already communicating with the vehicle via network 102 and teaches wireless communication via a network interface (e.g., interface 432) was well known, a POSITA would have found the modification straightforward and simple. The modification would have required including a similar radio apparatus in Ferro's charging station 118/403 to wirelessly communicate with the detecting apparatus 108 in Ferro's modified electric vehicle. Modifying the charging station to include a wireless radio apparatus to communicate with the apparatus 108 of modified Ferro would not have been challenging, given charging stations were known to wirelessly communicate with vehicles. *Taylor-Haw*

(Ex. 1053)*,* 19:31-20:2 (describing a "preferred embodiment" of a charging station as enabling "electronic or digital communication with the vehicle," such as by "wireless communication"); *Hoelzl* (Ex. 1054)*,* 7:22-25 (describing providing "bi-directional wireless information exchange" between a "charging station" and "vehicle" via transmitter/receiver). Thus, such a modification to the charging station 118/403 would have also been straightforward and simple. For example, the detector and radio apparatus may wirelessly communicate via RFID or employ simple transmitting/receiving when a vehicle is in range.

#### ***3. Claim 1[b]: "a communication device"***

133. Ferro teaches *a communication device*; namely, the collective: (1) communications unit 210, which may be a network interface card, and (2) communications fabric 202 that may comprise one or more buses, all comprised within the data processing system 200. *Ferro,* [0040], [0042], [0049]. Network interface 432 of vehicle 400 is an exemplary network interface card. *Ferro,* [0106], [0076]. Integration and service bus 324 is an exemplary bus. *Ferro,* [0064]. Data processing system 200 may be "a computing device on-board" electric vehicle 116/400 and is an "example of a computer." *Ferro,* [0039]; *See* ¶ 114.

##### **a) Communications Unit 210, Including Network Interface 432**

134. Data processing system 200 includes communications unit 210 and communications fabric 202:

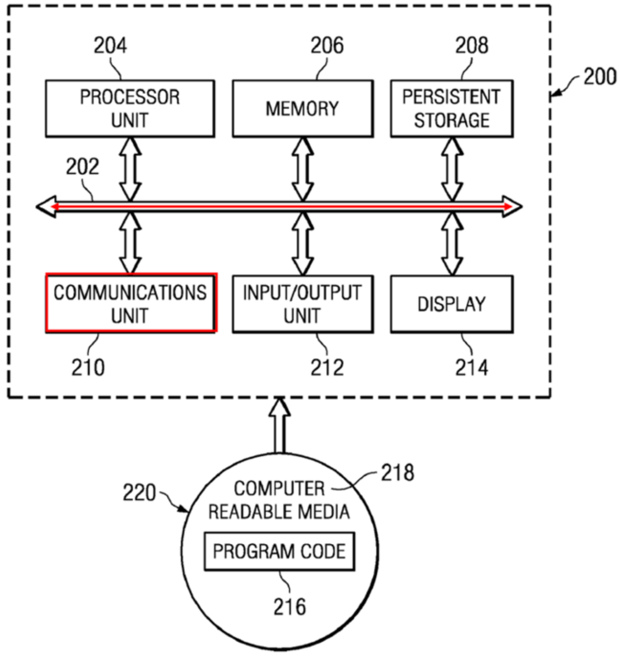



*FIG. 2*

*Ferro,* FIG. 2 (annotated), [0040].

135. The communications unit 210 may be a "network interface card" and provides communication "with other data processing systems or devices." *Ferro,* [0042]. Communications unit 210 may "provide communications" through "both physical and wireless communications links." *Id.*

136. In the "on-board" vehicle embodiment shown in FIG. 4, Ferro discloses a network interface 432 being in vehicle 400 that is "any type of network access software known or available for allowing electric vehicle 400 to access a network." *Ferro,* [0106]. FIG. 4 is a "block diagram of a dynamic energy transaction planner on-board an electric vehicle[,]" with planner 402 being a "software component[,]" such as planner 310. *Ferro,* [0076]; *see* ¶ 117.

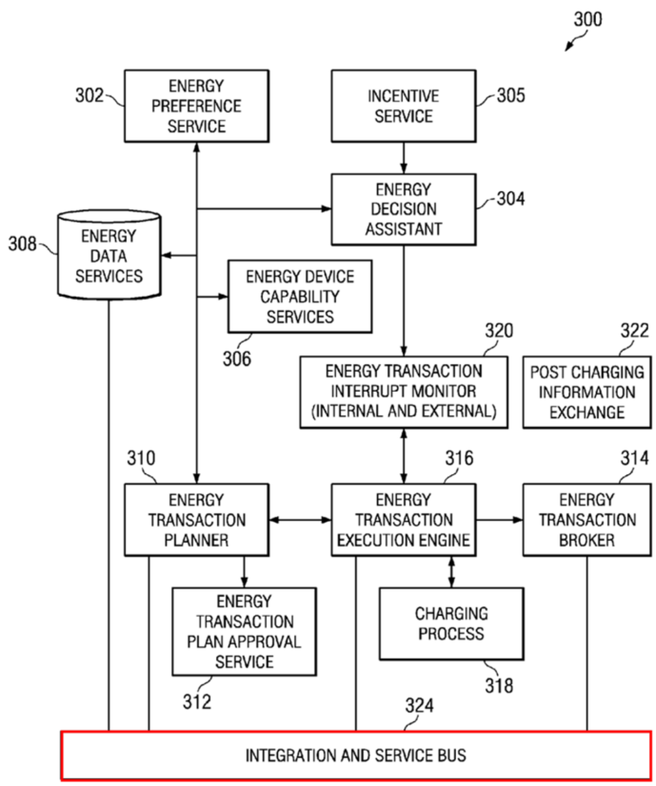
137. As discussed above, data processing system 200 implements the infrastructure 300 inside vehicle 400, such as planner 402/310, when "on-board" the vehicle. *Ferro,* [0039], [0076]; *see* ¶ 118. Thus, because (1) communications unit 210 may be a network interface card providing communications with other devices and (2) network interface 432 provides similar network communication between vehicle 400 and "other remote servers and/or client computing devices[,]" a POSITA would have understood or found it obvious network interface 432 is an exemplary network interface card forming communications unit 210 of data processing system 200. *Ferro,* [0106]. Network interface 432 serves the same purpose as communications unit 210 of providing communication between various computing devices. *Compare Ferro,* [0106] *with* [0042]. Additionally, Ferro discloses the communication unit 210 may be a network interface card, further indicating network interface 432 is an exemplary network interface card of communications unit 210. *Ferro,* [0042]. Thus, for these reasons and because data processing system 200 implements the components of vehicle 400, a POSITA would have found it obvious or understood network interface 432 ¶ 118 is an example of communications unit 210.

#### b) Communications Fabric 202, Including Bus 324

138. Communications fabric 202 "provides communications" between various hardware of the data processing system 200. *Ferro,* [0040]. Ferro discloses "a bus system may be used to implement communications fabric 202," which may

include "one or more buses, such as a system bus or an input/output bus." *Ferro,* [0049]. The "bus system" of communications fabric 202 may be "implemented using any suitable type of architecture that provides" for data transfer between different components "attached to the bus system." *Id.*

139. FIG. 3 is a "block diagram of an energy transaction infrastructure[.]" *Ferro,* [0052]. Block diagrams of Ferro "can be implemented by computer program instructions." *Ferro,* [0028]. The "components shown in FIG. 3" are implemented by data processing system 200 "associated with" (e.g., on-board) electric vehicle 116. *Ferro,* [0064]; ¶ 136-138. When the FIG. 3 components are implemented via data processing system 200 associated with the electric vehicle, "the components communicate and transfer data using integration and service bus 324[:]"




*Ferro,* FIG. 3 (annotated). The integration and service bus 324 is "an internal communication system within the electric vehicle" that may be a "wired communications system[,]" such as a "data bus[.]" *Ferro,* [0064].

140. Because data processing system 200 may implement the components of FIG. 3 when "associated with" (e.g., on-board) the vehicle, and fabric 202 may be a bus system, a POSITA would have understood or found it obvious that integration and service bus 324 is an exemplary bus forming communications fabric 202 of data processing system 200. Bus 324 provides the same function as fabric 202 by providing communication between internal components attached to the bus. *Ferro,* [0064], [0049], [0039]. Furthermore, both bus 324 and fabric 202 are

disclosed as being a "bus" for communicating "data" between components of the system. *Compare Ferro,* [0064] *to* [0049]. Additionally, because data processing system 200 implements the components of FIG. 3, which include bus 324, a POSITA would have understood the bus 324 is an example bus implemented via fabric 202. Thus, for these reasons, a POSITA would have found it obvious or understood bus 324 is an exemplary bus forming fabric 202.

#### *4. Claim 1[c]: "a processor in communication with the vehicle sensor and the communication device"*

##### a) Processor in communication with the communication device

141. Ferro teaches a *processor*; namely, processor unit 204 of data processing system 200:

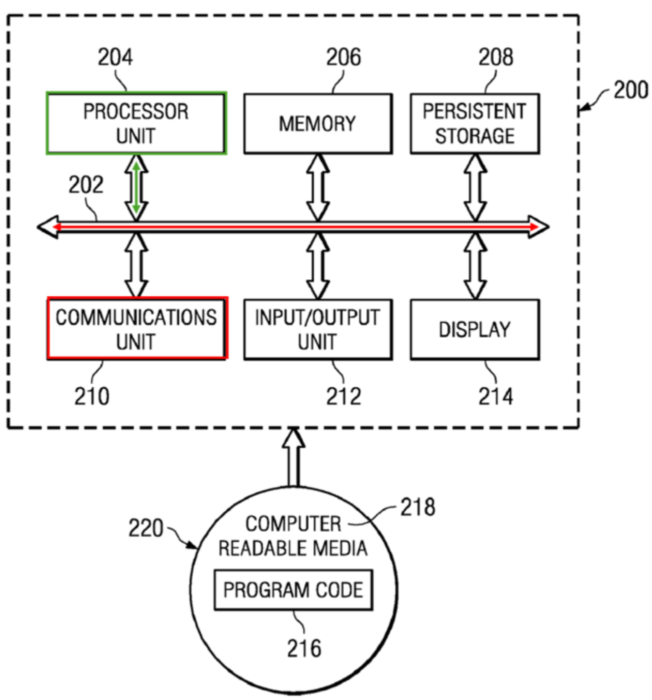



*FIG. 2*

*Ferro,* [0040], FIG. 2 (annotated). Processor unit 204 "serves to execute instructions for software that may be loaded into memory 206" and may be "a set of one or more processors or may be a multi-processor core." *Ferro,* [0040], [0044] (describing processor unit 204 "execut[ing]" instructions loaded into memory 206 and processes of "different embodiments" of the transaction plan system "may be performed by processor unit 204"). "A data processing system…will include at least one processor coupled directly or indirectly to memory elements through a system bus." *Ferro,* [0161].

142. Ferro's *processor* is *in communication with* communications fabric 202, which forms part of Ferro's *communication device*. Communications fabric 202 "**provides communications between processor unit 204**" and various other components of the data processing system 200, such as memory 206. *Ferro,* [0040]. Communications fabric 202 is a bus system, such as exemplary bus 324, and provides communication between different components attached to the bus system. *See* Section X.A.3.b). Because processor 204 is connected to the communications fabric 202, as shown in FIG. 2, and fabric 202 facilitates communication between the processor 204 and other system 200 components, a POSITA would have understood the processor 204 *is in communication with* communications fabric 202. Furthermore, buses, such as communications fabric 202, were known to be used for facilitating communications between various computer hardware components,

including a processor. *See, e.g., McPherson* (Ex. 1055), 2 ("A ***bus*** is the path through which a device sends its data so that it can **communicate with the CPU** and/or other devices"); *History* (Ex. 1056), 3 (describing common components of a "computer" as including "a communications network, called a 'bus,' **that links all the elements of the system[**,]" including the memory and central processing unit). Thus, a POSITA would have understood the bus system, such as bus 324, forming communications fabric 202, is *in communications with* processor 204.

143. Processor unit 204 is also *in communication with* communications units 210 of Ferro's *communication device*. Fabric 202 "**provides communications <u>between</u> processor unit 204" and "communications unit 210**." *Ferro,* [0040]. Thus, Ferro expressly discloses the processor unit 204 communicating with communications unit 210. Further, processor 204 executes "[i]nstructions for the operating system and applications or programs" of the data processing system 200, which may be a computer. *Ferro,* [0039]-[0040], [0044]. Communications unit 210 provides wired/wireless communications and is included in data processing system 200. *Ferro,* [0042]. Because the processor unit 204 executes the instructions and various programs of the data processing system 200, a POSITA would understand the processor 204 to instruct communications unit 210 to perform the wired/wireless communication. Thus, the processor unit 204 is *in communication with* the

communications unit 210, at least to instruct the unit 210 to perform the wired/wireless communication.

144. Additionally, Ferro teaches the *processor is in communication with the communication device*, namely the network interface card that allows for communication with remote servers. (*See* Claim 1(b) Mapping, Section (a), mapping that communications unit 210 includes network interface card). The processor 204 instructs communications unit 210 to communicate with various remote servers, such as third-party sources, to transmit/receive information for generating the energy transaction plan. Specifically, Ferro teaches the planner receives charging transaction information, such as charging station device capabilities and state of the charging station device, from third-party sources. *Ferro,* [0072], [0101], [0058] (describing "energy data services 308 are a set of one or more third party data sources providing information relevant to the energy transaction"). Ferro communicates with the third-party sources via, for example, network interface 432, which provides communication between the vehicle and remote servers. *Ferro,* [0106]. Because data processing system 200's processor 204 implements the planner 402 (*See* ¶ 117-118), a POSITA would have understood or found it obvious processor 204 instructs network interface 432 to receive information from the "third party sources" when generating a transaction plan by executing planner 402. *Ferro,* [0076] (describing

planner 402 is a "software component"), [0106] (network interface 432 connects to "remote servers and/or client computing devices).

### b) Processor in communication with the vehicle sensor

145. Per the Mapping of Claim 1(a), the Ferro-Oyobe system includes a *vehicle sensor*. A POSITA would have found it obvious and been motivated to modify Ferro's processor unit 204 to be *in communication with the vehicle sensor*; namely, in communication with Oyobe's detecting apparatus 108. Oyobe teaches detecting apparatus 108 "output[ting] a signal" to the control apparatus 60B when the detecting apparatus 108 "detects that the vehicle is parked at the location where charging equipment is installed[.]" *Oyobe,* [0143]. The control apparatus 60B is internal to the vehicle. *Oyobe,* [0141] (describing "hybrid vehicle 100B further includes" the detecting apparatus 108 and "a control apparatus 60B"), FIG. 16.

146. Oyobe's control 60B "execute[s]" processes, much like a processor executing program code. *Oyobe,* [0050]; *see also, Ferro,* [0044] (describing "processor" unit executing various instructions to "perform" various processes). Because control 60B executes processes, a POSITA would have understood Oyobe's control 60B is at least equivalent to a processor. Thus, a POSITA would have understood Oyobe's detecting apparatus 108 being in communication with control 60B internal to the vehicle satisfies a *processor* being *in communication with the vehicle sensor*.

147. It would have been obvious to modify Ferro's processor unit 204 to be *in communication with* Oyobe's detecting apparatus 108 in the Ferro-Oyobe system, to allow the detecting apparatus 108 to communicate to the processor 204 that "the vehicle is parked at the location where charging equipment is installed[.]" *Oyobe,* [0142]. A POSITA would have understood allowing detecting apparatus 108 to communicate with processor unit 204 would streamline communications within the energy transaction system. Moreover, a POSITA would have understood that if the vehicle sensor (Oyobe's detecting apparatus 108) was not in communication with the processor unit 204, then nothing would happen when the detecting apparatus 108 detected the presence of the vehicle in the parking space, i.e., the vehicle sensor being *in communication with* the processor unit 204 is **essential**. Thus, it would have been obvious to modify Ferro such that the vehicle sensor is *in communication with* the processor unit so that the processor unit can respond to the detection of the vehicle being at the charging station. Furthermore, the processor 204 of data processing system 200 implements the software of planner 402 to generate a charge transaction plan (*see* ¶ 144) and the Ferro-Oyobe system applies the detecting apparatus 108 to indicate an "intention to charge" (*see* Claim 1(a) Mapping, Section (c)). Thus, a POSITA would have found it obvious to send the parked vehicle information to the processor 204 so the processor 204 could immediately start executing the planner 402 to generate a charging transaction plan. *Ferro,* [0076].

This would make the charging transaction more efficient, as the transaction plan would be generated quickly and thus speed up when "the charging phase begins[.]" *Ferro,* [0060].

148. A POSITA would have been motivated to communicate information from the detecting apparatus 108 to processor unit 204 to make the "process for generating dynamic energy transaction plan" more efficient and would be required so that the processor unit 204 can act on the detection of the vehicle being parked at the charging station. *Ferro,* [0109]. For example, once the detecting apparatus 108 detected the vehicle was parked near the charging station, a POSITA would appreciate apparatus 108 sending a signal to processor 204 so the processor 204 of data processing system 200 would "begin" generating the transaction plan immediately and would only begin upon detecting apparatus 108 sensing the vehicle is in the parking space if the detecting apparatus 108 and the processor unit 204 were *in communication*. *Ferro,* [0109], [0059], [0076]. This would make the charging transaction more efficient, as opposed to detecting the vehicle is parked at the charging station and sending no signal to the processor 204, and thus having to wait until the user themselves "indicates an intention to charge[.]" *Ferro,* [0109]. Additionally, the detecting apparatus 108 being *in communication with* the processor unit is necessary as the detection otherwise has no purpose if the detection is not

communicated to processor unit 204 for the processor unit 204 to act on the information.

149. There would have been a reasonable expectation of success in modifying the Oyobe detecting apparatus 108 of Ferro-Oyobe to communicate with the processor unit 204, at least because apparatus 108 already includes necessary hardware and software to send signals to both an internal control apparatus and the external charging station. *Oyobe,* [0142]-[0143]. The modification only requires use of a known technique (communicating a detecting apparatus with a processor) to improve similar devices (electric/hybrid vehicles) in the same way (signal control of vehicle when car is parked near a charging station). As discussed above, the detecting apparatus 108 is included within the vehicle 116/400. *See* Section X.A.2.c. Given processor 204 is internal to the vehicle, all that is required is connecting detecting apparatus 108 to the processor 204, such as via fabric 202, such that the apparatus 108 may communicate with (e.g., send a signal to) the processor 204 when the vehicle is parked at the charging station.

150. Additionally, detecting apparatus 108 is much like an input/output device, given the apparatus 108 outputs a signal to controller 60B. *Oyobe,* [0143]. Because Ferro teaches input/output devices 212 communicating with processor 204 via fabric 202, a POSITA would not have found it challenging to connect another I/O device, such as apparatus 108, to processor 204 such that apparatus 108

communicates with processor 204 via fabric 202. *Ferro,* [0043], [0039]. Additionally, the charging station 118/403 in the modified system already includes a radio apparatus with which the detecting apparatus 108 communicates. *See* ¶ 131-132. Given Oyobe's apparatus 108 senses the vehicle being located at the charging station "based on the communication with a radio apparatus…provided" at the charging station location, it would have been obvious for the detector 108 in the modified Ferro system to communicate with the radio at the charging station (e.g., ping the radio or send a signal to the radio). *Oyobe*, [0142]. Thus, the modification also requires programming the detecting apparatus 108 to ping the radio apparatus at the charging station 118/403 and send a signal to processor 204 indicating when the vehicle is parked at the charging station. *Oyobe,* [0143].

#### 5. Claim 1[d]: "a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to"

151. Ferro teaches a *memory*; namely the collective memory 206 persistent storage 208. Storage device 426 is an example storage device of memory 206 and persistent storage 208, as discussed further below. The "communications fabric 202" provides communication **between processor 204 and "memory 206**" **and "persistent storage 208**," among other hardware components of data processing system 200. *Ferro,* [0040]-[0041], [0161] (describing "processor coupled directly or indirectly to memory elements through a system bus"). Figure 2, annotated below,

illustrates the memory 206 and persistent storage 208 are *in communication with* processor 204, at least via communications fabric 202:

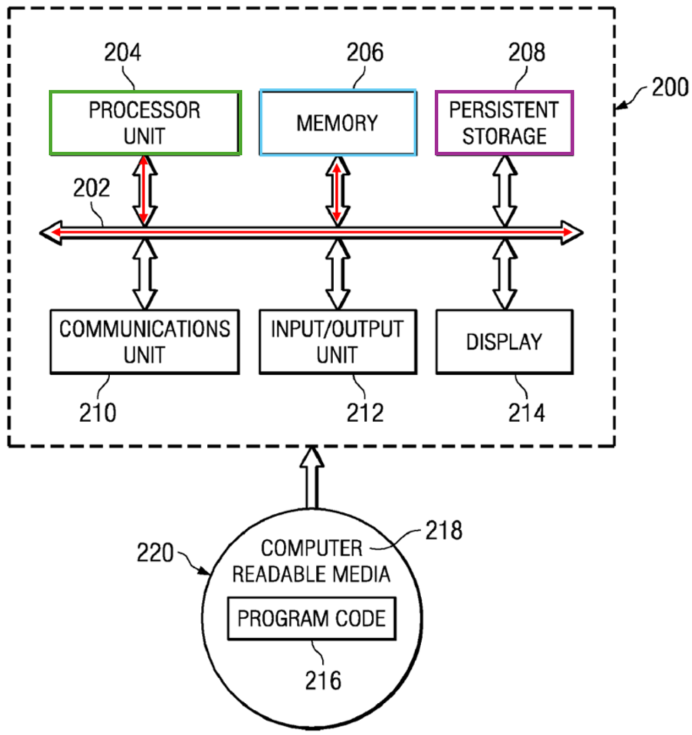



*FIG. 2*

Ferro*,* FIG. 2 (annotated to illustrate processor 204 (green) being in communication with memory 206 (blue) and persistent storage (purple) at least via fabric 202 (red)).

152. Ferro teaches "instructions for the operating system and applications or programs are located on persistent storage 208" initially, and then "may be loaded into memory 206 for execution by processor unit 204." *Ferro,* [0044] (disclosing "[t]he program code in the different embodiments may be" on "memory 206 or persistent storage 208"). Indeed, a POSITA would have understood that a typical computing system, such as system 200, stores program instructions in persistent (i.e.,

permanent) memory that are then read from persistent memory into a dynamic memory for execution by the processor. Thus, because the instructions executed by processor start in persistent storage 208 and then are loaded onto memory 206, the memory 206 and persistent storage 208 together teach *a memory*. Because processor 204 executes instructions loaded into memory 206 from storage 208, a POSITA would have understood memories 206 and 208 are *in communication* with processor 204. *See* Claim 1(c) (Mapping processor unit 204 to the *processor*). Thus, Ferro's processor unit 204 of data processing system 200 is in communication with memory 206 and storage 208 via fabric 202 (i.e., *a memory in communication with the processor*). Furthermore, because the storage 208 stores "instructions" that are then loaded into memory 206 for execution by processor unit 204, Ferro's *memory* stores *instructions* for *execut[ion] by the processor*.

153. Vehicle 400 of FIG. 4 includes a data storage device 426. Because data processing system 200 implements the energy transaction infrastructure 300 exemplified on-board vehicle 400 in FIG. 4, a POSITA would have understood storage device 426 is an example storage device of memory 206 and persistent storage 208. *Id.* Thus, persistent storage 208 and memory 206 teach the *memory,* with storage device 426 being an exemplary memory 206 and persistent storage 208.

154. Ferro teaches "[t]he processes of the different" energy transaction plan system "embodiments may be performed by processor unit 204 using computer

implemented instructions, which may be located in a memory, such as memory 206." *Ferro,* [0044]. Additionally, the data processing system 200 is a computing device on-board vehicle 116 "in which computer-usable program code or instructions implementing the processes" of the "illustrative embodiments" (i.e., the embodiments of the dynamic energy transaction system) may "be located[.]" *Ferro,* [0039], [0002] (describing "the present invention" as "computer usable program code for generating dynamic energy transaction plans for controlling charging an electric vehicle" and the invention is "related generally to an improved data processing system").

155. Because processor unit 204 executes the instructions loaded into memory 206 to perform the energy transaction plan "processes[,]" a POSITA would understand the *instructions when executed by the processor cause the processor to* perform the energy transaction plan system. For example, FIG. 4 illustrates such components as the planner 402 and preference service 405 being "software" for implementing the energy transaction plan. *Ferro*, [0076], [0082]. Thus, because data processing system 200 implements the components of FIG. 4 when on-board the vehicle (*see* ¶ 117-118), a POSITA would have understood the memory 206 of system 200 stores the instructions for implementing the energy transaction plan system, which are executed by processor 204 of the data processing system 200 to cause processor 204 to implement the dynamic energy transaction plan system.

### *6. Claim 1[e]: "receive, from the vehicle sensor, information indicative of a presence of a vehicle in a parking space"*

156. Ferro combined with Oyobe renders obvious Claim 1(e). Oyobe teaches control apparatus 60B (i.e., a processor) receiving a signal from vehicle position detecting apparatus 108 (mapped as *vehicle sensor*, per claim 1(a)) when detecting apparatus 108 "detects that **the vehicle is parked** at the location where charging equipment is installed", i.e., *information indicative of a presence of a vehicle in a parking space*. *Oyobe*, [0143], [0144] ("Control apparatus 60B also receives a detection signal from vehicle position detecting apparatus 108."). As discussed previously, because control apparatus 60B executes processes, much like a processor, control 60B is at least equivalent to a processor. *See* ¶ 146. Thus, Oyobe teaches a processor (e.g., control apparatus 60B) receiving a signal from a vehicle sensor (detecting apparatus 108).

157. Because the processor 204 receives a signal when apparatus 108 detects the vehicle is "parked" at the charging station (i.e., near "charging equipment"), a POSITA would have understood the modified processor unit 204 (*processor*) receives the signal from apparatus 108 (*receive, from the vehicle sensor, information*) indicating *a presence of a vehicle in a parking space*; namely, indicating vehicle 116/400 is parked at charging station 118/403.

**a) Information from detector 108 indicates the vehicle is *in a parking space***

158. A POSITA would have understood Oyobe teaches or renders obvious the electric vehicle is *in a parking space* when detecting apparatus 108 detects "the vehicle is parked" near charging equipment. *Oyobe,* [0143]. Charging equipment was known to be commonly installed at parking spaces so that vehicles may park proximate the charging station to connect to the equipment to charge the batteries. *See, e.g., Fukuda* (Ex. 1057)*,* 16 (describing the "battery chargers" as being at "**EV parking stations**"); *Taylor-Haw*, 17:1-3 (describing "**charging stations will typically be placed beside a parking space to enable electric vehicle users easy access for recharging their vehicle**").

159. A POSITA would understand any space proximate the charging station (i.e., charging equipment) where the vehicle "park[s]" to access the charging equipment would be a *parking space*, at least because the space is designated for a car parking there. *See, e.g., Ambrosio* (Ex. 1059)*,* 13:43-46 (describing a "charging station" charging an electric vehicle if the vehicle is "**parked at the charging station**"); *Kressner,* 10:60-66 (describing a "plug-in" hybrid (PIH) vehicle being pulled into a "<u>**recharging space**</u> **in a parking lot**"). Furthermore, the '987 Patent does not define a *parking space,* or any specific characteristics required of a *parking space. See, generally, '987 Patent.* Thus, a POSITA would have understood the plain and ordinary meaning of a parking space would include any space where a car is

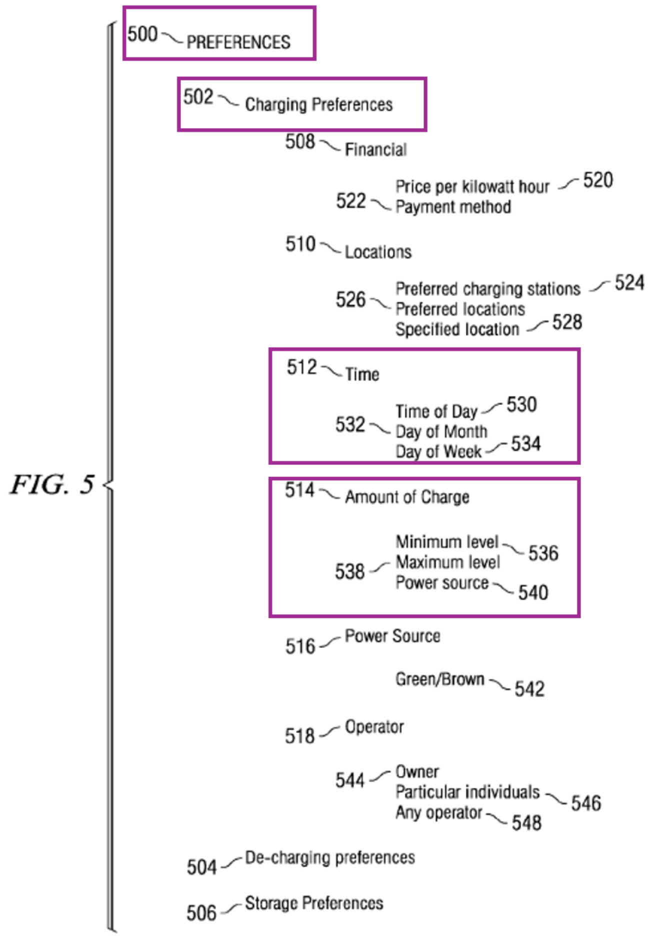
designated to park, including next to a car charger. Thus, because charging equipment was known to be placed at parking spaces and Oyobe teaches apparatus 108 detecting when the vehicle is **parked** near where charging equipment is **installed** (e.g., at a charging station), a POSITA would have understood and/or found obvious Oyobe at least implicitly teaches *a presence of a vehicle in a parking space*.

#### 7. *Claim 1[f]: "receive, from the communication device, information indicative of one or more charging preferences corresponding to a desired charging of the vehicle, wherein the one or more charging preferences are defined by an operator of the vehicle"*

##### a) **Ferro's preferences include** ***information indicative of one or more charging preferences***

160. Ferro teaches *charging preferences*; namely, preferences 500 that are example preferences of "preferences 406[.]" *Ferro*, [0082], [0084], [0118] (describing "[p]references 500 are types of preferences that may be included within preferences for one or more users, such as preferences 406 in FIG. 4"); *see also* ¶ 119. The preferences 406/500 are used to manage, govern, and/or control "one or more parameters of an electric vehicle charging transaction." *Ferro*, [0084], [0118] (describing preferences as "charging preferences 502 for governing energy transaction to charge" an electric vehicle). Preferences 406/500 include, for example, an amount of charge or a time of day for charging. *Ferro*, [0084] (describing preferences including a "maximum level of charge" or a "time to begin

charging"), [0120] (exemplary "preferences" including "time 512, amount of charge 514"). Below shows exemplary preferences 500:




*Ferro,* FIG. 5 (annotated to show various "charging preferences" of "preferences 500"). These preferences are example preferences of preferences 406, as shown in F 4 below:

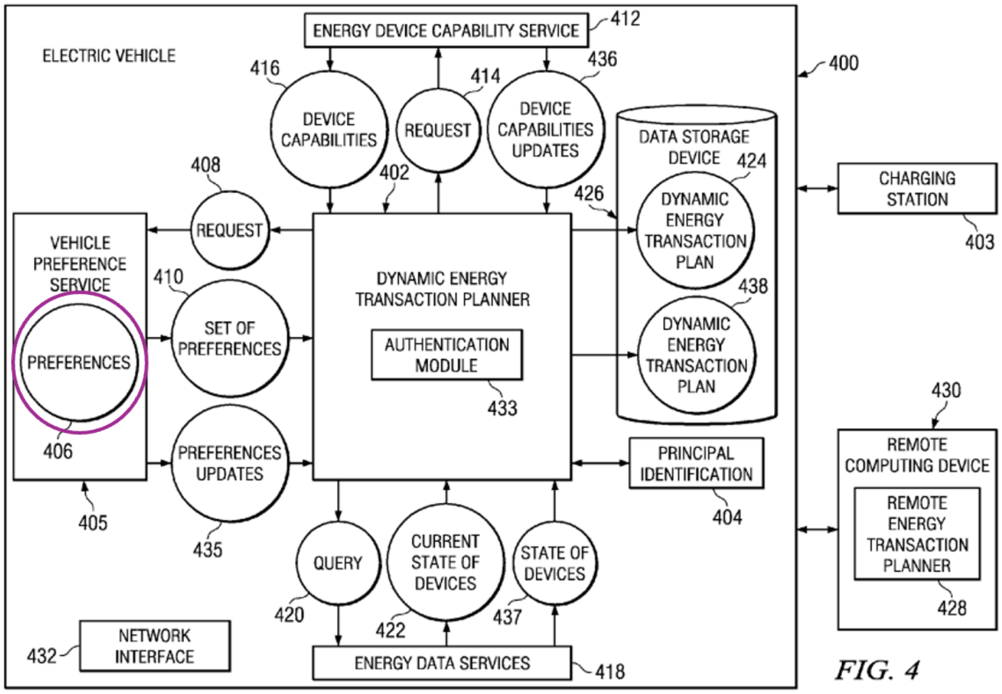


*FIG. 4*

*Ferro,* FIG. 4 (annotated to show the "preferences 406"). The dynamic energy transaction planner 402 uses the "preferences" to "create a charging transaction plan to control the charging, de-charging, or storing of electric power associated with electric vehicle 400." *Ferro*, [0084].

161. Ferro teaches numerous types of charging preferences, including a price 520 "the user is willing to pay to charge the electric vehicle[,]" a time 512 of day to charge the vehicle, and an amount of charge 514, such as a minimum or maximum level of charge 536/538. *Ferro*, [0120], [0122]-[0123]. The '987 Patent describes "preference data" that defines "how, when and/or where" the vehicle should be charged and/or discharged. *'987 Patent,* 10:21-23. Similarly, Ferro's preferences 406/500 define how (e.g., power source 516 specifying what type of power source

to use when charging, amount of charge 514 specifying how much charge to charge the batteries to) [0123]-[0124], when (e.g., time 512 specifying a time of day to begin and a time of day to stop charging) [0122], and/or where (e.g., locations 510 specifying charging stations where the vehicle should be charged at) [0121]. The ’987 Patent describes the preference data may include “billing parameters.” *’987 Patent,* 14:44-45. Similarly, Ferro’s preferences 406/500 include billing parameters, such as the payment method 522 and the price 520 a user is willing to pay. *Ferro,* [0120]. Thus, based on the ’987 Patent specification, Ferro’s preferences 406/500 are *information indicative of one or more charging preferences*.

#### *b) “…corresponding to a desired charge of the vehicle…”*

162. The ’987 Patent describes “preference information” may include “an indication of how much energy is desired to be stored by the vehicle 460 by a certain time[.]” *’987 Patent,* 10:60-62. Like the ’987 Patent, Ferro’s preferences 406/500 also indicate how much energy to store in the vehicle (e.g., amount of charge 514, such as a maximum level of charge 538) by a certain time (e.g., time 512 specifying the time of day to start and stop charging). *Ferro,* [0122]-[0123]. The ’987 Patent also describes the preference data including “settings regarding **desired** charge levels” and “charge times.” *’987 Patent,* 14:10-14. Ferro’s preferences 406/500, much like the preference data of the ’987 Patent, define desired charge levels (e.g., minimum and/or maximum level of charge 536/538) and charge times (e.g., time of

day 530 for charging the vehicle). *Ferro,* [0122]-[0123]. Thus, based on the '987 description and because Ferro's preferences 406/500 are choices indicating desired levels of parameters for "controlling" the electric vehicle charging transaction, the preferences 406/500 *correspond[] to a desired charging of the vehicle*. *Ferro,* [0084].

**c) "*…wherein the one or more charging preferences are defined by an operator of the vehicle*"**

163. Ferro teaches a "principal" creates or selects the preferences both in the on-board vehicle preference service 405 and in the remote energy preference services, such as service 302. *Ferro,* [0083] (describing "principals associated with the electric vehicle charging transaction may utilize an energy preference service that is located on a computing device that is remote from electric vehicle 400 to create and/or manage preferences"), [0093] (describing "the principal may use an input/output device located on-board the electric vehicle to create the preferences"). A principal includes "the **vehicle operator**, owner." *Ferro*, [0080]. Because a principal includes a vehicle operator and the principal enters the preferences on the vehicle preference service 405 and/or the remote energy preference services, Ferro teaches the *charging preferences are defined by an operator of the electric vehicle*[.]

#### d) Processor 204 receiving *information indicative of one or more charging preferences*

164. I have shown above that the preferences are indicative of one or more charging preferences, that they correspond to a desired charging level of the vehicle, and that they are input by the vehicle operator. Additionally, Ferro's processor unit 204 *receive[s]…information indicative of one or more charging preferences*; namely, receives preferences 406/500. Ferro discloses an energy preference service 302 and vehicle preference service 405 that both generate, store, and retrieve the preferences. *Ferro,* [0054], [0082]. Vehicle preference service 405 may be "included within or bolted on electric vehicle 400." *Ferro,* [0083]. In contrast, the "energy preference service[,]" such as energy preference service 302, may be "located remotely from electric vehicle[.]" *Ferro,* [0090], [0083] (describing "an energy preference service that is located on a computing device that is remote from electric vehicle"). The energy transaction planner 402 communicates with the remote energy preference service "through a wired or wireless network connection." *Ferro,* [0083].

165. Planner 402 communicates with both remote energy preference services (e.g., service 302) and vehicle preference service 405 when generating a dynamic energy transaction plan, as planner 402 "requests" preferences (or a set of preferences 410) "for a particular charging transaction by **sending**" a request to "service 405 and/or one or more" remote energy preference services. *Ferro,* [0090]. Planner 402 may send requests to multiple preference services, such as vehicle

preference service 405 and a remote energy preference service (e.g., preference service 302). *Ferro,* [0092], [0105] (disclosing a remote planner 428 may request the preferences "using a network connection"). FIG. 9 and FIG. 10, below, show steps executed via the planner 402/310, including "receiv[ing]" the preferences from "an energy preference service," such as remote energy preference service 302 or bolted-in vehicle preference service 405:

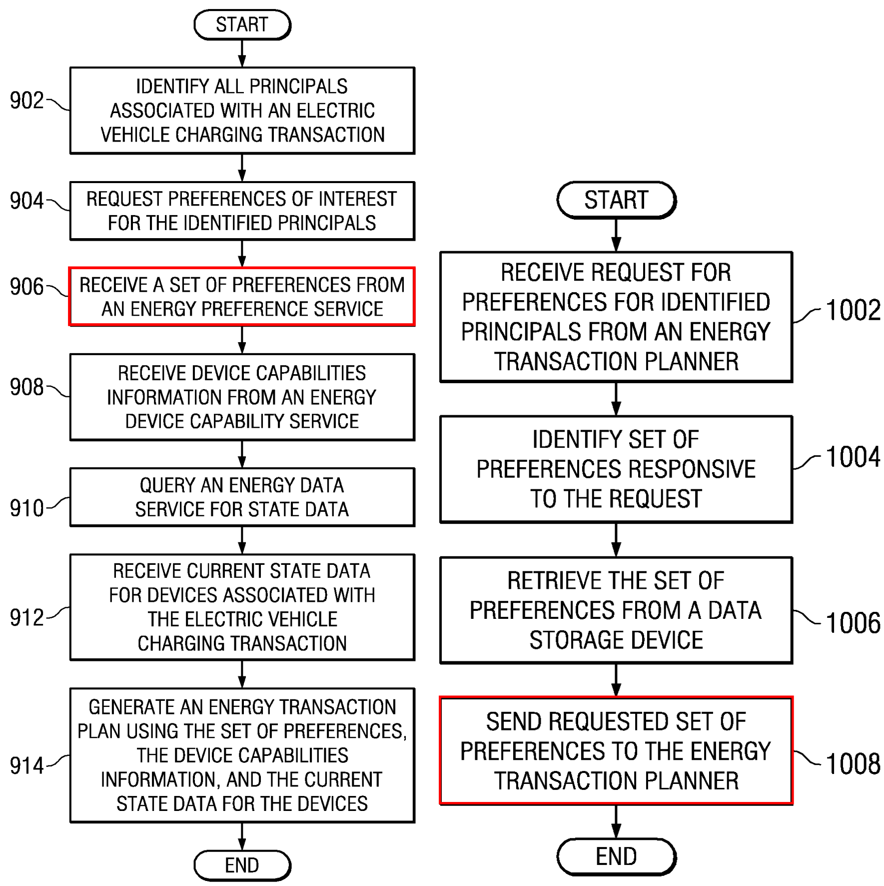



*FIG. 9* *FIG. 10*

*Ferro,* FIGs. 9-10 (annotating steps 904-906 and steps 1006-1008), [0142], [0143] (describing the planner 402 "receives a set of preferences from an energy preference service (step 906)), [0144]-[0145] (describing the energy preference services 302 and/or vehicle preference service 405 "sends the set of requested preferences to" the planner 402).

166. As discussed above, dynamic energy transaction planner 402, including other components in-vehicle on FIG. 4, are implemented by data processing system 200 on-board the vehicle, including processor 204 executing the planner 402 software. *See* ¶¶ 117-118, 144, 154. Thus, processor unit 204, in executing the energy transaction planner 402/310, requests and *receive[s]…information indicative of one or more charging preferences* (i.e., receiving the preferences from the preference services).

**e) Processor 204 receiving the preferences *from the communication device***

167. Ferro's processor unit 204 receives the charging preferences *from the communication device*; namely, via the communications fabric 202 from the vehicle preference service 405 and/or via communications unit 210 from the remote energy preference service 302, as discussed below.

168. Ferro discloses preferences may be sent to planner 402 "over a universal serial bus (USB) or other wired or wireless connection" within the vehicle, when from the bolted vehicle preference service 405. *Ferro,* [0091]. For example, Ferro teaches the preferences may be received via "an input/output device located on-board the electric vehicle[.]" *Ferro,* [0093]. Given data processing system 200

implements the components of FIG. 4 on-board the vehicle, a POSITA would understand the input/output unit 212 of system 200 is the "input/output device" used to enter the preferences for the vehicle preference service 405. *See* ¶¶ 117-118. Therefore, a POSITA would have understood when the preferences are entered by a user via the input/output device on-board the vehicle, the preferences are received by processor unit 204 *from the communication device*; namely, from the communications fabric 202.

169. Additionally, the preferences may be received by planner 402 "from a remote energy preference service" via a wired or wireless network connection. *Id.* In such a case, the preferences are received by processor unit 204 from communications unit 210 (*the communication device*), which itself receives the preferences from the remote energy preference service via the "network connection." *Ferro,* [0083], [0091] (describing sending preferences from remote preference services using a "network connection"). Given communications unit 210 is a network interface card, a POSITA would understand the preferences being sent over a network are received by processor 204 *from* communications unit 210.

170. Because (1) the processor unit 204 requests and receives the charging preferences on-board the vehicle from the built-in vehicle preference service 405 or remotely from energy preference service 302 and (2) communications with the

processor unit are enabled via the *communication device*, Ferro teaches the charging preferences are received by the processor unit 204 *from the communication device*.

### ***8. Claim 1[g]: "determine, based at least on the one or more charging preferences and at least one current value of a dynamic attribute of an electric charge provider, a charging schedule for the vehicle"***

171. I have been instructed to apply the construction of *dynamic attribute of an electric charge provider* in Section III.D, namely a changing or otherwise fluctuating cost (or price) of electricity for purchase from an electric charge provider.

172. Ferro teaches processor unit 204 executing planner 402 to determine a transaction plan (i.e., *determine…a charging schedule*) based on the principal-chosen preferences (i.e., the *one or more charging preferences*, as mapped in Claim 1(f)) and a current price of electricity from an electric charge provider, as discussed below. Ferro's planner 402 uses the current cost (i.e., price) of electricity provided by an electric charge provider, as the cost fluctuates, and thus determines the charging schedule based on the principal-chosen preferences and a current value of a *dynamic attribute,* as discussed further below.

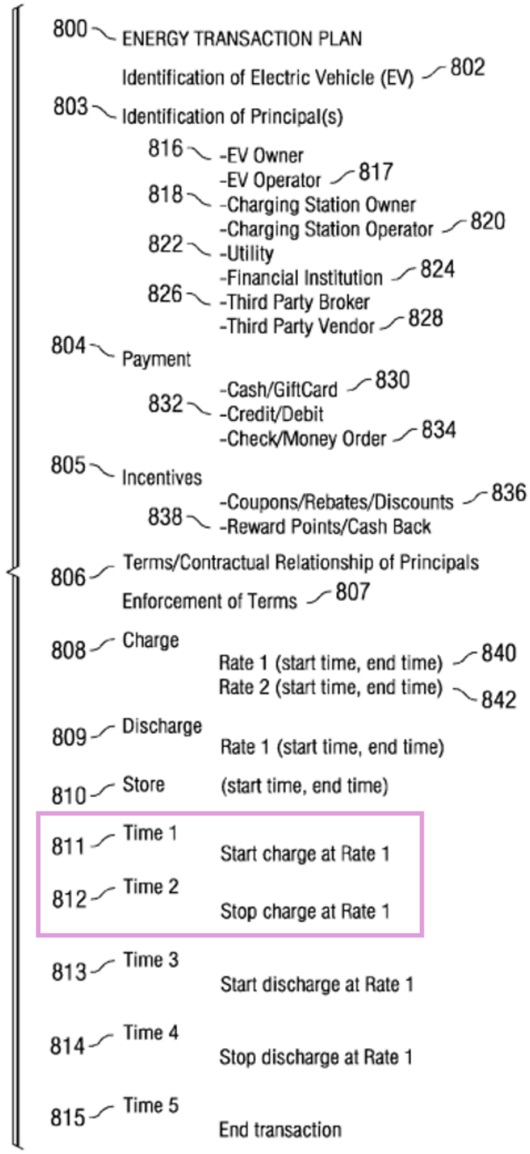
#### **a) Processor 204 determining *a charging schedule for the vehicle***

173. Ferro teaches dynamic energy transaction planner 402 "creates dynamic energy transaction plan 424. *Ferro,* [0102], [0076], [0079]. FIG. 8 illustrates an exemplary "[e]nergy transaction plan 800" that is "a plan for managing

an electric vehicle charging transaction, such as energy transaction plan 424 in FIG. 4." *Ferro,* [0136]. The transaction plan 800/424 "defines an energy transfer transaction encompassing the charge, discharge, and storage of electric energy in an electric vehicle and the incumbent financial exchanges related to those energy exchanges and storage of electric power in the electric vehicle." *Id.*

174. The planner generates "a first set of terms for a dynamic energy transaction plan using the set of preferences, the device capabilities information, and the current state data from the device (step 914) with the process terminating thereafter." *Ferro*, [0143]; *see also,* FIG. 9 (step 914), [0142]. Thus, the planner generates the transaction plan. The processor unit 204 of data processing system 200 executes the instructions for carrying out the dynamic energy transaction, including executing planner 402 to "create a charging transaction plan to control the charging[.]". *See* Claim 1(d) Mapping; *Ferro*, [0084]. Thus, the *processor* (i.e., processing unit 204) *determine[s]* the *charging schedule* (i.e., transaction plan).

175. The generated energy transaction plan, such as plan 800/424, is a *charging schedule* because it includes "a series of **time fields** indicating the electric flow direction at each time mark," such as the various "time" fields highlighted below:




*Ferro,* FIG. 8 (annotated to show the "time" fields that identify a time to "start charge" and a time to "stop charge"), [0136], [0139] ("[t]he time intervals 811-815 optionally indicate **start and end times for charging**….").

176. Furthermore, "Rate 1" is a "first time interval during which the electric vehicle receives electricity from the charging station" and "Rate 2" is a "second time interval" during which the vehicle is charged by the charging station. *Ferro,* [0138].

Because the transaction plan 800/424 indicates various start and stop times (i.e., scheduled times) at which to charge the electric vehicle, the transaction plan is a *charging schedule*.

**b) Processor 204 generates the transaction plan *based at least on the one or more charging preferences***

177. The process for generating the plan includes the planner "request[ing]" (step 904) and "receiv[ing]" the *charging preferences* from the energy preference service (which may be a remote energy preference service and/or an on-board vehicle preference service 405) (step 906). *Ferro*, [0143]; *see* Claim 1(f) Mapping. Because the planner 402 generates the transaction plan using "the set of preferences," the transaction plan (i.e., *charging schedule*) is determined *based at least on the one or more charging preferences. Ferro,* [0143], [0110], [0113] (disclosing planner 402 using the set of preferences to "calculate[] dynamic energy transaction plan 424").

**c) Processor 204 generates the transaction plan based on *at least one current value of a dynamic attribute of an electric charge provider***

178. Regarding the *dynamic attribute,* Ferro teaches planner 402 monitors the price of electricity, i.e., Ferro teaches the price of electricity is *a dynamic attribute*. *Ferro*, [0115]. Ferro describes that the transaction plan (*charging schedule*) is based on current state information (e.g., pricing) from the charge provided. For example:

> The dynamic energy transaction planner queries an energy data service for state data (step 910). The dynamic energy transaction planner receives current state data for devices associated with the electric vehicle charging transaction (step 912). The dynamic energy transaction planner generates a first set of terms for a dynamic energy transaction plan using the set of preferences, the device capabilities information, and the current state data from the device ( step 914).

*Ferro*, [0143].

> Dynamic energy transaction planner 402 sends query 420 to energy data services 418 requesting information from one or more third party sources. In response to request 420, energy data services 418 sends current state of devices 422 to dynamic energy transaction planner 402.

*Ferro,* [0101]. Ferro describes multiple other examples where charging is based on dynamic attributes such as pricing. *Ferro*, [0088], [0098], [0112]-[0113] (describing the information received by planner includes "present and projected energy rates" and calculating the transaction plan with these rates), [0115] (describing monitoring electricity price, including whether the prices is above/below a threshold price). Thus, the state data received by the planner 402 from energy data services includes "charging station prices," which would include the cost (i.e., price) of energy at a current time. A POSITA would have recognized that such pricing information provided by a charge provider is subject to change and thus represents the claimed *dynamic attribute of an electric charge provider*. Further, because processor 204 executes planner 402 that uses the current state information (including the current electricity cost) in generating the transaction plan, processor 204 *determine[s]* the transaction plan *based* on a ***current value*** *of a dynamic attribute*. *Ferro*, [0112] (teaching the "present and projected energy rates"). A POSITA would have understood electricity cost fluctuates over time. *See, e.g., Pollack,* [0181] (describing an "electrical charging station" "collecting" grid information, including the "current electricity price"); *Kressner,* FIG. 11, 3:36-42 (showing a plug-in hybrid "meter" that utilizes such information as the "cost of energy").

179. Because Ferro's planner 402 generates the transaction plan based on a current price of electricity, which Ferro teaches changes/fluctuates (i.e., may go higher or lower (*Ferro*, [0115]), Ferro teaches basing the transaction plan (i.e., *charging schedule*) on *a current value of a dynamic attribute*, in addition to basing the transaction plan on the *charging preferences*.

180. Ferro's teachings of determining the transaction plan based on both the user preferences and the current electricity cost, which fluctuates, to enable cost-effective charging of the electric vehicle mirrors the '987 Patent's description of determining a charging schedule based on charging preferences and fluctuating electricity cost. *Ferro,* [0051], [0098]-[0099] (generally describing the transaction plan being determined based on the current electricity price and user preferences to "maximize the benefits of charging"). This is like the '987 Patent's determining "a

schedule for charging" based on the "time-of-day rate" of electricity to "result[] in the lowest estimated cost for charging" the vehicle. *'987 Patent,* 8:33-38.

#### d) Ferro's current cost of electricity comes from *an electric charge provider*

181. Ferro teaches the current price of electricity that fluctuates comes from *an electric charge provider*. Ferro teaches a "utility 822 of the owner; operator; or charging station" may also serve as a "principal" in the charging transaction. *Ferro,* [0137]. The transaction plan 800/424 identifies principals "for a particular charging transaction," which may include a utility 822:

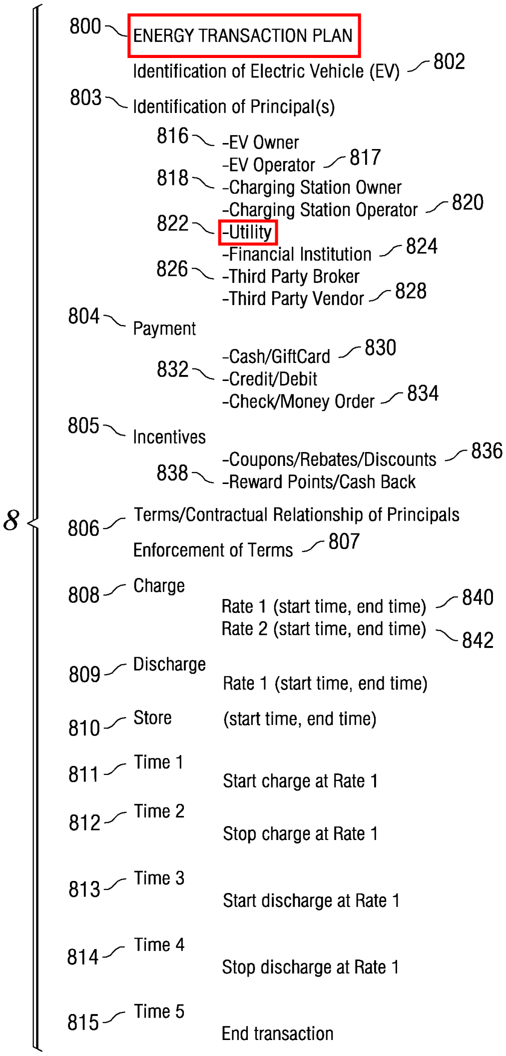


*FIG. 8*

*Ferro,* FIG. 8 (annotated to show the "energy transaction plan 800" with fields identifying the "Utility 822" of the transaction); [0137].

182. Additionally, the current state data received from the energy data services and used by planner 402 in determining the transaction plan, such as energy data service 308, is a third-party data source for "charging station price information[.]" *Ferro,* [0058], FIG. 3; *see* ¶ 174. "A utility is an **electric energy provider**. An electric energy provider typically provides electric power to a charging

station via an electric power grid." *Ferro*, [0066], [0132] (describing "[a] utility is a provider of electric power, such as" via an "electric power grid"), [0052]. Ferro discloses the "price of electricity" is received by vehicle 116/400 from "a power grid[.]" *Ferro,* [0037]. The price of electricity comes from the power grid and an "electric energy provider" (i.e., utility company) provides power via the "electric power grid," indicating the electricity price is set by and received from the electric energy provider. Thus, the current price of electricity (i.e., *dynamic attribute*) used by planner 402 comes from *an electric charge provider*.

183. Thus, Ferro teaches Claim 1(g) because processor unit 204 executes planner 402 to determine the transaction plan 800/424 (i.e., *charging schedule*) based on the vehicle operator-defined charging preferences (i.e., *one or more charging preferences)* <u>and</u> the current cost of electricity, which fluctuates and is from a third-party electric energy provider (i.e., *changing or otherwise fluctuating cost of electricity for purchase from an electric charge provider*).

#### e) Ferro also teaches Claim 1(g) if ***determine…a charging schedule*** invokes means-plus-function

184. I have been asked to provide an opinion as to whether Ferro teaches Claim 1[g] applying the means-plus-function construction in Section III.D.2. It is my opinion Ferro teaches the structure; namely, a processor (i.e., processor unit 204) performing the described algorithm, per Section III.D.2. The processor 402 executes the planner 402 software to generate the schedule. *See* ¶ 174. Execution of the

planner 402 to generate a transaction plan includes "using" a current cost of electricity (received via energy state services) and vehicle operator defined preferences (received from vehicle preferences service and/or energy preference service), much like the '987 Patent describes a "processor" utilizing a "time-of-day" rate for electricity and "preference information" to "determine the most cost-effective schedule for charging…." *Compare, Ferro,* [0143], *with '987 Patent,* 10:55-59; *see* ¶ 178 (discussing how the "current state data" includes a current cost of electricity). Planner 402 generates the most "cost-effective" transaction plan by monitoring the price of electricity and charging the vehicle when the current electricity price is low. *Ferro,* [0115]. Thus, Ferro's structure of the processor unit 204 performing the algorithm of using the current electricity price and user preferences to determine a cost-effective transaction plan performs the function of *determining…a charging schedule* by using the charging preferences and the current electricity price when creating the transaction plan, much like the '987 Patent's processor. *'987 Patent*, 10:51-67 (describing the processor using "available market rates" and combining that information with "preference information" to "determine the most cost-effective schedule for charging"), 16:62–17:8 (describing determining the charging schedule by using preference information), 17:39-42 (describing using electricity "rate information" to "derive appropriate charging schedules").

### *9. Claim 1[h]: "transmit a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the vehicle;"*

#### a) Ferro's Teachings

##### (i) <u>charging, in accordance with the charging schedule, of the vehicle</u>

185. Ferro teaches *charging…of the vehicle*. Namely, Ferro teaches the "[e]lectric vehicle 116 receives electricity from…an electric grid at charging station 118" such that "**electric charge** may flow from an electric grid through charging station 118 to electric vehicle 116[.]" *Ferro*, [0035], *see also*, [0036]. Ferro further teaches "[e]lectric vehicle charging transactions can be divided into the pre-charge phase, **the charge phase**, and the post-charge phase" and, during the charge phase, "electricity flows to, from, or is stored in the electric vehicle." *Ferro,* [0051].

186. In FIG. 4, Ferro illustrates "a block diagram of a dynamic energy transaction planner on-board an electric vehicle" including an on-board "[d]ynamic energy transaction planner 402 [that] is a software component that creates a transaction plan for controlling a charging transaction for electric vehicle 400 coupled to charging station 403." *Ferro*, [0076], [0105].

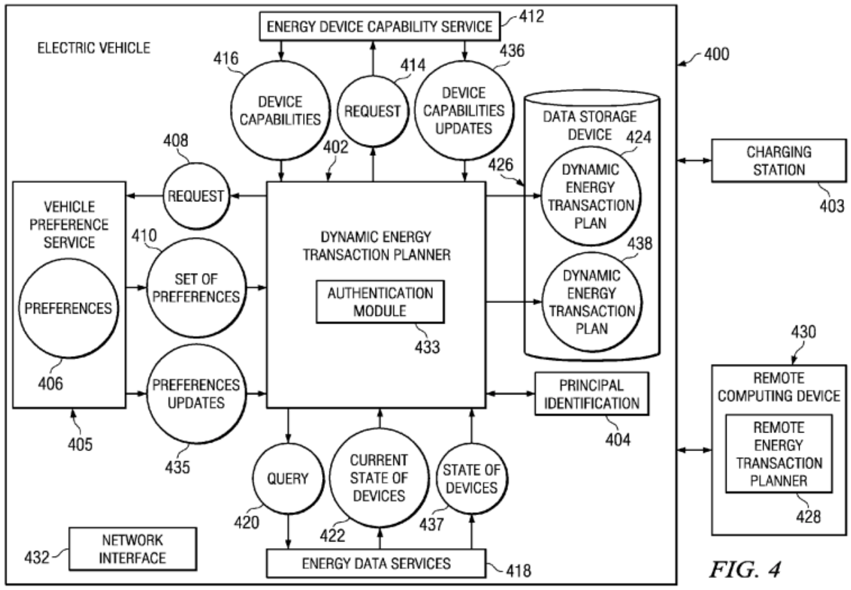


FIG. 4

*Ferro*, FIG. 4. The charging transaction is "a transaction that involves any combination of **charging the electric vehicle**, storing electric power in an electric storage mechanism associated with the electric vehicle, and de-charging the electric vehicle." *Ferro*, [0078]. "[T]he charging phase **begins** when energy transaction execution engine 316 sends the transaction plan" and "**initiates** the request to begin charging the electric vehicle[.]" *Ferro*, [0060], [0051] ("During the charging phase, electricity flows to, from, or is stored in the electric vehicle.") Therefore, because Ferro teaches a charging phase during which "electric charge may flow from an electric grid through charging station 118 to electric vehicle 116", teaches or renders obvious *charge…the electric vehicle*. *Ferro*, [0035]

187. Furthermore, Ferro teaches or renders obvious that *charging…of the vehicle* is done *in accordance with the charging schedule*. As I discussed with

respect to Claim 1[g], Ferro's generated energy transaction plan 424/800 teaches the claimed *charging schedule*. *See* Claim 1[g]'s Mapping. Therefore, because the energy transaction plan 424, when executed, causes *a charging…of the vehicle*, and the energy transaction plan teaches the *charging schedule*, Ferro teaches or renders obvious *a charging, <u>in accordance</u> with the charging schedule, of the vehicle*.

188. Additionally, Ferro teaches the memory (e.g., storage device 426) stores the instructions that cause the processor to *charge* the vehicle. As I opined with respect to Claim 1[d], the processor unit 204 executes all of the software instructions that carry out the dynamic energy transaction plan. *Ferro*, [0039]; *see* Claim 1[d]'s Mapping. Because planner 402 is software executed by processor unit 204 of data processing system 200, processor unit 204 executes the planner software to carry out the *charg[ing]…of the vehicle*. Thus, a POSITA would have understood or found obvious that execution of the instructions results in processor unit 204 *charging…the electric vehicle* by initiating the request to begin charging the vehicle *in accordance with the* transaction plan 424/800 (*charging schedule*).

**(ii) <u>a parking space charge device</u>**

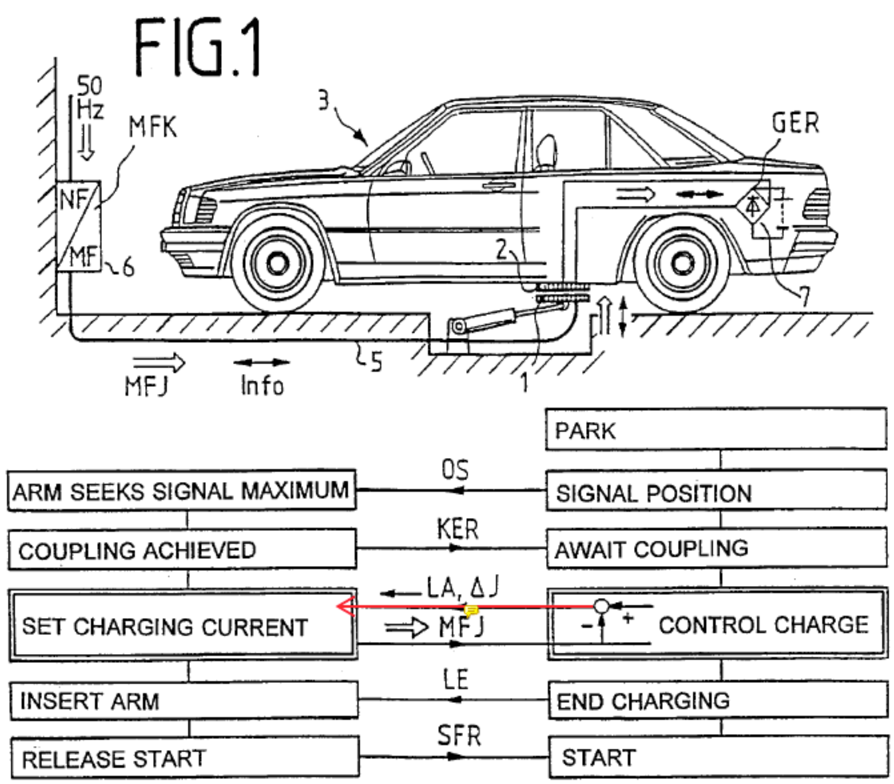
189. Ferro also teaches *a parking space charge device*, i.e., the charging station 118/403. The charging station 118/403 is a *parking space charge device* at least because the charging station is taught as being "a selected charge/discharge site, such as an outlet or kiosk, for providing electric vehicle 116 with access to the

electric grid." *Ferro*, [0035]. Per Ferro, "[e]electric vehicle 116 connects to charging station 118 via an electrical outlet" and "electricity may also be optionally transferred via wireless energy transfer[.]" *Ferro*, [0036]. Additionally, Ferro teaches the charging station 118 "may be a power outlet in a privately owned garage, an electric outlet in a docking station in a commercially owned electric vehicle charging kiosk, or a power outlet in a commercially owned garage." *Ferro*, [0035]. Because the charging station 118 is next to or proximate a location where a user would park their vehicle for purposes of charging the vehicle by the charging station 118/403, the Ferro charging station is a *parking space* charge device. A POSITA would thus have understood or found it obvious that each of these examples provided by Ferro are *parking space[s]* where a vehicle owner parks their car. Furthermore, in a similar manner, the '987 Patent describes a parking space charge device as being "physically and/or electrically coupled to the vehicle 460 and/or the vehicle charge device 462 thereof." *'987* Patent, 9:48-51, FIG. 5. Therefore, Ferro teaches or renders obvious *a parking space charge device*.

**b) Seelig's Teachings**

190. In related art, 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, like Ferro, teaches a *parking space charge device*, disclosing that "[i]t is already known to charge the battery of electric vehicles by means of inductive

charging stations." *Seelig*, 1:11-13. Further, 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*, 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[.]" *Seelig*, 2:1-3.




*Seelig*, FIG. 1. As shown in FIG. 1, the method includes (in part): (1) the vehicle parking; (2) coupling of the vehicle to a charging device (e.g., *a parking space* *charge device*); and (3) the vehicle sending a signal LA that is a "charging **initiation** signal" to "switch[] **on** the inverter." *Seelig*, FIG. 1, 6:29-32 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." *Seelig*, 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 "start[s] a charging of the vehicle[,]" as claimed. *Seelig*, 2:42-44. Therefore, because primary element 1 is in a **parking space**, which is used for **charging** the electric car 3, the primary element 1 is *a parking space charge device*.

191. Again, referring to FIG. 1, the right-hand side of the flow chart are actions taken by the 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[.]" *Seelig*, 6:21-24. Thereafter, a "**charging initiation signal LA** transmitted to the charging apparatus…switches on the charging operator memory LBS and thus switches on the inverter." *Seelig*, 6:29-32. 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":

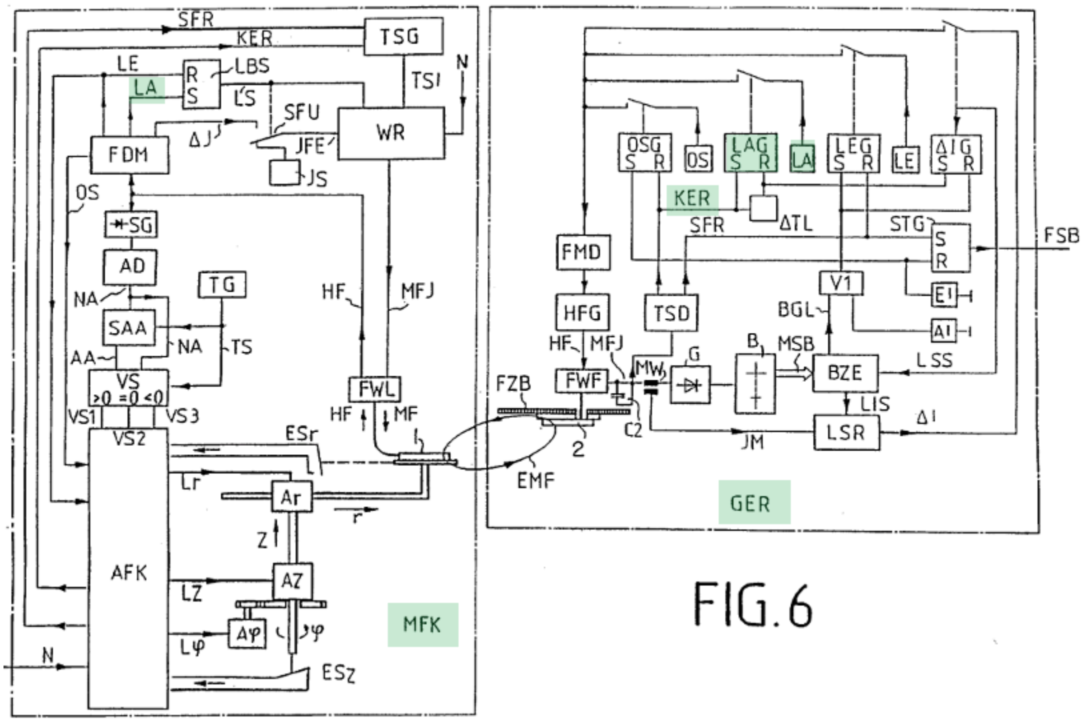


FIG.6

*Seelig*, 4:53-55, FIG. 6. Therefore, Seelig's transmission of charging initiation signal LA, sent from the vehicle 3, that turns on the inverter teaches *transmit a control signal to a parking space charge device that starts a charging* of a vehicle. In the proposed combination, the charging of the vehicle that is being started by the signal LA is the scheduled charging taught by *Ferro* and described above. Thus, in the combination, the modified Ferro system (within the car) transmits a signal (per Seelig) to start a charging of the vehicle according to the schedule, as claimed. A POSITA would have configured the transmitted signal of the combined Ferro and Seelig system to operably start the scheduled charging according to whichever transmission and signaling protocol desired, using skills common to a POSITA, without being limited to the specific data structure described by Seelig.

#### c) Motivation to Combine

192. In my opinion, a POSITA would have found it obvious and been motivated to modify Ferro's electric vehicle charging managing system with Seelig's charging initiation signal LA to initiate charging of the electric vehicle in Ferro by communicating a charge signal to Ferro's charging station (*parking space charge device*). So modified, the control signal/charging initiation signal LA would "indicate an intention to begin a charging transaction", per Ferro, resulting in the "[d]ynamic energy transaction planner 402 submit[ting] dynamic energy transaction plan 424…to begin charging/discharging[.]" *Ferro*, [0109], [0113].

193. A POSITA would have been motivated to modify Ferro with Seelig's teachings at least because Ferro expressly motivates such, disclosing that "[e]lectric vehicle 400 may…indicat[e] a desire to begin a charging transaction." *Ferro*, [0109]. Ferro does not expressly disclose that a signal can indicate the desire to begin the charging transaction. However, Ferro, like Seelig, teaches wireless charging of the electric vehicle. *Ferro,* [0036] ("The electricity may also be optionally transferred via **wireless energy transfer**, also referred to as wireless power transfer, in which electrical energy is transferred to a load, such as electric vehicle 116, without interconnecting wires."), *Seelig*, 1:6-8. Furthermore, 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. Therefore, based on Ferro's

teachings of wireless charging and indicating a desire to charge, a POSITA would have been motivated to turn to references teaching such, including Seelig.

194. Seelig also expressly motivates the combination, as Seelig 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. *Seelig*, 1:13-29. Therefore, at least based on the express motivations provided by both Ferro and Seelig, a POSITA would have found it obvious and been motivated to modify Ferro with Seelig to utilize a wireless charging initiation signal (*transmit a control signal*) to initiate charging in Ferro's electric vehicle charging system.

195. Additionally, as I discussed above, modifying Ferro's system with Oyobe's teachings of a wireless detecting apparatus 108 to detect that a vehicle is parked at a charging station provides advantages in enabling the vehicle driver to instruct charging of the electric vehicle without having to perform any actions. *See* ¶¶ 128-132. For example, modifying Ferro with Oyobe eliminates the need for the vehicle driver to interact with the charging station or an interface to instruct charging. *Id.* The examples provided by Ferro to initiate charging all require some sort of user interaction, e.g., exiting the vehicle to plug the vehicle into the charging station, informing an operator/attendant, etc. *Ferro*, [0109], [0121]. Thus, a POSITA would have further been motivated, for similar reasons discussed above with respect

to modifying Ferro with Oyobe, to further modify Ferro with Seelig's teachings of a wireless charging initiation signal to initiate charging at least because such a modification simplifies the charging operation and reduces the burden on the user to charge the electric vehicle, thereby providing a more user-friendly electric vehicle charging experience.

196. Such a modification is nothing more than the combination of prior art elements according to known methods to yield predictable results. The only difference between the claimed invention and the prior art is the lack of the combination of the known elements (Ferro's charge control signaling protocol and Seelig's charging initiation signal) in a single prior art reference. Together, each element would perform the same function as the element does separately. Specifically, Ferro's charge control signaling protocol would still charge the electric vehicle according to the charging schedule/transaction plan 424, while Seelig's signal LA would still function to initiate charging of an electric vehicle. Modified in such a way, Ferro would include a charging initiation signal communicated from Ferro's electric vehicle 116/400 to the charging station 103/403 that initiates charging of the electric vehicle in Ferro according to the transaction plan 424. The results of the combination would have been predictable and have had a reasonable expectation of success at least because wirelessly communicating information, such as a signal to start a process, was well-known prior to the alleged invention of the

’987 Patent. *See, e.g., Kelly* (Ex. 1079), 1:23-27 (describing CPUs to be known to control operations and perform “various types of input/output (I/O) operations, calculations and logical operations”), 3:43-45 (describing a CPU communicates “with other components” via sending “signals”).

197. Further still, such a combination would have had a reasonable expectation of success. Ferro teaches the charging station and the electric vehicle are “connected to network 102” to “send and receive data associated with the charging of [the] electric vehicle[.]” *Ferro*, [0037]. Because Ferro teaches “[n]etwork 102 may include connections, such as…**wireless communication links**,” and vehicle 116/400 includes a network interface 432 enabling connection of the vehicle to network 102, a POSITA would have understood the electric vehicle and the charging station to be wirelessly connected via network 102. *Ferro*, [0032], [0106]. Thus, electric vehicle 116/400 is able to communicate with the charging station 118/403 wirelessly via network 102. Furthermore, Seelig teaches a similar system in which the vehicle 3 wirelessly communicates with the inverter/charging apparatus. *Seelig*, 3:51-54 (“Contactless transmission of information takes place between the charging current setter 310 of a[n] inverter 7 and the charging current controller 300 of the battery.”), FIG. 3. Accordingly, further modifying Ferro to wirelessly communicate a charging initiation signal (per Seelig) via network 102 would have had a reasonable expectation of success at least because Ferro already teaches the infrastructure

necessary to wirelessly communicate the charging initiation signal. Thus, Ferro modified by Seelig renders obvious *transmit a control signal* (per Seelig's teaching of charging initiation signal LA) *to a parking space charge device* (Ferro's charging station 118/403) *that starts a charging, in accordance with the charging schedule, of the vehicle* (per Ferro, the charging is initiated and carried out in accordance with the transaction plan 424, i.e., the *charging schedule*.)

***10. Claim 1[i]: "wherein at least one of the one or more charging preferences is defined by user input received via a graphical user interface adapted to display a unitary vehicle charge indicator 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; and (iii) a third portion comprising a slider by which an amount of charge may be specified."***

198. As a summary, Ferro (as modified by Oyobe and Seelig) combined with Donnelly and Letendre renders Claim 1(i) obvious. As discussed below, it would have been obvious to (1) modify Ferro-Oyobe-Seelig's input/output and display to be a touch screen presenting a graphical user interface ("GUI") having the claimed vehicle charge indicator with first and second portions, per Donnelly; and (2) modify the Ferro-Oyobe-Seelig-Donnelly GUI to include a slider for inputting the desired charge, per Letendre.

#### a) Ferro's Charging Preferences are *Defined by User Input*

199. Ferro teaches the charging "preferences" are **entered** by a "principal" (e.g., **vehicle operator**) via an **input**/output device on-board the vehicle. *See* Claim 1[f]'s Mapping (citing *Ferro*, [0093], [0084]). Namely, Ferro's vehicle operator preferences 406 would be entered via the input/output unit 212 of data processing system 200 on-board vehicle 400. *See* Claim 1(f) Mapping, ¶ 168. Ferro discloses input/output devices include a keyboard, mouse, or displays, among others. *Ferro,* [0043], [0162]. Thus, Ferro teaches *at least one or more of the charging preferences* being *defined by user input* because the vehicle operator preferences are input by the operator, via input/output unit 212.

#### b) User Input *Received Via a Graphical User Interface* (GUI)

##### (i) <u>Donnelly's Teachings</u>

200. While Ferro teaches the user inputting the charging preferences by way of an input/output device, which includes "keyboard, mouse, or displays", etc., Ferro does not describe the nature of the mechanism by which this input is made, specifically what might be displayed such that the user can use the I/O devices. Donnelly, however, provides such a description.

201. 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 touch screen commands. *Donnelly*, 21:47-58. Donnelly's

invention is for "monitoring, controlling and optimizing an electrically powered locomotive[.]" *Donnelly,* 5:6-8. However, Donnelly also notes the inventive features, such as the GUI provided on the touch screen, may be applied to "vehicles other than locomotives, such as cars" or "trucks." *Donnelly,* 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 touch screen, being applied to vehicles and (2) being used in electrically powered vehicles, such as locomotives, 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 '987 Patent even admits an electric "train" (i.e., locomotive) is an exemplary electric vehicle. '*987 Patent,* 3:25-31. Additionally, Donnelly's GUI touch screen provides various parameters that would apply to an electric car, such as the "state of" the "battery pack[.]" *Donnelly,* 21:55-58. Thus, a POSITA would have understood or found it obvious that Donnelly's GUI touch screen 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).

202. 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.

*Donnelly,* 21:47-58. Because Donnelly teaches "commands" being received from the user via "touch screen" displays of the "GUI," Donnelly teaches *user input* being *received via a graphical user interface*; namely, Donnelly's GUI provided on the touch screens.

**(ii) <u>Motivation to Combine Donnelly's GUI Touch Screen into Ferro-Oyobe</u>**

203. A POSITA would have found it obvious and been motivated to modify Ferro's (as otherwise modified by Oyobe and Seelig) collective display 214 and input/output unit 212 of data processing system 200 with a touchscreen display presenting a GUI for receipt of the preferences 406/500 and other commands or information input by a user, per Donnelly. Ferro already teaches communications fabric 202 "provides communications between processor unit 204" and input/output unit 212, as well as display 214. *Ferro*, [0040], [0043] (describing input/output unit 212 allowing for "input and output" and display 214 providing display of information), [0161]-[0162] (disclosing coupling of I/O devices to data processing

system). As discussed above, a POSITA would have understood Ferro's preferences input via a "principal" (e.g., vehicle operator) would be input using the input/output unit 212 of data processing system 200. *See* Claim 1(f) Mapping, ¶ 168 (*citing Ferro,* [0093]). Therefore, the modification to Ferro-Oyobe requires simply modifying the display 214 and input/output unit 212 with Donnelly's touchscreen display presenting a GUI. *Donnelly*, 21:47-58.

204. Graphical user interfaces were common and "standard paradigm for Human Computer Interaction[,]" existing since the 1970's. *See* Section VI.C.2 (*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* Section VI.C.2 (*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 Ferro's charging preferences via a GUI presented on a touchscreen. Furthermore, a POSITA would have understood that setting charge preferences 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 '987 Patent. *See e.g., Pryor*, 2:2-5.

205. A POSITA would have been motivated to implement Ferro's I/O unit 214 and display 212 that allow the user to enter charging preferences (*Ferro*, [0093]) using Donnelly's known touchscreen display presenting a GUI receiving user inputs to yield the predictable result of allowing the user to efficiently enter desired charging preferences in a familiar and user-friendly manner. *Sherrick* (Ex. 1060), 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* ¶ 204. Thus, a POSITA would have appreciated replacing Ferro's I/O unit 214 and display 212 with a touchscreen presenting a GUI to simplify charging preference input by making the inputting more efficient. *See also* ¶¶ 206-208 (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 Ferro's display and I/O unit to be a touchscreen display presenting a GUI for receiving charging parameters input by the user. *See* Section VI.C; *see also,* ¶ 209.

206. As of the priority date of the '987 Patent, it was well-known to utilize touch screen displays in vehicles. *See, e.g., Obradovich,* 3:55-58 (generally

describing a touch screen 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)*,* 2:12-17 (describing a "touch screen" as part of a "personal computer within an automobile" were known); *Jurnecka* (Ex. 1062)*,* 3 (describing various "Volkswagen" models already offering a "touch-screen unit" as of late 2007); *see also,* Section VI.C.1.

207. A POSITA would have appreciated using a touch screen display for entering the charging preferences in a vehicle, 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,* 3:21-24; *Pryor,* 2:55-61 (describing the "automotive dashboard" having various switches, knobs, dials, gages, being "confus[ing] and "hard…to understand"). Contrastingly, providing a single touch screen eliminates such buttons, such as the numerous buttons found on a "keyboard." *Ferro,* [0043]. Furthermore, "touchscreens" were known to be a "useful interface" because they are "highly programmable," unlike physical buttons. *Colgate* (Ex. 1065)*,* [0154]; *Pryor*, 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 touch screens, to make the interface and various selections on the screen 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 buttons, knobs, dials, etc. to the vehicle interior.

208. Additionally, touch screens were known to provide both input of commands and output of information via a single hardware component (i.e., touch screen display using GUIs). *See, e.g., Obradovich,* 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*, 2-4—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,* 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 (i.e., input/output GUI on touch screen component), and thus would have been motivated to implement Ferro's I/O device as a touchscreen

presenting 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,* 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 Ferro's input/output unit 212 and display 214 using Donnelly's touch screen display implementing a GUI. The implementation would have simply included use of a known device (touchscreen displays implementing a GUI) to improve similar devices (i.e., non-touch displays, such as display 214) in a similar way (avoid using separate I/O device for inputting information, such as a keyboard).

209. A POSITA modifying Ferro's existing display 214 and input/output device 212 would have had a reasonable expectation of success, given that touchscreens were commonly applied in vehicles and well-known. *See* ¶ 206. Further, because touch screens implementing GUIs were known to be used to control various parts of a vehicle, a POSITA would have had the expertise to program the GUI touch screen display for receiving Ferro's inputs, such as preferences. *See, generally, Obradovich; Pryor,* 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 Ferro's input/output unit 212 and display 214 via a touch screen

presenting a GUI, by, e.g., including known touch screen circuitry and programming processor 204 to present a GUI and interpret the user's touchscreen inputs. *See, e.g., Obradovich,* 5:37-45. A POSITA would have understood in modifying Ferro's input/output device and display with Donnelly's touch screen, the touch screen would "implement[]" "a Graphical User Interface display." *Donnelly,* 21:48-55 (describing the "**Graphical User Interface display**" being "**implemented** using" display screens that "are configured to receive **touch screen** commands").

#### c) The GUI is *Adapted to Display a Vehicle Charge Indicator Element Comprising a First Portion Indicative of the Amount of Charge* and *a Second Portion Indicative of Uncharged Capacity* of the *Battery of the Electric Vehicle*

#### (i) <u>Ferro's Teachings</u>

210. Ferro teaches one of the preferences a vehicle operator may choose is an "[a]mount of charge 514 preferences" including "a maximum level of charge 538[.]" *Ferro,* [0123], FIG. 5; *see also* Claim 1(f) Mapping. Ferro further teaches planner 402 using information received from the energy data services 418 when generating the transaction plan, with such information including "the present **charge state** of the batteries on electric vehicle 400[.]" *Ferro*, [0112]-[0113]. This information indicates the "current state of the devices[,]" with the present charge state indicating the state of the batteries. *Id.* As discussed below, Donnelly teaches a

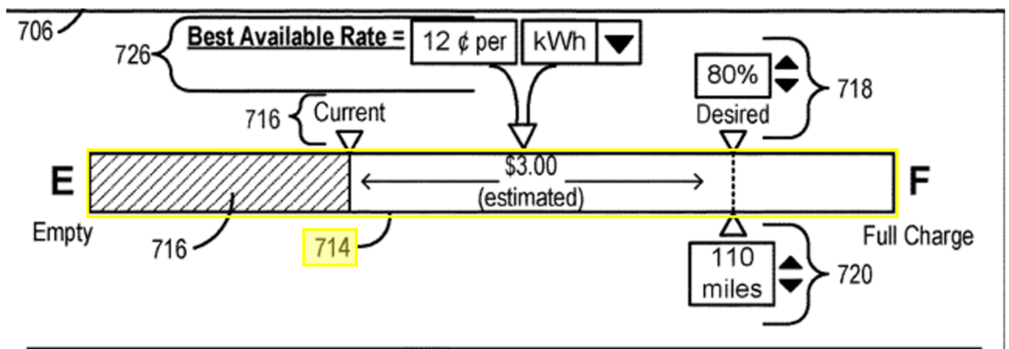
GUI in an electric vehicle having a vehicle charge indicator that contains the claimed first portion and second portion. *See* Section X.A.9.c.

211. The processor unit 204 of data processing system 200 executes the instructions/software for implementing the dynamic energy transaction plan. *See* Claim 1(d) Mapping (*citing* [0039]-[0040], [0044], [0076]). For example, the processor 204 executes the planner 402, which receives the "present charge state of the batteries" information. *Ferro,* [0112]-[0113], [0101]. A POSITA would have understood the "charge state of the batteries" to include information on the state of charge, which contains the amount of charge residing in the battery and an uncharged capacity. *See* ¶ 219. Thus, a POSITA would have understood or otherwise found obvious that processor 204 receives information relating to an amount of charge residing in the battery of the EV 116/400 (per Ferro) and, when combined with Donnelly (as discussed below), causes display of uncharged/charged capacity. Furthermore, a POSITA would have understood that the level of charge in a battery is by itself not very useful because the user has no basis for understanding what that number mans. Rather, the more useful way in which to provide battery charge is in terms of how much of the overall capacity the current charge represents. For example, for a gas-powered vehicle, it is more helpful to know you have a quarter of a tank of gas as opposed to 5 gallons of gas because the relative measure (quarter of a tank) is more informative to how much further you can drive your vehicle. For

this additional reason, a POSITA would have been motivated to combine Ferro and Donnelly.

**(ii) Vehicle charge indicator as described in the '987 Patent**

212. The '987 Patent describes a "vehicle charge indicator 714 that visually indicates a current charge level" of the vehicle:




*987 Patent,* FIG. 7 (excerpt, annotated to show "vehicle charge indicator 714"), 14:56-58. Thus, the vehicle charge indicator is at least satisfied by a bar graph showing the current charge level.

**(iii) Donnelly's Vehicle Charge Indicator**

213. Donnelly discloses the GUI displaying a bar graph 28004 depicting the state of charge of the battery. *Donnelly*, 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." *Donnelly,* 23:16-33. The "bar graph" 28004 is annotated below in FIG. 28:

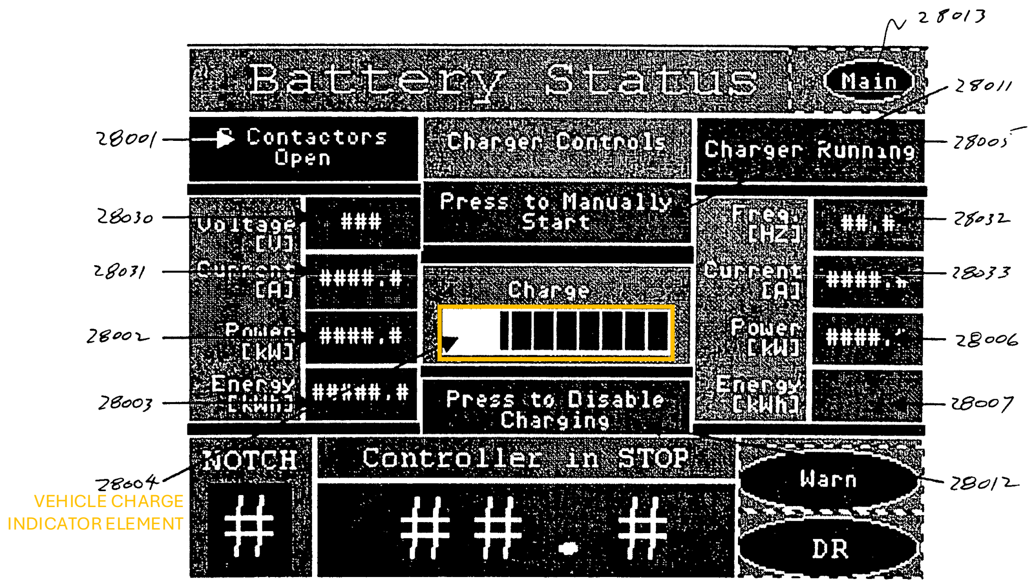



FIG. 28

*Donnelly,* FIG. 28, 23:31-33.

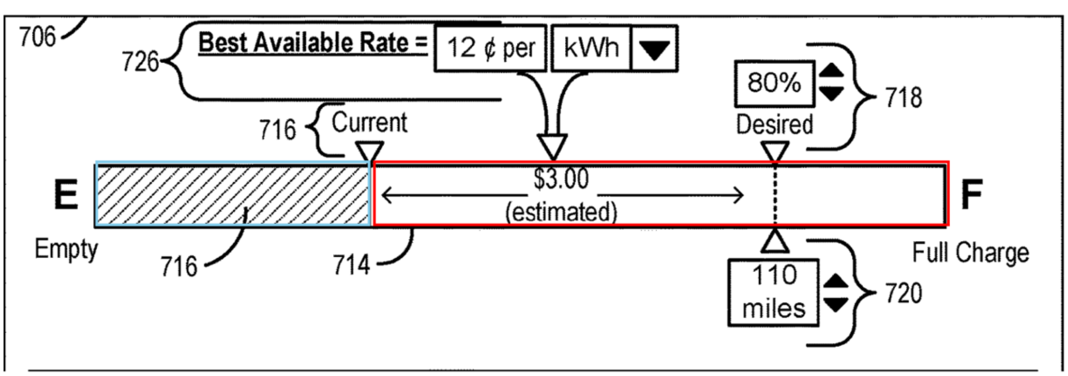
214. The "Battery State of Charge 28004" bar graph on the GUI satisfies the *vehicle charge indicator element* because it is part of and displayed by the GUI (i.e., *GUI* is *adapted to display* the bar graph) and indicates the charge of the "energy storage unit (e.g., battery)" of the vehicle (i.e., train). *Donnelly*, 23:31-33, 23:16-18 (the "Battery Status Screen" displays "details about the electrical state of the energy storage unit (e.g., battery)"), 5:29-37 (describing the "locomotive" as including the "energy storage unit" for providing "power" to drive the "motors"). Additionally,

Donnelly's bar graph State of Charge 28004 display field is much like the bar graph vehicle charge indicator 714 described in the '987 Patent. Thus, based on the '987 Patent specification, Donnelly's 28004 on GUI displaying a bar graph indicating the current battery charge thus satisfies *a vehicle charge indicator*, which the *GUI* is *adapted to display*.

215. As discussed above, Donnelly expressly discloses the "energy storage unit" is a battery. *See* ¶ 214. Furthermore, the header for FIG. 28 is "**Battery Status[**.]" *Donnelly*, 23:16-19, FIG. 28 (showing the header at top of GUI displays "Battery Status"). Thus, field 28004 on the "Battery Status" GUI screen indicates the state of charge for a *battery*.

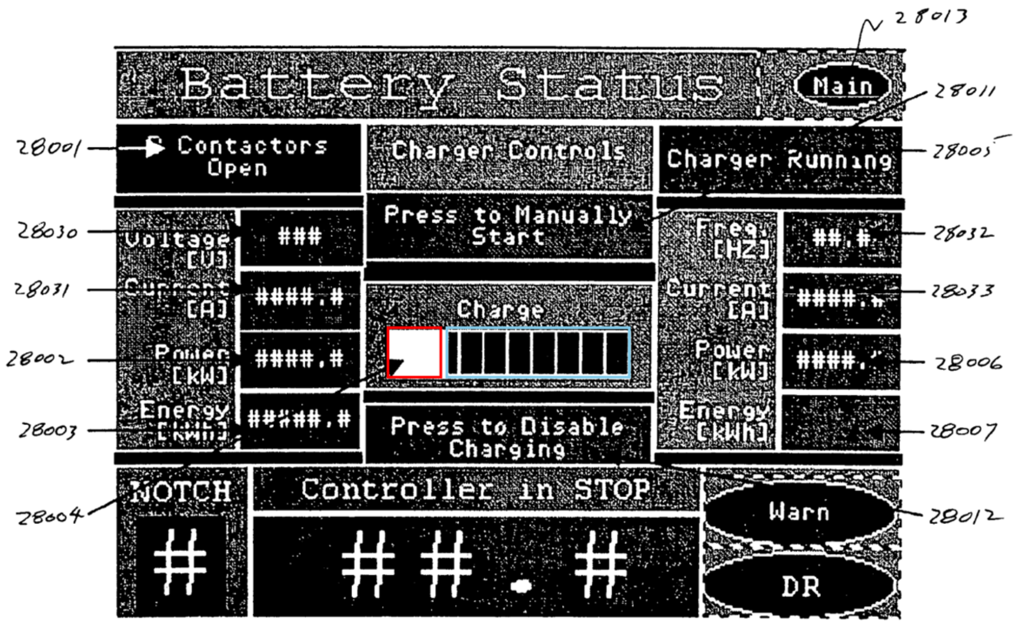
**(iv) Donnelly's *first portion indicative of an amount of charge residing in a battery of the electric vehicle and second portion indicative of an uncharged capacity of the battery of the electric vehicle***

216. As a preliminary matter, the vehicle charge indicator 714 described in the '987 Patent includes both a filled-in dark portion and a white unfilled portion, with the filled-in portion indicating a "current charge level" of the battery:



*'987 Patent,* FIG. 7 (annotated to show the filled-in portion (blue) and the white unfilled portion (red)), 14:56-58.

217. As shown below in annotated FIG. 28 from Donnelly, 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,* FIG. 28 (annotated).

218. A POSITA would have understood and/or found obvious 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 '987 Patent. *See* ¶ 216.

219. Additionally, because the 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), 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.

220. It was well-known to visually depict a variable level of a fillable object (e.g., fuel level in gas tank, charge of vehicle battery) through portions of a bar graph that show filled in vs. not filled in. *See, e.g., 2000 Honda Insight Manual,* 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), 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 graphs for battery charge).

221. I also note Claim 1[i] does not recite any visual characteristics of the first and second portion, other than the information being indicated within the *vehicle charge indicator*. Thus, for the reasons above, a POSITA would have found obvious 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*).

222. Thus, Donnelly teaches a graphical user interface being adapted to display a vehicle charge indicator element comprising a first portion indicative of an amount of charge residing in a battery of the electric vehicle and a second portion indicative of an uncharged capacity of the battery of the electric vehicle, as claimed.

#### (v) Motivation to Combine Donnelly's First and Second Portion into Ferro-Oyobe's GUI Touch Screen

223. A POSITA would have found it obvious and been motivated to modify the GUI presented on the touchscreen of Ferro-Oyobe-Donnelly to display a vehicle charge indicator element presenting both the current uncharged and charged capacity of the battery of the electric vehicle, per Donnelly. Ferro already contemplates using

the state of charge of the batteries in the charging system, as processor 204 receives state of charge information, such as the current charge of the batteries. *See* Section X.A.9.c.i. The modified Ferro already includes a touchscreen presenting a GUI. *See* Section X.A.9.b. Donnelly teaches displaying the state of charge, including the charged amount and uncharged portions using a bar graph on the GUI. *See* Section X.A.9.c.iv. A POSITA would have been motivated to modify Ferro 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. Additionally, such a modification would have provided advantages in conserving screen space on the modified Ferro GUI, which was an important consideration at the time of the ’987 Patent due to the relatively small size of in-dash vehicle screens. *See e.g., Pryor*, 2:2-5.

224. A POSITA would have also been motivated to visually show a vehicle operator the current charge level prior to choosing the “amount of charge” preference. For example, a POSITA would have appreciated being presented with the charge level information (both current charge and uncharged capacity) prior to choosing preferences for the transaction plan so they could predict what the transaction cost, and charging time would be. Seeing a high uncharged capacity and low current charge would allow the vehicle operator to prepare for a more costly 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 "amount of charge" preferences, such as "maximum" charge, to something they know they can afford, and/or have time to complete.

225. Additionally, a POSITA would have been motivated to display the state of charge of the vehicle battery via an indicator element on a GUI so the vehicle operator could better prepare for future charging of the vehicle. For example, the touch screen displaying the GUI with the state of charge indicator element would allow a user of the vehicle to track the charge battery 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 go to a charging station 403/118 to perform an energy transaction to charge the vehicle.

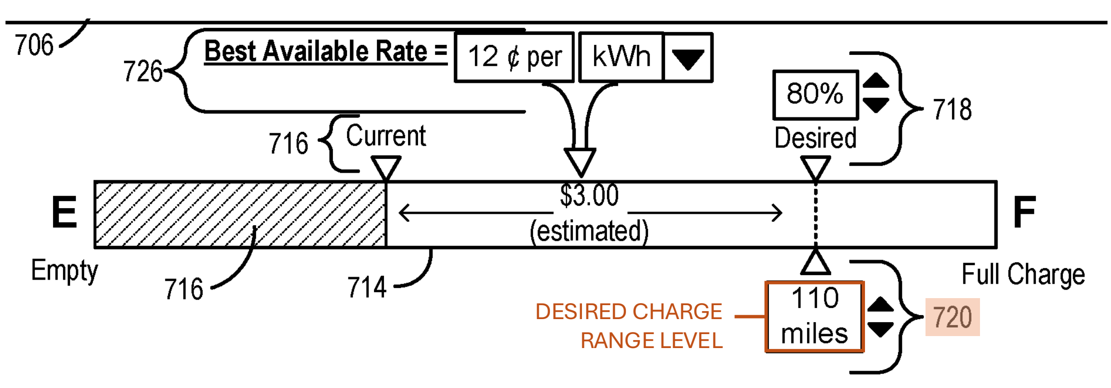
226. Such a modification would have simply required combining prior art elements (i.e., a GUI displaying a bar graph depicting the battery's state of charge/uncharged in visually distinct portions of the bar graph, per Donnelly) according to known methods to yield predictable results of allowing an operator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

227. A POSITA making this modification would have also had a reasonable expectation of success, given the modified Ferro (as otherwise modified by Oyobe) already includes a touch screen display presenting a GUI. *See* Section X.A.9.b. As

discussed in the above modification, the display is connected and communicates with the processor 204 and a user enters the charging preferences via the display. *Id.* Furthermore, the processor 204 already receives information about the state of charge of the batteries. *See* ¶ 223. Thus, all that is required for the modification is (1) including programming in the memory 206 that processor unit 204 executes to display the bar graph showing the uncharged and charged amount of the batteries on the GUI; and (2) programming the processor unit 204 to use the current state of charge information when generating the GUI bar graph. These modifications would not have been challenging, given touch screens were known to be programmable (*see* ¶ 207) and the Ferro processor 204 already uses the current state of charge information for another purpose (i.e., generating the transaction plan). *Ferro,* [0112]-[0113]; *see* ¶ 210-211.

### d) Slider for Specifying an Amount of Charge

228. As a preliminary matter, the ’987 Patent describes that “a desired charging level” may be “based on a desired distance of travel.”



*’987 Patent*, FIG. 7 (excerpt) (illustrating RN 720, desired charge level for a set range of 110 miles). The ’987 Patent describes “the user may indicate a desired charging level…based on a desired distance of travel.” *’987 Patent,* 19:49-57. The set distance may be “utilized to express the desired charge level in terms of distance[.]” *’987 Patent*, 14:65–15:8 (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”).

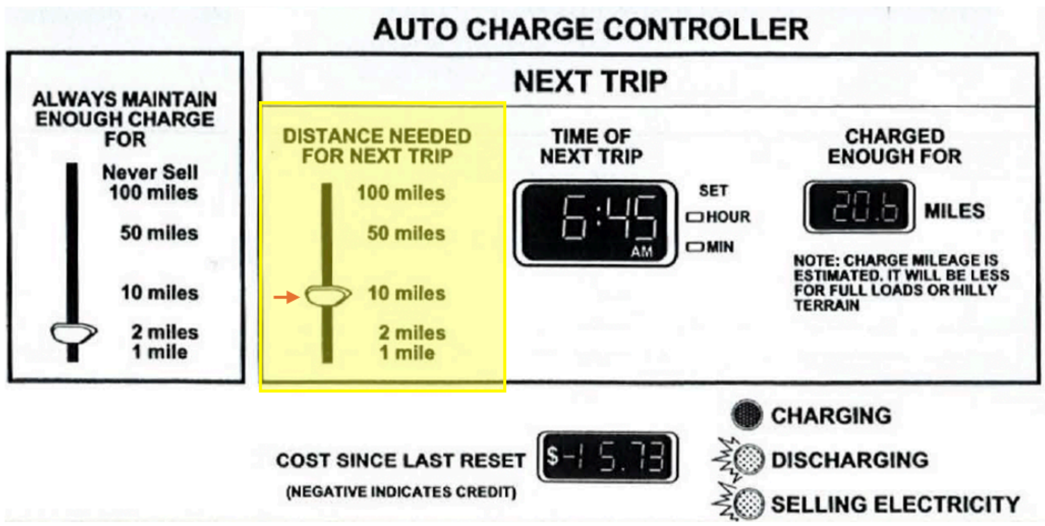
**(i) <u>Ferro’s Teachings</u>**

229. Ferro teaches the vehicle operator inputting the charging preferences, including a “minimum level” or “maximum level” to denote the “[a]mount of charge 514 preferences[.]” *Ferro,* [0123]; *see also,* Claim 1(f) Mapping. The vehicle operator may also specify “different levels of charge depending on” the power source used for charging. *Id.* Because Ferro teaches the principal (e.g., vehicle operator) “specify[ing]” the amount of charge (e.g., maximum, minimum), Ferro teaches *an amount of charge may be specified*. Ferro, however, does not explain how this information is input to the system.

**(ii) <u>Letendre’s Teachings</u>**

230. Letendre teaches a *slider by which an amount of charge may be specified*. Namely, Letendre discloses an “auto charge controller” 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,* Figure 1, 18 (illustrating an "auto charge controller" design for a "vehicle dashboard"). Letendre discloses the "driver sets" the controller "[A]ccording to driving needs." *Letendre,* 19 (disclosing auto charge controller of FIG. 1 is the "example control panel" a user may use to set charging according to driving needs).

231. Letendre cites to Kempton 1997 when describing the exemplary control panel of FIG. 1, as the Figure was pulled from Kempton 1997. *Letendre,* 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)*,* 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,* 162. Thus, given the above, a POSITA would understand the "distance needed for next trip" control (i.e., righthand control) to be a *slider.*

232. 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,* 19-20.

233. 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 element on a GUI. Webpages were known to display graphical elements a user may click on. *See, e.g., Webster's New World Telecom Dictionary* (Ex. 1074), 228 (defining a "web page" as containing "hypertext and navigation **buttons that allows the user to navigate the site by clicking them**…"). Thus, Letendre's user-selectable slider on the web page is a graphical element that allows a user to enter charging information, e.g., the "distance needed for next trip," (i.e., a *slider* on a *graphical user interface by which an amount of charge may be specified*).

234. Much like the '987 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 '987 Patent. The combination, therefore, yields a *unitary* vehicle charge indicator because, when combined, the *first portion*, *second portion*, and *third portion* would be on a single bar graph (per Donnelly), with Letendre's slider enabling the user to select an *amount of charge*.

**(iii) <u>Motivation to Combine Letendre's Amount of Charge Slider into Ferro-Oyobe-Donnelly's GUI Vehicle Charge Indicator</u>**

235. A POSITA would been motivated and found it obvious to modify Ferro-Oyobe-Donnelly to include Letendre's graphical slider on the charge level bar graph of the Ferro-Oyobe-Donnelly GUI, such that the operator moves the slider to specify a desired charge. As discussed above, in the Ferro-Oyobe-Donnelly system, Ferro's input/output and display is implemented using Donnelly's touch screen presenting a GUI. *See* Section X.A.9.b. The GUI on the touch screen is modified to display Donnelly's bar graph depicting the state of charge. *See* Section X.A.9.c. Furthermore, and as discussed below, the bar graph of the GUI is modified to display a selectable slider to select Ferro's minimum and/or maximum amount of charge preference, or Letendre's desired miles of travel the car should be charged to provide (both serving as *an amount of charge*).

236. Letendre expressly motivates the combination. Letendre applies the charge controller such that a vehicle may both recharge and discharge to the grid. *Letendre,* 19 (describing the controller being used to "limit the degree of battery discharge…in accordance with the **vehicle owners settings**"), 24 (describing Letendre's "model" being used to "charg[e] their batteries" and "selling power [from the batteries] to the grid"). Similarly, Ferro discloses the dynamic energy transaction plan being used to both "charge" and "discharge" the electric vehicle. *Ferro,* [0136] (describing the energy transaction plan "defines an energy transfer transaction encompassing the **charge, discharge**, and storage of electric energy in an electric vehicle). 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,* 19. Ferro teaches both charging and discharging the vehicle battery via the energy transaction plan system [0136] and using an I/O device on-board the vehicle to manage charge/discharge preferences. *Ferro,* [0093], [0118] (describing the "preferences 500" as including both "charging" and "discharging" preferences). Thus, a POSITA would have been motivated to include an on-board GUI with a movable slider by which the user may indicate a desired charge level (e.g., Ferro's maximum/minimum charge preference [0123] or Letendre's set number of miles) [18]), as such is "essential…so travel is not affected." *Letendre,* 19. Additionally, a POSITA would be motivated to combine Letendre's slider with

the GUI in the Ferro system so a user could input the amount of charge preference on the same interface that shows the current charge and uncharged capacity (via the bar graph). 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.

237. The modification would have merely required applying 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), 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), 1:14-36. These graphic elements on GUIs were known to be "eas[y] to use" and quickly learnable by a user.

*Id.*. Thus, to provide the same benefit of easily allowing a user to indicate a charging preference, a POSITA would have been motivated to include a movable slider the user interacts with to easily indicate a desired charge level. Furthermore, Patent Owner even admitted "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, 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.

238. Furthermore, a POSITA would have found it obvious and been motivated to modify Ferro 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 '987 Patent, it was recognized that there was a need for user-friendly EV interfaces. *See* ¶¶ 66-74; *Letendre,* 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 ’987 Patent, as I described above. *See* ¶¶ 66-74.

239. A POSITA implementing the modification would have had a reasonable expectation of success, given the modified Ferro system already has a touch screen with a GUI where a user inputs the charging preferences (*see* Section X.A.9.b), and these preferences include a user indicating “an amount of charge,” such as a “maximum level of charge” and “minimum” level. *Ferro*, [0123]. Additionally, applying a slider graphic on the GUI for allowing a user to adjust a parameter was well-known. *See, e.g., Davis,* 1:14-36 (describing sliders as a way to “adjust” a level of a parameter on a GUI); *see* ¶ 72. Thus, the modification would simply require including programming in memory 206 executed by processor 204 for the GUI to display a slider on the bar graph that an operator interacts with to input Ferro’s “amount of charge” charging preference or Letendre’s set number of miles to charge to. The processor 204 would execute the programming of the GUI to display the bar graph on the input/output display, including the slider. In this modified system, the GUI on the input/output display would receive the amount of charge (i.e., Ferro’s minimum/maximum or Letendre’s set miles to charge to), as well as Ferro’s other charging preferences, and then the communication fabric 202

would communicate the preferences from the touchscreen GUI to the processor 204. *See* Section X.A.9.b.

#### e) ***Unitary* Vehicle Charge Indicator**

240. As I discussed in Section III.D.3, 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* ¶ 30. A POSITA would have understood that Ferro, modified with Donnelly's bar graph on a GUI further modified to include Letendre's slider yields a *unitary vehicle charge indicator*. 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 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. 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. 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.

241. A POSITA would have been motivated to display the charged/uncharged information 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, thereby providing charge level context to the slider. A POSITA would have specifically recognized that an efficient use of space and 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 '987 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*, [0403], FIG. D22. Likewise, Letendre's slider is part of a unitary vehicle indicator element where the slider is overlaid a fill level such that the user can adjust the slider to select a mileage the user wants their electric vehicle to have enough charge for. *Letendre*, FIG. 1, 18-20.

242. A POSITA would have had a reasonable expectation of success in modifying Ferro to include a *unitary* vehicle charge element at least because such unitary elements were well-known, such as those taught by Cramer and Letendre. *See* ¶ 197; *Letendre*, FIG. 1; *Cramer*, FIG. D22.

### B. Claim 2: "The electrical charging system of claim 1, wherein the graphical user interface is adapted to display a web page."

243. Claim 2 depends from Claim 1. I have shown above that Ferro in combination with other references renders claim 1 obvious.

244. As discussed above and in the combined system of Claim 1, the system includes an on-board (in-vehicle) GUI. *See* Claim 1(h)'s Mapping.

245. Ferro teaches the data processing system 200 (part of *electrical charging system)* may connect to "other data processing systems or devices" via a network, such as the Internet, using communications unit 210. *Ferro,* [0042] (disclosing communications unit 210 providing communications with "other data processing systems or devices" via "wireless communications links"), [0039] (referring to a "data processing system," such as system 200, as a "computer"), [0027] (disclosing connecting the user's computer (e.g., system 200) to a "remote computer" via a local area network (LAN), wide area network (WAN), or "through the Internet using an Internet Service Provider"). Network interface 432, which is an exemplary communications unit 210 (*see* Claim 1(b) Mapping), permits access to networks (e.g., "the Internet") to connect the vehicle 400 to other "remote" devices and "**remote servers**." *Ferro,* [0106].

246. Ferro also teaches data processing system 200 "transfer[ring] data" between various components of FIG. 3 via a "wireless network connection" if the components are "located remotely," such as transferring preferences from a remote

server to the on-board system. *Ferro,* [0064], [0091], [0083], [0093]. Thus, Ferro at least contemplates transferring data via a wireless network, such as the Internet, from a remote server.

247. Letendre teaches an auto charge control panel, may be "on a Web page." *Letendre,* 19-20; *see also,* Section X.A.9.d.ii.

248. A POSITA would have found it obvious and been motivated to modified Ferro system's GUI of the on-board data processing system to *display a web page,* per Letendre. And thus, the GUI would be *adapted to* display the web page. Displaying web pages on vehicle displays was well-known prior to the '987 Patent. For example, BMW provided a "BMW Online" feature in their vehicles that allowed users to use the "Google" web page to perform online searching as early as the Summer of 2007. *Harley* (Ex. 1063), 2. BMW then rolled out the "BMW ConnectedDrive" feature in early 2008 that offers full "internet in a BMW" on the car "display." *Harley,* 2. Ford also developed an "in-dash computer" that has a "touch screen." *Ford* (Ex. 1064), 2. The computer includes a "built-in web browser" that "allows access to manufacturer web sites." *Ford,* 3. Thus, vehicles displaying web pages on their GUIs was known.

249. A POSITA would have found it obvious to adapt the modified Ferro system's GUI to be presented via a web page, and thus *adapted to display a web page,* given displaying web page-based GUIs on vehicle displays was well-known

and given Ferro's data processing system 200 is already connected to and communicates with a wireless network, such as the Internet. *Ferro,* [0042]; *see also,* ¶¶ 245-246. Thus, because Ferro's data processing system 200 already includes the necessary hardware and software for communicating and connecting to a remote server via the Internet, all that is required in the modification is (1) programming the GUI to be accessed via a web page, (2) programming processor 204 to retrieve the web-page based GUI from a remote server, and (3) display the web-page GUI on the touch screen of the modified Ferro system.

250. A POSITA would have been motivated to make the modification to allow easy access of the GUI for users that are in the vehicle and users that are using remote servers in Ferro. Ferro teaches certain services of the charging system may be remote, such as the preference service, among others. *See* SA0178 (citing [0091], [0083], [0093]). For principals of the charging transaction to enter preferences at such remote services, a POSITA would have appreciated inputting such preferences through a web-based GUI via accessing a web browser. As the same GUI would be accessed from a web server when inputting preferences in the car or at remote locations, the interface could be standardized, which a POSITA would find advantageous. Designing a car that uses the web as the in-car interface was known to provide the benefit of allowing users to access the web while in their cars, as well as easily keeping a vehicle updated with various information. *See, Jameel* (Ex.

1068), 637, 640. Thus, a POSITA would have been motivated to make the GUI web-based. The modification merely includes applying a known technique (displaying a web page based GUI) to a known device (touchscreen presenting in the vehicle) ready for improvement to yield the predictable result of centralizing the preference interface as a web-based GUI easily accessible for remote users and users in the car. Ferro envisions various types of principals inputting and "managing" preferences, including the "vehicle operator, owner," utility owner, or charging kiosk owner. *Ferro,* [0080], [0083]-[0084]. Thus, a POSITA would have been motivated to apply a web page based GUI for entering/managing the preferences to standardize the preference interface for all principals, no matter what device they use for entering the preferences thereon.

251. There would have been a reasonable expectation of success in modifying the modified Ferro system to display a web page on the GUI, given (1) the system 200 already includes communications unit 210 for wirelessly connecting with remote devices. *Ferro,* [0042]. Furthermore, data processing system 200 is already connected to the Internet via network 102. *Ferro,* [0038], [0106], Claim 1(b) Mapping (discussing network interface 432 is an exemplary network interface forming communications unit 210). Thus, a POSITA would simply have had to program the processor 204 to access the web page via network 102 and display the web page on the GUI. This would not have been challenging, given displaying web

page interfaces via a vehicle's display was well-known. *See* ¶ 248. Additionally, web interfaces were well established by 2009, and using such would simplify the development and implementation of the in-vehicle GUI.

### C. Claim 3: "The electrical charging system of claim 2, wherein the graphical user interface forms a part of the electric vehicle."

252. Claim 3 depends from claim 2. I have shown above that Ferro, as modified by other references renders claim 2 obvious.

253. The modified Ferro system includes a touchscreen display presenting a GUI that is on-board the vehicle. *See* Claim 1(i) Mapping, Section V.A.9.b. Thus, because the GUI touchscreen is on-board the vehicle, a POSITA would understand the *graphical user interface forms a part of the electric vehicle.*

### D. Claim 4: "The electrical charging system of claim 1, wherein the graphical user interface is adapted to receive a maintenance notification."

254. Claim 4 depends from claim 1. I have shown above that the Ferro system as modified by other references renders claim 1 obvious. Further, as shown below, the modified Ferro system of Claim 1, in further view of Donnelly also renders Claim 4 obvious.

255. Donnelly teaches a GUI displaying a Warnings Screen 25006. *Donnelly*, 21:39–22:1, FIG. 34. The warnings screen 25006 "displays minor alarms that have been detected," including a "high temperature warning field 34009 indicating an unacceptably high temperature…in the energy storage unit," or an

unacceptable high temperature in the "motors." *Donnelly,* 25:4-5, 25:18-21. The "high temperature" warning is shown below:

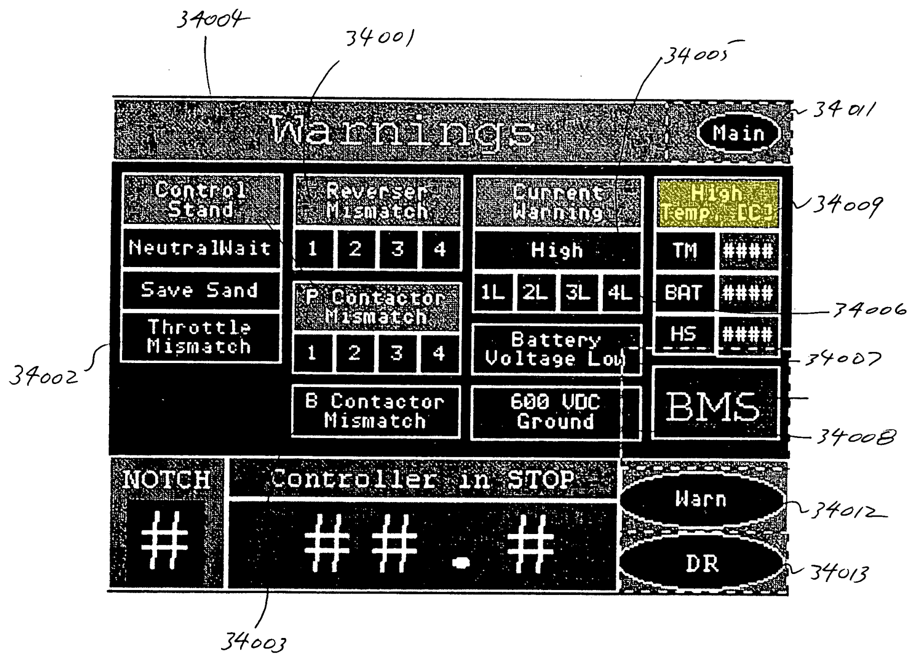



FIG. 34

*Donnelly,* FIG. 34 (annotated). Additionally, Donnelly discloses displaying a current warning "indicating an unacceptably high or low current on any of the traction motors…." *Donnelly*, 25:12-14.

256. As a reminder, the "energy storage unit" is the batteries. *Donnelly,* 23:17-18. Because Donnelly's Warning screen on the GUI displays "minor alarms that have been detected," such as a high temperature of the battery or a high/low current, a POSITA would have understood or found obvious the displayed high temperature warning is a *maintenance notification* received by *the graphical user interface*. For example and regarding the high temperature notification, electric

vehicle batteries reaching too high of a temperature was known to be dangerous and was known to affect the maintenance of the battery by having "an adverse effect on the performance and life of the battery." *Ohnuma* (Ex. 1069), 1:5-11, 2:15-18; *see also, Kadouchi* (Ex. 1070)*,* 3:15-32 (describing electric vehicle batteries at high temperatures compromises the "safety of the battery," especially when using batteries that have organic "vaporizable" chemicals, such as lithium batteries), 3:38-41 (describing "temperatures in the battery" being high as being "dangerous"). Further, such "dangerous" battery conditions in electric vehicles were known to "require[e] immediate servicing," and thus electric vehicles would often include "'**maintenance required'** commands." *Sandeep,* 144-145 (describing including a "warning light or an audible signal for a battery in a dangerous or faulty condition requiring immediate service as a 'maintenance required' command"). Furthermore, maintenance manuals for batteries often included instructions on how to handle the battery temperature, as a high temperature battery "may result in severe overcharge and damage to the cell/battery" during charging. *See, PowerSafe* (Ex. 1072)*,* title page (titled the manual as a "Safety, Storage, Operating and **Maintenance Manual**"), 16 (instructing to monitor the "battery temperature during" charging, because a high temperature battery "may result in severe overcharge and damage to the cell/battery"). Thus, given a high battery temperature was known to be a dangerous issue affecting and/or warranting maintenance, a POSITA would have understood or found it obvious Donnelly's displayed high temperature warning for the battery is a *maintenance notification*.

257. A POSITA would have found it obvious and been motivated to modify the GUI of the modified Ferro system to receive a maintenance notification, per Donnelly's teachings. A POSITA would have appreciated the GUI presenting a warning (e.g., high battery temperature warning or current warning) to allow the user to be alerted to and accordingly correct any issues to maintain the vehicle and its components (e.g., battery or motor) properly. Given high temperatures were known to damage and/or reduce the life of batteries, a vehicle operator would appreciate being notified when the battery temperature was getting too high, so that they could either perform maintenance of the battery themselves or have someone else look at the battery.

258. Furthermore, the GUI of the modified Ferro system already displays information relating to the battery conditions, including the state of charge. *See* Section X.A.9.c. A POSITA would have appreciated including any other battery condition information, such as a high temperature warning and/or low/high current warning, on the same GUI. In this way, the vehicle operator would easily be able to view the condition of the battery as whole. As GUIs are user-friendly, a POSITA would have been motivated to use the GUI of the modified system to display the high temperature maintenance notification. *See* Section VI.C.2.

259. There would have been a reasonable expectation of success in modifying the GUI of the Ferro system to receive a maintenance notification (e.g., high battery temperature). The processor 204 already determines various information about the battery, such as the current state of charge, for displaying on the GUI. *See* Claim 1(h) Mapping. Additionally, the GUI touchscreen already receives and displays an alert indicating the battery has reached a low voltage/charge set point. *See* Claim 1(n) Mapping. The processor 204 sends this alert by comparing the current battery charge to the lower set point. *Id.* All that is required in the modification is (1) programming the processor 204 to additionally receive temperature readings of the battery or monitor operating current levels and compare such readings to a high temperature threshold, and (2) programming the processor 204 to send a high temperature warning to the GUI touchscreen for display when the detected temperature reaches a high temperature point. Monitoring the temperature of batteries via monitoring current flow or the temperature itself was well-known in EVs, and thus this modification would not have been challenging. *See, e.g., Ohnuma,* 3:45-56 (describing an EV "charging system" that includes a "battery temperature detecting device" and a "charge current detecting device"), 4:24-36 (generally describing a "control device" receiving the battery temperature from the detecting device); *Kadouchi,* 6:20-25 (describing a "controller" receiving the temperature of the battery "detected by a temperature detector").

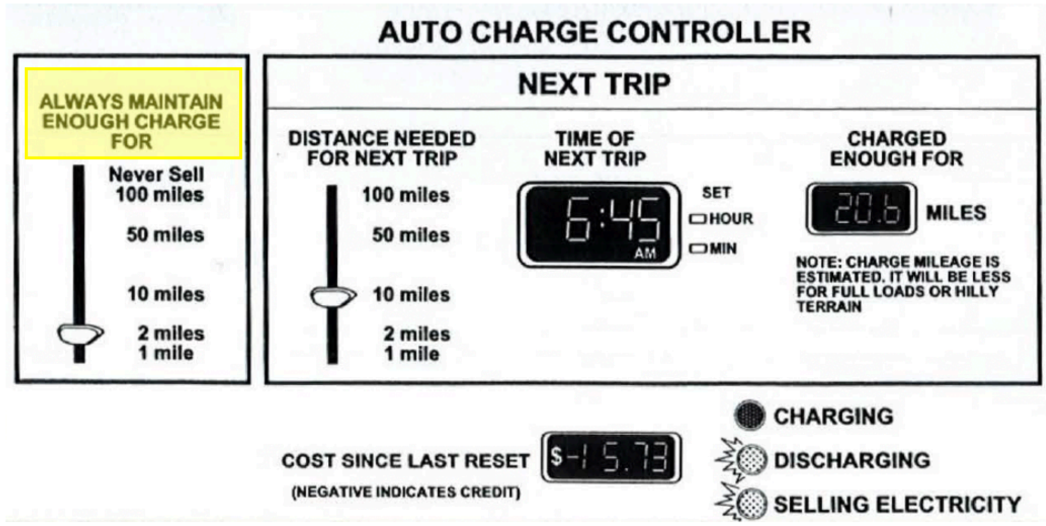
**E. Claim 6: "The electrical charging system of claim 1, wherein the charging schedule for the electric vehicle is further based upon a factor of safety parameter."**

260. Claim 6 depends from claim 1. I have shown above that Ferro as modified by other references renders claim 1 obvious.

261. In Ferro, the transaction plan (i.e., *charging schedule*) is generated by the energy transaction planner 402 using the principal-entered charging preferences, including the maximum and minimum amount of charge, among other information. *See* Claim 1(f)-1(g) Mapping. Further, the modified Ferro system including Letendre's "always maintain" mileage input renders obvious Claim 6(a).

262. As a preliminary matter, the '987 Patent describes a "factor of safety field 726 via which the user may set a factor of safety to be utilized in calculations regarding charging levels and schedules for the vehicle." *'987 Patent,* 15:39-42. The field 726 shows "1.5," indicating the user-specified charge level is multiplied by 1.5 to ensure there is extra charge left for unknown travel. *'987 Patent,* FIG. 7. Furthermore, the '987 Patent describes a "factor of safety and/or **reserve travel capacity**" as being added to a user's planned "travel" distance (e.g., "20 miles"). *'987 Patent,* 19:52-57.

263. Letendre teaches a distance (in miles) the vehicle battery should "always maintain enough charge" for:




*Letendre,* 18, FIG. 1 (annotated). A slider on the charge controller under the "always maintain enough charge for" is moved by a user to indicate the amount of charge to always maintain for a certain amount of mileage. *Kempton,* 162 (describing the same Figure, with the "slider at left allow[ing] the operator to specify, for example, 'never discharge below 2 miles' (say, if the corner store is 1.5 miles round trip)").

264. Given the "NEXT TRIP" entry specifies the next "planned trip" distance the user will drive, a POSITA would understand these inputs cause the auto charge controller to charge the EV to the NEXT TRIP distance plus the ALWAYS MAINTAIN distance. *Kempton,* 162. If this were not the case, then the batteries would not **always** maintain the user's specified "always maintain" distance. In the example shown in FIG. 1 above, the vehicle would be charged to travel a distance of 12 miles, in order to account for the "NEXT TRIP" and the "always maintain" distance amount. The "always maintain" entry, similar to the '987 Patent's factor of

safety 726, is used in calculating charging levels. See ¶ 262. Additionally, Letendre's "always maintain" distance that is, e.g., a "2-mile reserve," being added to the user's NEXT TRIP entry is much like the factor of safety 726 described in the '987 Patent as a reserve travel capacity that is added to a planned travel distance. *Kempton,* 162 (caption for FIG. 1 that is the FIG. 1 in Letendre). Thus, a POSITA would have understood or found obvious the "always maintain" slider entry of Letendre is a type of *factor of safety*, as the "always maintain" distance is used in calculating the battery charge to encompass the desired NEXT TRIP distance and a reserve distance.

265. A POSITA would have found it obvious and been motivated to modify the Ferro charging system (as already modified by Oyobe, Donnelly, Letendre, Seelig, Knockeart) to additionally include Letendre's "always maintain" charge entry that indicates a distance that the vehicle battery should always be charged to allow travel of. Letendre expressly teaches the auto charge controller is beneficial because "[i]t is essential that the driver be able to limit any draw down so travel is not affected." *Letendre,* 18. Thus, a POSITA would have been motivated to include the "always maintain" mileage entry into the modified Ferro system so that travel is not affected by any charging and discharging.

266. Furthermore, a POSITA would have appreciated inputting a distance that is "always maintain[ed]" via battery charge in Ferro's vehicle for any unexpected trips, in order to account for a "reserve" distance. *Kempton,* 162.

Additionally, a vehicle operator would appreciate being able to indicate a level of charge to maintain via a distance, in addition to Ferro's minimum level, as it may be easier for a user to know the distance they are planning to travel, rather than the exact charge required to travel such distance. Additionally, the "auto charge controller" in Letendre's FIG. 1 (including the "always maintain" distance input) is "useful for 'smart' charging based on driver travel needs, allowing more flexibility than the simpler timed charge" often used for EVs. *Kempton,* 162. Thus, a POSITA would appreciate including an "always maintain" distance entry in Ferro's charging system would increase the flexibility of the charging and better meet user needs.

267. A motivation to combine the modified Ferro system with Letendre was also provided at Claim 1(i), Section X.A.10.d.iii. Thus, for the reasons above, a POSITA would have been motivated to include an "always maintain" distance entry in Ferro's charging system. Additionally, the modification is simply combining prior art elements (Letendre's "always maintain" user input distance parameter and Ferro's charging system) according to known methods (including "always maintain" distance parameter in Ferro's chosen charging preferences) to yield predictable results of making the charging system more flexible, user-friendly, and fit the needs of the user so travel is not affected.

268. A POSITA would have had a reasonable expectation of success in making this modification. Ferro already teaches basing the transaction plan (i.e.,

*charging schedule*) on charging preferences input by a vehicle operator. *See* Claim 1(g) Mapping (referring to Claim 1(f) Mapping for "one or more charging preferences). Additionally, processor 204 already uses Ferro's charging preferences, among other information, to generate the transaction plan and the user enters the preferences via the GUI presented on the touchscreen. *See* Claim 1(h) Mapping, Claim 1(g) Mapping. Thus, all that is required in the modification is programming the processor 204 to (1) present an "always maintain" factor of safety on the GUI that a user interacts with to input a mileage at which charge should always be maintained, (2) receive the user input as part of the charging preferences used in generating the transaction plan, and (3) generating the transaction plan according to this additional charging preference. Because processor 204 already receives the charging preferences entered by the user in determining the transaction plan, this modification would not be challenging.

### F. Claim 7: "The electrical charging system of claim 6, wherein the one or more charging preferences comprise the factor of safety parameter."

269. The Ferro system (as already modified by Oyobe-Seelig-Donnelly-Letendre) is modified to include Letendre's "always maintain" factor of safety as part of the charging preferences entered by the user. *See* Claim 6(a) Mapping. Thus, the *one or more preferences comprise the factor of safety.*

## G. Claim 8

### *1. Claim 8[Pre]: "An electrical charging method, comprising:"*

270. Ferro teaches an *electrical charging method*. *Ferro*, Abstract, [0012]. *See* Claim 1((Pre).).

### *2. Claim 8[a]: "receiving, from a vehicle sensor, information indicative of a presence of an electric vehicle in a parking space;"*

271. *See* Claims 1(a), 1(e).

### *3. Claim 8[b]: "receiving, via a communication device, information indicative of one or more charging preferences corresponding to a desired charging of the electric vehicle, wherein the one or more charging preferences are defined by an operator of the electric vehicle;"*

272. *See* Claims 1(b), 1(f).

### *4. Claim 8[c]: "determining, by a processor and based at least on the one or more charging preferences and at least one current value of a dynamic attribute of an electric charge provider, a charging schedule for the electric vehicle;"*

273. *See* Claims 1(c)-1(d), 1(g).

### *5. Claim 8[e]: "transmitting, by the processor, a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle;"*

274. *See* Claim 1(h).

***6. Claim 8[f]: "wherein at least one of the one or more charging preferences is defined by user input received via a graphical user interface adapted to display a vehicle charge indicator 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; and (iii) a third portion comprising a slider by which an amount of charge may be specified;"***

275. *See* Claim 1(i).

**H. Claim 9: "The electrical charging method of claim 8, wherein the graphical user interface is adapted to display a web page."**

276. *See* Claim 2.

**I. Claim 10: "The electrical charging method of claim 9, wherein the graphical user interface forms a part of the electric vehicle."**

277. *See* Claim 3.

**J. Claim 11: "The electrical charging method of claim 8, wherein the graphical user interface is adapted to receive a maintenance notification."**

278. *See* Claim 4.

**K. Claim 13: "The electrical charging method of claim 10, wherein the charging schedule for the electric vehicle is further based upon a factor of safety parameter."**

279. *See* Claim 6.

**L. Claim 14: "The electrical charging method of claim 13, wherein the one or more charging preferences comprise the factor of safety parameter."**

280. *See* Claim 7.

## M. Claim 15

### *1. Claim 15[Pre]: "An electrical charging system, comprising:"*

281. *See* Claim 1(Pre).

### *2. Claim 15[a]: "a vehicle sensor;"*

282. *See* Claim 1(a).

### *3. Claim 15[b]: "a communication device;"*

283. *See* Claim 1(b).

### *4. Claim 15[c]: "a processor in communication with the vehicle sensor and the communication device; and"*

284. *See* Claim 1(c).

### *5. Claim 15[d]: "a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to:"*

285. *See* Claim 1(d).

### *6. Claim 15[e]: "(a) receive, from the vehicle sensor, information indicative of a presence of a vehicle in a parking space;"*

286. *See* Claim 1(e).

### *7. Claim 15[f]: "(b) receive, from the communication device, information indicative of one or more charging preferences corresponding to a desired charging of the vehicle, wherein the one or more charging preferences are defined by an operator of the vehicle;"*

287. *See* Claim 1(f).

#### *8. Claim 15[g]: "(c) determine a first value of a dynamic attribute of an electric charge provider;"*

288. The *dynamic attribute of an electric charge provider* is a changing or otherwise fluctuating cost of electricity for purchase from an electric charge provider. *See* Section III.D. As discussed above for the mapping of Claim 1(g), Ferro's current price of electricity from an electric energy provider (e.g., a utility company)) is a *dynamic attribute See* Claim 1[g] Mapping (*citing Ferro*, [0037], [0066]). Ferro teaches planner 402 receiving and using a current price of electricity to generate the transaction plans. *See* ¶¶ 178-180. Because planner 402 requests the current price of electricity from third party sources and processor 204 executes the planner 402 software, the processor *determine[s]* the cost of electricity.

289. The current price of electricity at a given time is a *first value*. Ferro teaches planner 402 generating a "first set of terms for a dynamic energy transaction plan," using the current price of electricity (e.g., current electricity price from the "current state of device information" received via the energy data services). *Ferro,* [0149]; *See also,* ¶¶ 178-180. The planner 402 then "receives updated" information, including "updated state of device information" and uses such information to update the energy transaction plan. Thus, because the state of device information includes the price of electricity and this information is later updated to generate an updated transaction plan, the current price of electricity applied in generating the first transaction plan is a *first value*. *See* Claims 15[j]-15[k]'s Mapping, which provides

additional detail on Ferro's teaching of continuously updating current the price of electricity and using a *first* and *second value* to generate the first plan (i.e., first set of terms) and an updated transaction plan (i.e., second set of terms).

***9. Claim 15[h]: "(d) determine, based at least on the one or more charging preferences and the first value of the dynamic attribute, a charging schedule for the vehicle;"***

290. *See* Claim 1(g).

***10. Claim 15[i]: "(e) transmit a control signal to a parking space charge device that starts a charging of the vehicle in accordance with the charging schedule;"***

291. *See* Claim 1(h).

***11. Claim 15[j]: "(f) retrieve a second value of the at least one dynamic attribute; and***

***12. Claim 15[k]: "(g) repeat (d) and (e), utilizing the retrieved second value of the dynamic attribute as the first value of the dynamic attribute,"***

292. Ferro teaches continuously updating the cost of electricity to *retrieve a second value of the at least one dynamic attribute*. Namely, Ferro's planner 402 receives updated current prices of electricity when generating an updated transaction plan (e.g., via a second set of terms). As discussed above, planner 402 queries energy data services that provide current device state information, including the current cost of electricity. *See* Claim 1(g) Mapping. Planner 402 uses this information to generate a first transaction plan having a first set of terms. *Ferro,* [0112]-[0113], [0149]. Planner 402 then "receives" a set of updated current state information (including

updated current cost) and modifies dynamic energy transaction plan 424 to create an updated dynamic energy transaction plan 438 having a second set of terms. *Ferro*, [0114], [0073]-[0076], [0150] (disclosing planner receiving "updated charging transaction information," including "updated state of device information" and updated the transaction plan based on the information to include a "second set of terms").

293. In order to receive the updated cost, planner 402 continuously requests updated information from energy data services 418 (which provides the price of electricity information) or the services 418 send the information when an update in information occurs. *Ferro,* [0116]-[0117]. Because processor 204 executes planner 402 (*see* Claim 1(d) Mapping), Ferro teaches processor 204 *retrieve[s] a second value of the at least one dynamic attribute,* per claim 15(j), by requesting or automatically receiving updated electricity price information to generate the updated plan having the second set of terms.

294. Below shows FIG. 12, that illustrates how an updated dynamic energy transaction plan is generated:

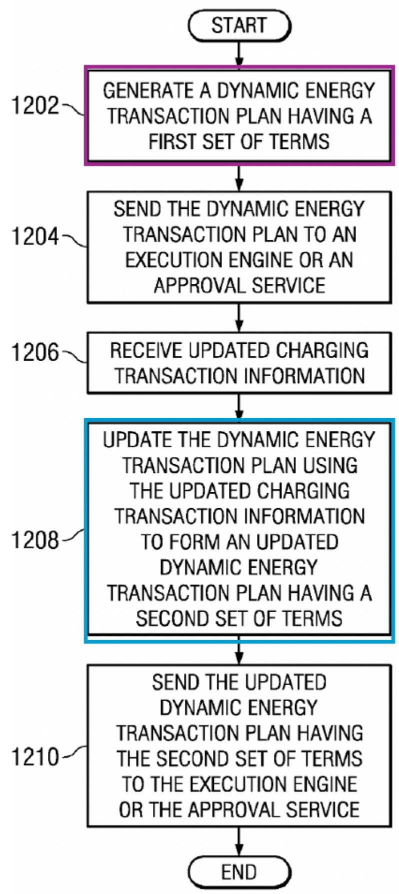


*FIG. 12*

*Ferro,* [0148], FIG. 12 (annotated). Ferro's first cost (i.e., *first value*) is used to generate the transaction plan that has a first set of terms (step 1202, purple above). *Ferro,* [0149]. The planner 402 then uses the retrieved updated cost (i.e., retrieved *second value* – step 1206) to generate an updated transaction plan that has a second set of terms (steps 1208). *Ferro,* [0150]. Because the planner 402 determines a second updated plan having the second set of term, and bases this second plan on the updated cost, Ferro teaches *repeat[ing] (d), utilizing the retrieved second value of the dynamic attribute*, per claim 15(k).

295. Additionally, the plan having the second set of terms is sent to the execution engine, which executes the updated plan having the second set of terms to charge the vehicle. *Compare* Step 1204 to Step 1210, above; *see also,* Claim 1(i) Mapping (execution engine execution the plan charges the vehicle according to the plan). Thus, Ferro also teaches *repeat[ing] (e),* per claim 15(k).

***13. Claim 15[l]: "wherein at least one of the one or more charging preferences is defined by user input received via a graphical user interface adapted to display a vehicle charge indicator 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; and (iii) a third portion comprising a slider by which an amount of charge may be specified."***

296. *See* Claim 1(i).

**N. Claim 16: "The electrical charging system of claim 15, wherein the graphical user interface is adapted to display a web page."**

297. *See* Claim 2.

**O. Claim 17: "The electrical charging system of claim 16, wherein the graphical user interface forms a part of the vehicle."**

298. *See* Claim 3.

**P. Claim 18: "The electrical charging system of claim 15, wherein the graphical user interface is adapted to receive a maintenance notification."**

299. *See* Claim 4.

**Q. Claim 20: "The electrical charging system of claim 15, wherein the charging schedule for the vehicle is further based upon a factor of safety parameter."**

300. *See* Claim 6.

**R. Claim 21: "The electrical charging system of claim 20, wherein the one or more charging preferences comprise the factor of safety parameter."**

301. *See* Claim 7.

**S. Claim 22[Pre]: "An electrical charging system, comprising:"**

302. *See* Claim 1(Pre).

**T. Claim 22[a]: "a communication device;"**

303. *See* Claim 1(b).

**U. Claim 22[b]: "a processor in communication with the communication device; and"**

304. *See* Claim 1(c).

**V. Claim 22[c]: "a memory in communication with the processor, the memory storing instructions that when executed by the processor cause the processor to:"**

305. *See* Claim 1(d).

**W. Claim 22[d]: "provide a user interface comprising a unitary combined input/output element comprising: (i) a graphical depiction of an electric vehicle battery capacity, (ii) a graphical depiction of a current charge level of the electric vehicle battery, and (iii) a graphical input slider element that permits an operator of the vehicle to provide input defining a desired charge parameter of the electric vehicle;"**

306. *See* Claim 1[i]. In my opinion, the modified Ferro teaches *provid[ing] a user interface*. In the combination, Ferro's collective display 214 and input/output

unit 212 is modified with Donnelly's teachings of a touchscreen presenting a GUI (i.e., a graphical **user interface**). *See* Section X.A.10. Therefore, by modifying Ferro's collective display to present a GUI, per Donnelly, a POSITA would have understood the combination teaches or renders obvious *providing a user interface* by virtue of modifying Ferro to display Donnelly's graphical **user interface**.

307. The Ferro-Donnelly-Letendre combination also teaches or renders obvious the claimed *graphical depiction[s]*. In the modified Ferro, the touchscreen presents a GUI displaying a bar graph (per Donnelly) and a slider on the bar graph (per Letendre). The bar graph and slider are graphical depictions, as they are presented on a graphical user interface (the Donnelly GUI) and depict graphical elements (bar graph and slider).

308. The Donnelly-Letendre bar graph depicts (i) *an electric vehicle battery capacity,* (ii) *a current charge level of the electric vehicle battery*, and (iii) a *slider element*. As I discussed with respect to Claim 1[i], Donnelly's bar graph includes a filled-in portion and an unfilled portion, where the filled-in portion represents a current charge capacity of the battery. *See* ¶¶ 200-202; *Donnelly*, FIG. 28 (below). Here, the entire bar graph that is available to be filled when the battery is fully-charged (highlighted in orange) provides *a graphical depiction of an electric vehicle battery capacity*. Specifically, a POSITA would have understood the entire length of the bar graph (where the bar graph is annotated orange in the figure below)

represents the "Charge" capacity of the battery, as indicated on FIG. 28. *Donnelly*, FIG. 28. It is common sense that FIG. 28's bar graph, which Donnelly states depicts the battery charge, would indicate the entire battery capacity along its length. Representing a maximum amount, capacity, or some other parameter by symbols filling in the bar graph is an extremely common and common-sense form of visually indicating a capacity. Additionally, either the black, filled-in portion provides *a graphical depiction of a current charge level of the electric vehicle battery*, or alternatively, the white, unfilled portion represents *a current charge level of the electric vehicle battery*.

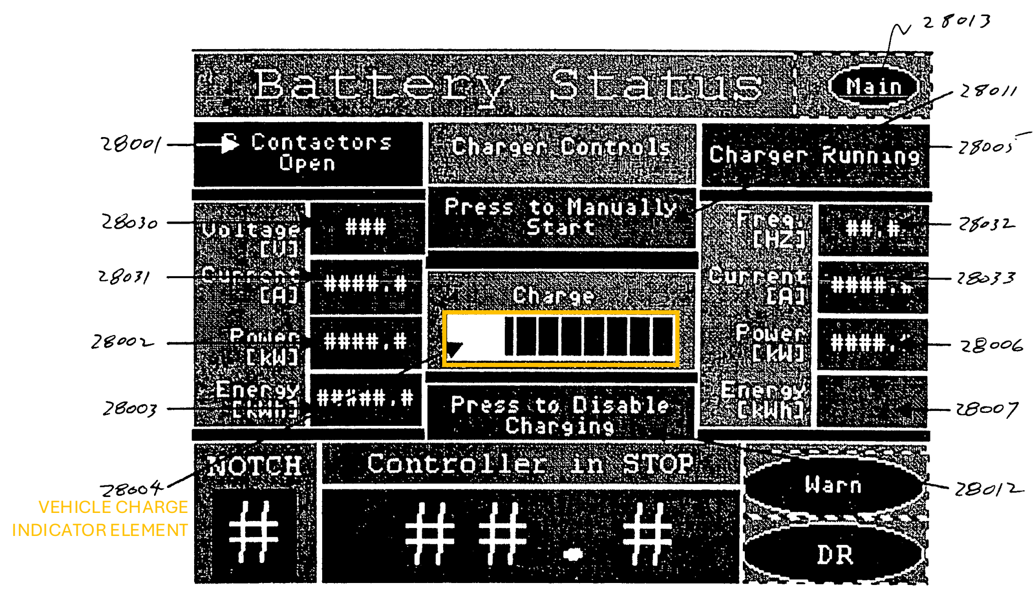



FIG. 28

*Donnelly*, FIG. 28, 23:19-20. To state another way, because Donnelly's display depicts the current charge and the available capacity, together the two indicators represent *an electric vehicle battery capacity*. *Donnelly*, FIG. 28, 23:19-20.

309. Additionally, the Donnelly-Letendre bar graph depicts a *slider element that permits an operator of the vehicle to provide input defining a desired charge parameter of the electric vehicle*. *See* ¶¶ 230-234. That is, the user may manually actuate the slider to select a *desired charge parameter of the electric vehicle*, such as an amount of charge, as I previously discussed. *Id.*

310. Furthermore, the Ferro-Donnelly-Letendre combination teaches or renders obvious a user interface comprising a *combined input/output element*. Namely, the combination of Donnelly's bar graph with Letendre's slider yields a *unitary combined input/output element*. *See* X.A.10.e). Specifically, Donnelly's bar graph is an *output element* – displaying, i.e., *output[ting]* the *capacity* and *current charge level* – and Letendre's slider is an *input* element, allowing a user to *provide input defining a desired charge parameter*, such as a desired charge amount. *See* Claim 1[i]. The *element[s]* are a *combined input/output* at least because the *unitary…element* is a *combin[ation]* of Donnelly's output element (bar graph) and Letendre's slider element. *See* ¶¶ 240-242. As I previously discussed, in the combination, Letendre's slider is displayed simultaneously with Donnelly's bar graph such that the user can set the desired charge level. *Id.* A POSITA would have

understood that such an arrangement yields a *combined input/output element*. The motivations to combine are the same as I discussed with respect to Claim 1[i]. *See* Claim 1[i].

**X. Claim 22[e]: "receive, from the communication device and via the user interface, information indicative of one or more charging preferences corresponding to a desired charging of the electric vehicle, wherein the one or more charging preferences are defined by the operator of the vehicle and include an indication of the desired charge parameter of the electric vehicle received via the graphical input element that permits the operator of the vehicle to provide input defining the desired charge parameter of the electric vehicle;"**

311. *See* Claims 1(f), 1(i).

**Y. Claim 22[f]: "determine, based at least on the one or more charging preferences and at least one current value of a dynamic attribute of an electric charge provider, a charging schedule for the vehicle; and"**

312. *See* Claims 1(f), 1(i).

**Z. Claim 22[g]: "transmit a control signal to a parking space charge device that starts a charging, in accordance with the charging schedule, of the electric vehicle."**

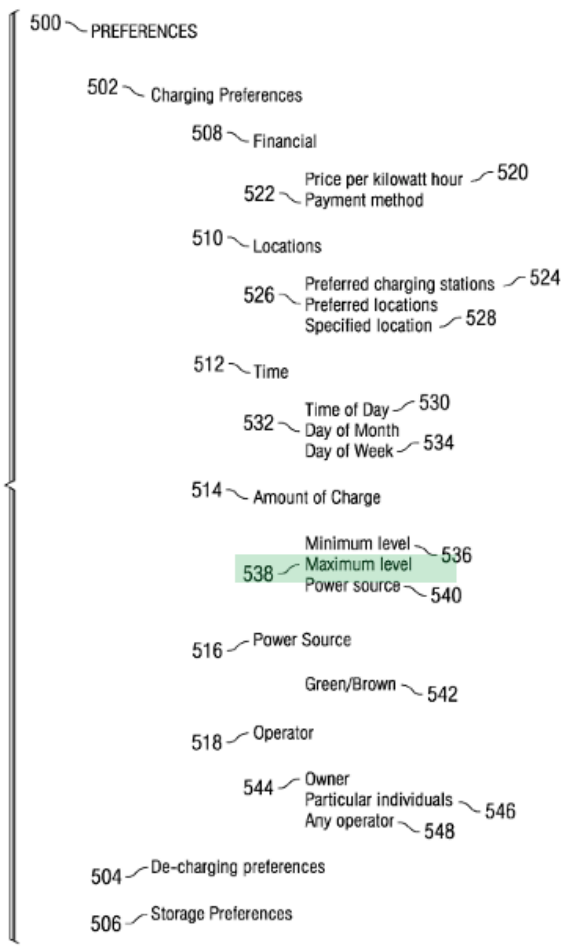
313. *See* Claim 1(h).

**AA. Claim 23: "The electrical charging system of claim 22, wherein the desired charge parameter comprises a desired charge limit for the electric vehicle."**

314. Ferro teaches Claim 23. The motivations to combine I described with respect to Claim 1[f] are incorporated. *See* ¶¶ 203-209, 223-227, 235-242. As I opined with respect to Claim 1[f], Ferro teaches *charging preferences/desired*

*charge parameters*, i.e., preferences 406 and electric vehicle charging preferences 500. *See* Claim 1[f]'s Mapping. Preferences 500 are taught by Ferro as "types of preferences that may be included within…preferences 406." *Ferro*, [0118]. Ferro additionally teaches a "parameter of the charging transaction is any feature of the charging transaction, such as…**a maximum level of charge** [or] **a minimum level of charge**[.]" *Ferro*, [0084]. FIG.5 illustrates "a block diagram of electric vehicle charging preferences" including "amount of charge 514":

FIG. 5



*Ferro*, FIG. 5, [0118]-[0120], [0123] ("Amount of charge 514 preferences may specify minimum level 536 of charge in the electric vehicle's storage device, a **maximum level of charge 538**…").

315. Therefore, because Ferro teaches users setting preferences 400/500 (*desired charge parameter[s]*) that include a maximum level of charge (*desired charge limit*), Ferro teaches or renders obvious *wherein the desired charge parameter comprises a desired charge limit for the electric vehicle*.

### BB. Claim 24: "The electrical charging system of claim 22, wherein the desired charge parameter comprises a time parameter governing charging of the electric vehicle."

316. Ferro teaches wherein the desired charge parameter comprises a time parameter governing charging of the electric vehicle. As I opined with respect to Claim 1[f], Ferro teaches *charging preferences/desired charge parameters*, i.e., preferences 406 and electric vehicle charging preferences 500. *See* Claim 1[f]. The parameters 500 include "[t]ime 512 preferences [that] may specify, without limitation, time of day 530 for charging the vehicle, time of day to stop charging the vehicle, day of month 532 for charging, and/or day of week 534 for charging the electric vehicle." *Ferro*, [0122], [0120]. FIG. 5 depicts time preferences 512:

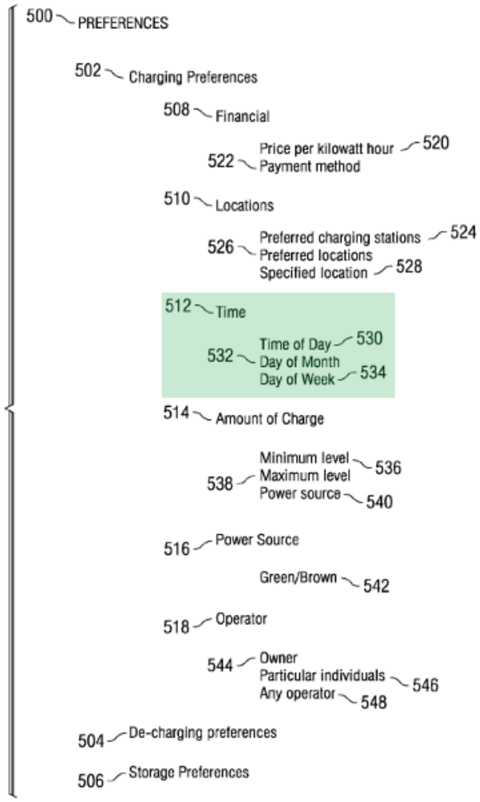



FIG. 5

*Ferro*, FIG. 5. The '987 Patent similarly describes enabling the user to set preference information including "an indication of how much energy is desired to be stored by the vehicle 460 by a certain time[.]" *'987 Patent*, 10:59-67, *see also*, 15:9-25, FIG. 7; *compare to, Ferro*, [0122]. Therefore, Ferro teaches *wherein the desired charge parameter* (parameters 500) *comprises a time parameter* (time parameter 512) *governing charging of the electric vehicle* (the time parameter specifies, i.e., *govern[s]*, the time for charging the electric vehicle). *Ferro*, [0122].

**CC. Claim 25: "The electrical charging system of claim 22, wherein the graphical user interface is adapted to display a web page."**

317. *See* Claim 2.

### DD. Claim 26: "The electrical charging system of claim 25, wherein the graphical user interface forms a part of the vehicle."

318. *See* Claim 3.

### EE. Claim 27: "The electrical charging system of claim 22, wherein the graphical user interface is adapted to receive a maintenance notification."

319. *See* Claim 4.

### FF. Claim 29: "The electrical charging system of claim 19, wherein the charging schedule for the vehicle is further based upon a factor of safety parameter."

320. *See* Claim 6.

### GG. Claim 30: "The electrical charging system of claim 29, wherein the one or more charging preferences comprise the factor of safety parameter."

321. *See* Claim 7.

## XI. GROUND 2: OBVIOUSNESS OF CLAIMS 5, 8, 14, 17, 23, AND 26

### A. Claims 5, 12, 19, 28: "The electrical charging system of claim 4/11/18/27, wherein the graphical user interface forms part of a smartphone."

322. The modified Ferro charging system includes a touchscreen on-board the vehicle presenting the *graphical user interface*. *See* Claim 1[h] Mapping. Knockeart teaches a removable personal device, "such as a PDA, cellphone or similar device" that communicates with a computer on-board a vehicle *Knockeart,* Abstract, 4:32-41, 5:52-65, 6:29-31, FIGs. 1, 3-6 (FIGs. 5-6 disclosing communication with onboard computer). The removable device may communicate

with the on-board vehicle computer system through "wireless communication." *Knockeart,* 7:1-9 (disclosing removable device may communicate with on-board computer via wireless communication), 13:57-60. The "removable personal device provides an input/output interface between in-vehicle system 105 and an operator of the vehicle." *Knockeart,* 4:49-53. The removable 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." *Knockeart,* 4:53-67, FIG. 1. When the removable device is "coupled" to the on-board computer, the graphical display and touchscreen are "accessible to the on-board computer." *Knockeart,* 7:49-58, FIG. 7.

323. Knockeart discloses the removable personal device may be a "cellular telephone" or "personal digital assistant" (PDA), such as Palm Computer made by Palm, Inc. *Knockeart*, 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." *Pervasive Computing: The Smart Phone* (Ex. 1080)*,* 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*.

324. Additionally, the smart phone was also referred to as a "marriage between a powerful cell phone and a wireless-enabled PDA." *Zheng* (Ex. 1081), 1. Knockeart's exemplary Palm PDA as the removable device was such a "marriage between a powerful cell phone and a wireless-enabled PDA," even being considered a "PDA/**smart phone[**.]" *Krakow* (Ex. 1090), 3. 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.,* 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,* 4; *PALM Treo 700P Manual,* 11. Thus, given a Palm PDA is an exemplary removable device in Knockeart, a POSITA would have understood and/or found it obvious the removable device is a *smartphone*.

325. A POSITA would have been motivated and found it obvious to display the GUI on a removable smartphone, such as Knockeart's smartphone. In the modification, the processor 204 sends the GUI for display on the smartphone's touchscreen via communication unit 210 wirelessly communicating over network 102, and is still capable of displaying the GUI on the in-car touchscreen, as discussed further. The combination is merely use of a known technique (implementing a GUI on the touchscreen of a smartphone) 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 (Ferro's on-board vehicle charging system and Knockeart's smartphone) according to known methods (wirelessly connect smartphone to in-vehicle computer system) to yield predictable results of allowing a user to view charging information when they are away from the vehicle.

326. Ferro's communication unit 210 provides wireless communication via a network interface (e.g., network interface 432) to remote devices. See Claim 1(b) Mapping. The communication unit 210 connects to network 102, which may be a wireless network, to communicate with remote devices. *Ferro,* [0106], [0032]-[0033], [0064]. The network 102 allows components "located remotely" to "transfer data using any type of wired or wireless network connection," even when the data processing system 200 is in the vehicle. *Ferro,* [0064], [0037] (describing vehicle 116 using network 102 to "send and receive data associated with the charging of electric vehicle"). Thus, a POSITA would recognize utilizing such wireless communication to connect a smartphone to Ferro's system 200 and displaying the GUI on the smartphone 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. *Sunyama* (Ex. 1092), 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

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 smartphone screen 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).

327. There would have been a reasonable expectation of success in modifying the Ferro system to display the GUI on a smartphone wirelessly communicated therewith. The smartphone already includes "[a] graphical display" and "touch-screen" that receives "manual input." *Knockeart*, 2:46-50, 4:53-59. Ferro already employs a wireless communication unit 210 that communicates with processor 204 and connects to a wireless network 102 for transferring information between remote devices. *See* Claim 1(b)-1(c) Mapping. Similarly, Knockeart's removable smartphone is also already capable of communicating with an in-vehicle computer via wireless connection. *See* ¶ 322. Thus, having the touchscreen of the smartphone display the GUI for entering charging preferences would have been fairly simple.

328. The modification would only require (1) connecting the smartphone to network 102 so the communications unit 210 can transfer information between processor 204 and the smartphone and (2) programming the processor 204 to display the GUI on the graphical touchscreen of Knockeart's smartphone. As the processor 204 is in communication with the communications unit 210 (*see* Claim 1(c) Mapping), the processor 204 would communicate to the smartphone touchscreen to display the GUI. Given (1) displaying GUIs on a touchscreen was well-known (*see* Claim 1(h) Mapping), and (2) wirelessly communicating information between a smartphone and vehicle was well-known, these modifications would have been within a POSITA's expertise. *See, e.g., Sunyama,* Abstract (describing wirelessly communicating charging information to a remote device); *Lowrey* (Ex. 1067), 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").

## XII. CONCLUSION

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: 11/8/2024 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
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21. Connected Vehicle Performance Requirements; Presented at the 22$^{nd}$ World Congress on Intelligent Transportation Systems, October, 2015, Bordeaux, France

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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

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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

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