

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner,

v.

GRAPHITE CHARGING COMPANY LLC,
Patent Owner.

Case No. IPR2024-00387

U.S. Patent No. 8,103,391

**DECLARATION OF C. ARTHUR MACCARLEY, PH.D., P.E.
REGARDING CLAIMS 1-20 OF U.S. PATENT NO. 8,103,391**

Petitioner Ex-1009

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PETITIONER'S EXHIBIT LIST

<u>Exhibit</u>	<u>Description</u>
Ex-1001	U.S. Patent No. 8,103,391 to Ferro <i>et al.</i> (“’391 Patent”)
Ex-1002	U.S. Patent No. 5,596,258 to Kimura <i>et al.</i> (“Kimura”)
Ex-1003	U.S. Patent No. 5,650,710 to Hotta (“Hotta”)
Ex-1004	U.S. Patent No. 5,659,240 to King (“King”)
Ex-1005	U.S. Patent No. 5,696,367 to Keith (“Keith”)
Ex-1006	U.S. Patent No. 5,548,200 to Nor <i>et al.</i> (“Nor”)
Ex-1007	Prosecution History of the ’391 Patent
Ex-1008	U.S. Patent No. 6,614,204 to Pellegrino <i>et al.</i> (“Pellegrino”)
Ex-1009	Declaration of Expert C. Arthur MacCarley
Ex-1010	Curriculum Vitae of Expert C. Arthur MacCarley
Ex-1011	SAE Standard J1772 (Revised Nov. 2001)
Ex-1012	Federal Court Management Statistics—Profiles (Sept. 30, 2023)
Ex-1013	Motion for Extensions of Time (Jan. 26, 2024)
Ex-1014	District Court Complaint (Aug. 4, 2023)

I, Arthur MacCarley, declare as follows:

I. ENGAGEMENT

1. I reside at 1413 Eucalyptus Road, Nipomo, CA, 93444, USA.
2. I have been retained by Tesla, Inc. (“Petitioner”) in connection with the above-captioned petition for *Inter Partes* Review (“IPR”) of U.S. Patent No. 8,103,391 (“’391 Patent,” Ex-1001). I have been informed that the ’391 Patent is purportedly assigned to Graphite Charging Company LLC (“Patent Owner”).
3. I have been asked by the Petitioner to offer opinions regarding the ’391 Patent, including opinions regarding Claims 1-20 in view of certain prior art. This declaration sets forth the opinions I have reached to date regarding these matters.
4. I am being compensated by the Petitioner at my standard hourly consulting rate for my time spent on this matter. My compensation is not contingent on the outcome of the IPR or on the substance of my opinions.
5. I have no financial interest in the Petitioner or the Patent Owner.

II. PROFESSIONAL BACKGROUND

6. My qualifications are set forth in my curriculum vitae, a copy of which I understand has been submitted as Ex-1010.
7. I received a Bachelor of Science (B.S.) in Engineering and a Master of Science (M.S.) in Electrical Engineering from the University of California, Los Angeles, in 1976 and 1978, respectively. From 1976 to 1979, I was employed by

Hughes Aircraft Corp, and from 1979 to 1984, I worked for the University of Denver Research Institute and the American Bosch Division of United Technologies. Thereafter, I earned a Doctor of Philosophy (Ph.D.) in Electrical Engineering from Purdue University in 1987, with a specialty in Computer-Based Control Systems. While at Purdue, I was the recipient of the David Ross Fellowship for doctoral study and focused my research on microprocessor-based control systems and indirect sensing methods for automotive applications.

8. I am currently an Emeritus Professor of Electrical and Computer Engineering at the California Polytechnic State University (Cal Poly) in San Luis Obispo, California, a leading public technical university in the United States. I served on the faculty of the California Polytechnic College of Engineering from 1988 to 2019, receiving tenure in 1994. Since 2019, I have continued to teach electronics, control systems, and automotive engineering courses part time at Cal Poly in addition to consulting in forensic automotive electronics. I also continue to teach mechanical engineering and electrical engineering courses as part of the International Summer School Program at the Munich University of Applied Sciences in München, Germany, as I have done every summer since 2014.

9. Among the most relevant courses I have taught recently is Cal Poly Course EE/BRAE 434, *Automotive Engineering for a Sustainable Future*, 2005-2002, which covers advanced electric vehicle technologies, including electric vehicle

technologies and infrastructure. I also founded and advised two popular student engineering clubs, the Cal Poly Electric Vehicle Engineering Club (EVEC) (since 1996) and the Future Fuels Club (since 2005). The EVEC achieved a degree of recognition in 2014 by designing and building the world's fastest automated battery exchange and charging system for an electric shuttle bus, an accomplishment not yet surpassed according to available media (demo videos available at <https://www.youtube.com/watch?v=DZvteZl77do> and <https://www.youtube.com/watch?v=yi7NDjSNVZ0>).

10. My academic and research specialties include digital control systems, advanced electronics, and electric and alternative energy vehicle engineering. Among other appointments, I served as the Chair of the Electrical and Computer Engineering Department from 2007 to 2010, as the Director of the Computer Engineering Program from 2000 to 2003, and as the Director of the Transportation Electronics Laboratory from 1994 to 2013.

11. I am a Senior Member of the Society of Automotive Engineers (SAE), the Institute of Electrical and Electronic Engineers (IEEE), and Sigma Xi. I have been a Registered Professional Engineer (Electrical and Mechanical) in good standing in the State of Colorado continuously since 1981.

12. I have published 95 technical papers and articles in refereed journals, in conference proceedings, and as book chapters, all in the field of automotive and

transportation electronics and control systems. My research activities have focused on electric vehicle power and control systems, as well as indirect sensing methods for low-emission engine control. For my research, I have received funding from the National Science Foundation, the U.S. Department of Energy, the California Energy Commission, the U.S. Department of Commerce, the California Department of Transportation, the California Office of Transportation Safety, Pacific Gas and Electric Company, and Isuzu Motor Company.

13. Among my funded research projects was a feasibility study and a preliminary design of automated battery exchange and charging systems, resulting in two journal papers that have been recognized among the most downloaded publications by Research Gate and LinkedIn: (1) “Review and Assessment of Battery Interchange Methods for Electric Vehicles,” Proc. SAE Future Car Conference 2000, Society of Automotive Engineers, Washington, DC. January 2000 and (2) “Battery Interchange Alternatives to In-Vehicle Charging: Technical, Safety and Economic Considerations,” Proc. FISITA 2000 World Automotive Congress, Seoul, Korea, June 2000.

14. I have also served as the designated expert witness in 49 litigated cases since 1999 and remain active in this capacity (complete listing in CV).

III. MATERIALS REVIEWED

15. In forming the opinions that I express in this declaration, I have reviewed the

'391 Patent and considered each of the exhibits that I cite here and all other materials that I have discussed herein. I have also relied on my experience in the field and carefully considered the viewpoint of a person of ordinary skill in the art ("POSA") as of the time of the priority date (which as I explain below is assumed to be August 19, 2008). As is clear from the aspects of my professional background summarized above (and further documented by my CV), and as I also explain in more detail below, I am very familiar with a POSA's perspective as of that time. All of the opinions I have formed have been assessed from the perspective of a person of ordinary skill in the art.

IV. DESCRIPTION OF THE RELEVANT TIMEFRAME, THE RELEVANT FIELD, AND A PERSON OF ORDINARY SKILL IN THE ART

16. I understand that the '391 Patent was filed on August 19, 2008, and that it does not claim priority to any other patent applications. Therefore, for purposes of my analysis, I have treated the priority date of Claims 1-20 as August 19, 2008 ("Priority Date"). I reserve the right to update my analysis should the Patent Owner assert a different priority date.

17. I have received and understand the specification, claims, and prosecution history of the '391 Patent.

18. In my opinion, a POSA would have had a bachelor's degree in computer science or electrical engineering, along with at least two to three years of

experience working on software and/or hardware used to manage charging processes for electric vehicles. Additional advanced educational degrees could substitute for some years of industry experience and vice versa.

19. A POSA would also have been familiar with relevant standards and regulations relevant to charging of electric vehicles, including the SAE J1772 standard (which I understand is Ex-1011 in this proceeding). And a POSA would have known with the principles and technologies that the '391 Patent identifies as part of the general knowledge, including: (i) electric vehicles, (ii) vehicle charging stations, and (iii) power grids. Ex-1001, 1:15-62.

20. The opinions I present herein are as viewed through the eyes of a POSA prior to August 19, 2008. As I noted above, I am very familiar with a POSA's perspective as of the Priority Date (as is clear from the aspects of my professional background summarized above (and as further demonstrated by my CV)).

V. OVERVIEW OF THE '391 PATENT

21. I have reviewed the '391 Patent and understand that Erica Haefner Ferro, Mark William Trekell, and Paul Stuart Williamson are named as the inventors on the '391 Patent. The '391 Patent relates to “monitoring a charging process for interrupt conditions that terminate the charging process.” Ex-1001, 1:8-14.

22. In particular, the '391 Patent describes two generic, black-box constructs for monitoring and terminating the charging process: (1) “an energy transaction

execution engine” and (2) “an energy transaction interrupt monitor.” As indicated in the independent claims, the energy transaction execution engine executes the charging process. *Id.*, Claim 20. This may involve, for example, transmitting *a request signaling the start of the charging process* and receiving *a response ... to terminate the charging process*. *Id.*, Claim 1.

23. Whereas the energy transaction execution engine serves to execute the charging process, the energy transaction interrupt monitor is described as performing monitoring operations. *Id.*, Claim 20; *see also id.*, Claim 1 (describing various operations involved in monitoring the charging process while not explicitly naming the energy transaction interrupt monitor). The claims indicate that this monitoring occurs responsive to receipt of the aforementioned request from the energy transaction execution engine. *E.g., id.*, Claim 1. The claims also indicate that the monitoring involves monitoring operational parameters of the charging process to determine whether the charging process ought to be terminated, in which case the energy transaction interrupt monitor sends the aforementioned response back to the energy transaction execution engine. *E.g., id.*

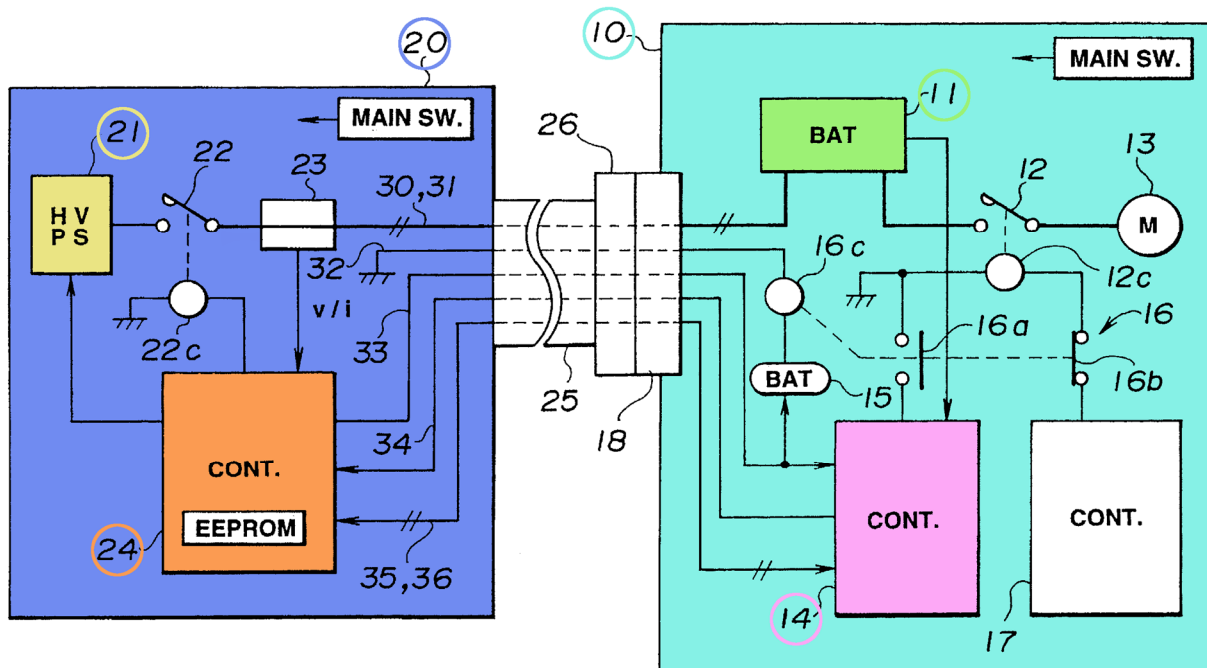
VI. OVERVIEW OF THE PRIOR ART

A. Kimura

24. I understand that the Examiner was not aware of Kimura (Ex-1002) nor was it listed among the prior art references in the '391 Patent, denying the Examiner

relevant information during their evaluation prior to allowing the patent to issue.

Kimura regards “a charging apparatus and method for charging a battery of an electric car (vehicle).” Ex-1002, 1:8-9. As illustrated in Figure 1, the charging apparatus of Kimura includes a charger 20 (purple) with a charger controller 24 (orange). *Id.*, Fig. 1. The charger controller “is so constructed as to control the charge operations,” which involve providing power to a battery 11 (green) of the electric vehicle 10 (turquoise). *Id.*, 3:30-31 and 3:39-41.

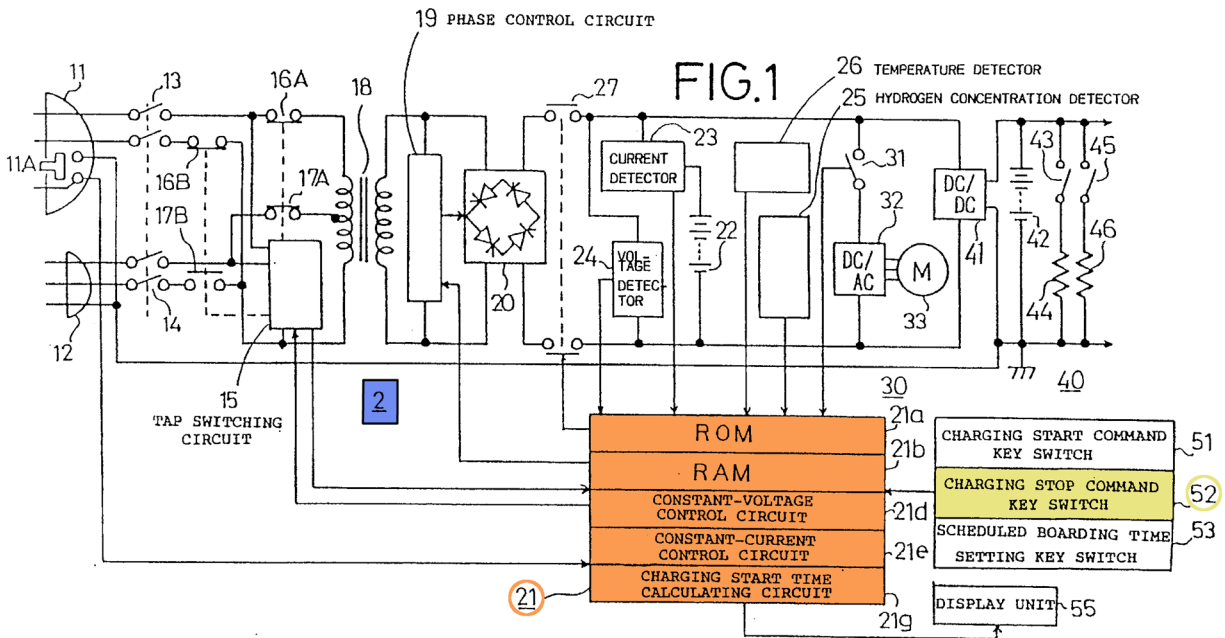


Ex-1002, Fig. 1. I pause here to note that the use of colors in reproduced figures reflect my understanding of how elements of the claims are depicted in the figures. Likewise, in discussing certain text that I reproduce (such as quotes to the references), I use bold font to emphasize certain areas of that text.

25. In Kimura, during charging, the charger controller 24 monitors the charging process to determine whether it ought to be terminated, for instance, due to “a leakage in ... current of the charger 20, [or] a breakdown, overheat, or power failure in the high voltage power supply 21 [yellow].” *Id.*, 7:32-48. A battery controller 14 (pink) also monitors the charging process for events warranting termination. *Id.*, 10:19-22 and 10:38-50. As I explain in detail below, Kimura invalidates many of the claims of the ’391 Patent.

B. Hotta

26. The ’391 Patent does not list Hotta among the prior art, and I understand that the Examiner was not aware of Hotta (Ex-1003) while evaluating whether to allow the patent to issue. Hotta regards “an apparatus for controlling the charging of a storage battery ... [of] an electric vehicle.” Ex-1003, 1:11-16. This apparatus includes a charger 2 (purple) with a controller 21 (orange) that has a charging stop command key switch 52 (yellow). *Id.*, 3:45-51 and 5:13-29. The key switch 52 allows a user of the charger 2 to manually terminate the charging process. *Id.*, 17:16-21 and 20:52-57.

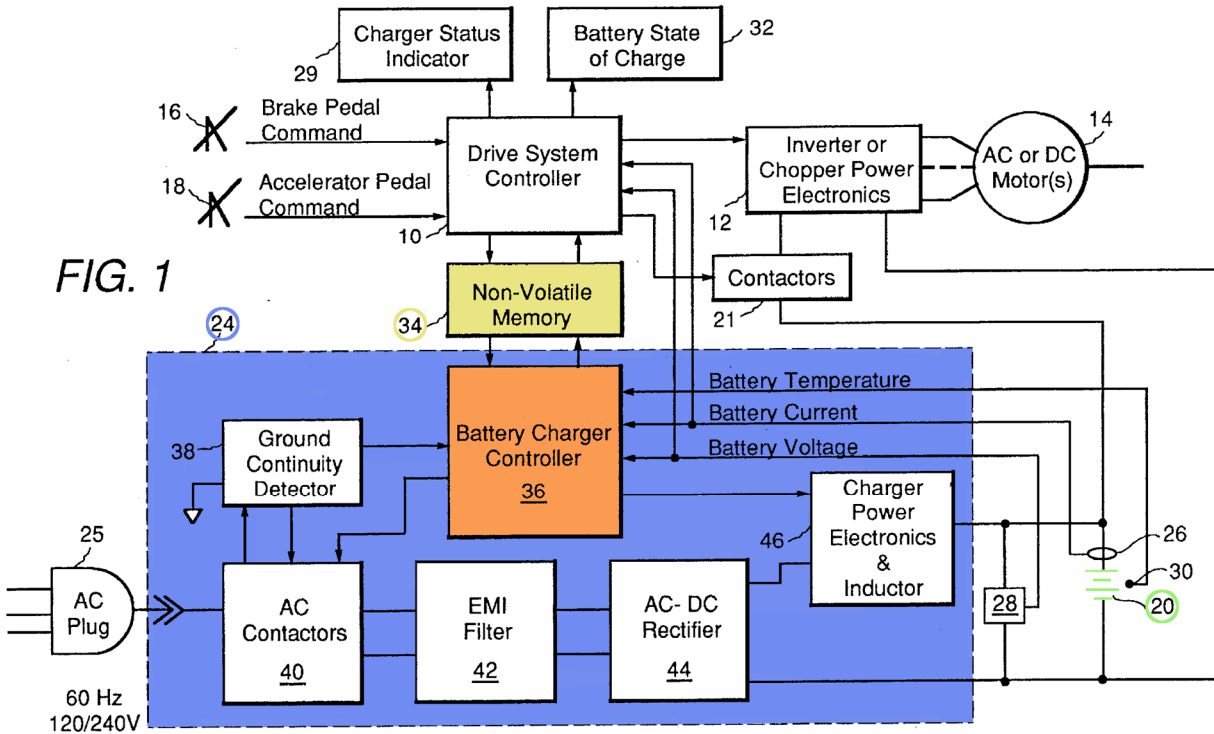


Ex-1003, Fig. 1. As I explain in detail below, Kimura including certain aspects of Hotta (e.g., the manual-termination aspects discussed above) invalidates certain claims of the '391 Patent.

C. King

27. The '391 Patent does not list King among its prior art, and I understand that the Examiner was not aware of King (Ex-1004) when the Examiner was involved with evaluating whether to allow the patent to issue. King describes an electric-vehicle battery charger 24 (purple) with a controller 36 (orange) for managing the charging process. Ex-1004, 2:30-58 and 5:49-51. The battery charger controller 36 operates based on various parameters of the charging process, thereby ensuring that the process is terminated once the battery 20 (green) is fully charged or in the event of a fault. *Id.*, 5:24-33. These parameters are stored in a

memory 34 (yellow), where they can then be accessed by the battery charger controller 36. *Id.*, 4:66-5:6.

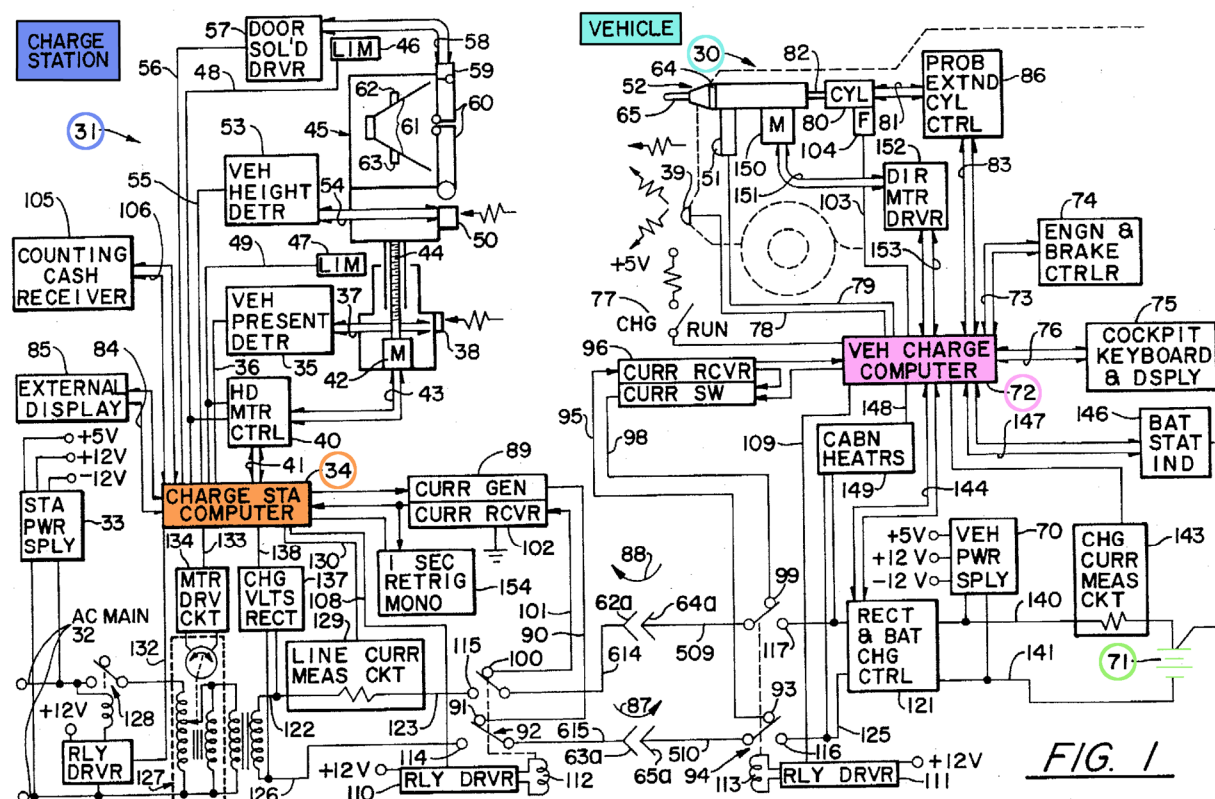


Ex-1004, Fig. 1. As I explain in detail below, Kimura modified to include certain aspects of King (including related to the storage of parameters, mentioned above) invalidates certain claims of the '391 Patent.

D. Keith

28. The asserted '391 Patent does not list King among its prior art, and I understand that the Examiner was not aware of Keith (Ex-1005) during the process of determining whether to allow the patent to issue. Keith relates to “electric vehicles which are operated with a battery and charging stations to which the vehicles may be presented for a charge when connected thereto.” Ex-1005, 1:9-12.

In Figure 1, Keith illustrates a charge station 31 (purple) for charging the battery 71 (green) of an electric vehicle 30 (turquoise). *Id.*, 4:65-5:2. Both the charge station 31 and the vehicle 30 include respective computers 34 (orange) and 72 (pink), each of which participates in the charging process.



Ex-1005, Fig. 1.

29. As Keith explains, the charge station computer 34 executes a charge station computer program, which involves monitoring various operational parameters to determine whether the charging process ought to be terminated. *See id.*, 17:47-49 (describing execution of a portion of the charge station computer program) and *id.*, 21:29-22:29 (discussing the monitoring performed at the charge station

computer 34).

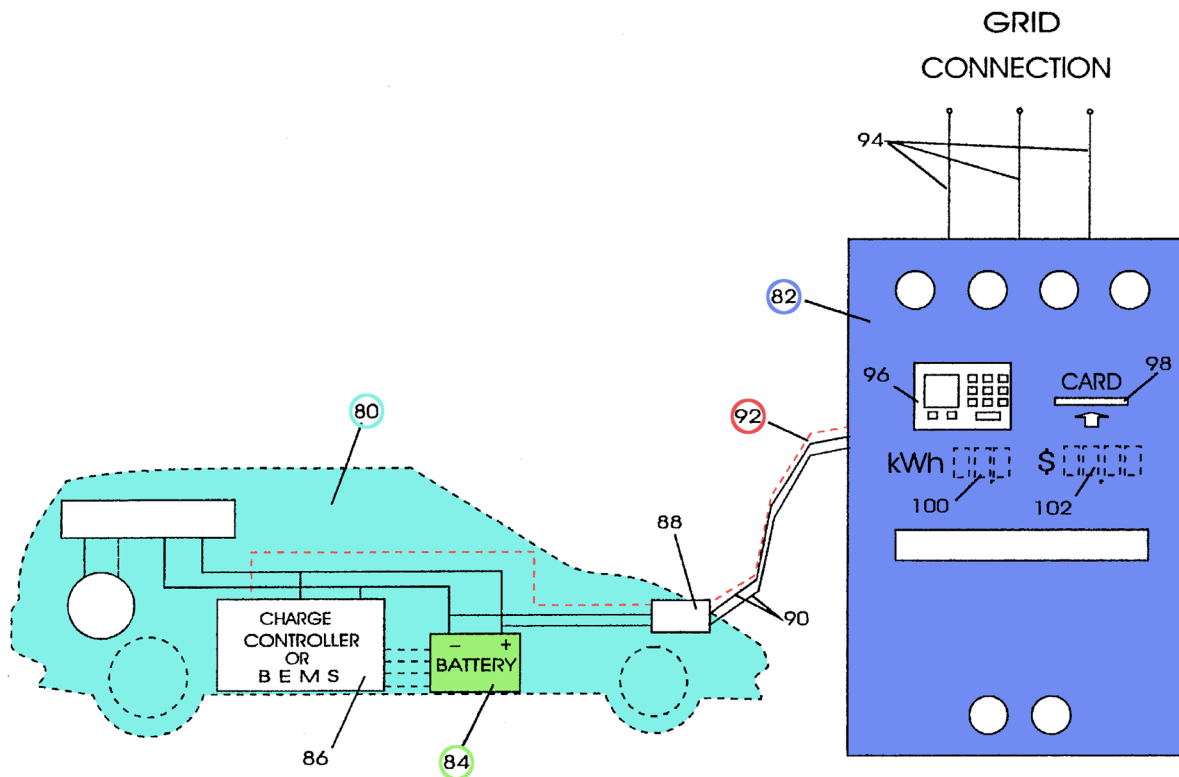
30. With regard to the vehicle charge computer 72, Keith describes a similar computer program that likewise involves monitoring operational parameters to determine whether the charging process should be terminated. *Id.*, 17:41-47 (describing execution of a portion of the vehicle charge computer program) and *id.*, 23:57-24:34 (discussing the monitoring performed at the vehicle charge computer 72).

31. As I explain in detail below, Keith invalidates many of the claims of the '391 Patent. I use Keith as a base/starting point reference and my use of Keith is independent of my use of Kimura, which, to me, further reveals that the claims of the '391 Patent are not novel or are obvious given that there were so many on-point teachings out there.

E. Nor

32. The '391 Patent does not list King among its prior art, and I understand that the Examiner was not aware of Nor (Ex-1006) while the Examiner was evaluating whether to allow the patent to issue. Nor describes a charging station 82 (purple) for charging the battery 84 (green) of an electric vehicle 80 (turquoise). Ex-1006, 9:62-10:6. The charging station 82 is connected to the vehicle 80 via data communication means 92 (red) (*id.*), which are monitored continuously for a communication failure between the charging station 82 and the vehicle 80 (*id.*,

4:52-63).



Ex-1006, Fig. 2.

33. As I explain in detail below, Keith as modified by Nor (e.g., related to use of a separate communication pathway between vehicle and charger) invalidates many of the claims of the '391 Patent.

VII. CLAIM CONSTRUCTION

34. I understand that claim construction is the process of determining the meaning of a term or phrase in a patent claim. I understand that the proper construction of a term is how a POSA would have understood the term based on its use in the claims, specification, and file history of the patent. I further understand

that the claims are construed before the Board using the same claim construction standard that applies in district courts. I have followed these principles in my analysis throughout this declaration. For the purpose of this declaration, I do not believe that any express constructions are needed and have applied the plain and ordinary meaning of all terms to a POSA.

VIII. ANTICIPATION

35. I have been instructed as to the legal meaning of “anticipation” in the context of U.S. Patent Laws.

36. I understand that anticipation of a claim requires that every element of the claim be disclosed in a single prior art reference and arranged as in the claim. I also understand that a single prior art reference may anticipate claims expressly, but may also (i) disclose a feature of the claimed invention inherently if that feature is necessarily present in a reference and (ii) disclose features or combinations of features such that they would at once be envisaged from a reference’s teachings. Further, I understand that a reference is read from the perspective of a POSA as of the Priority Date.

IX. OBVIOUSNESS

37. Additionally, I have been instructed as to the definition of “obviousness” in the context of U.S. Patent Laws. It is my understanding that even though an invention may not have been identically disclosed or described before it was made

by an inventor, in order to be patentable, the invention must also not have been obvious to a POSA before the Priority Date.

38. It is my understanding that obviousness is a question of law based on underlying factual issues including the scope and content of the prior art, the level of skill in the art, and any differences between the prior art and the claimed invention.

39. I understand that the scope and content of prior art for deciding whether the invention was obvious includes at least prior art in the same field as the claimed invention. The prior art can also come from different fields that a POSA would have considered when trying to solve the problem that is addressed by the invention. I understand that prior art that under either (or both) of these standards is referred to as being analogous art.

40. I understand that one may find obviousness if, at the time of the patent's alleged invention, there was a reason that would have prompted a POSA to combine the known elements in a way the claimed invention does. I have also been informed that obviousness can be evaluated based on the following considerations: (1) whether the claimed invention was merely the predictable result of using prior art elements according to their known function(s); (2) whether the claimed invention provides an obvious solution to a known problem in the relevant field; (3) whether the prior art teaches or implies the desirability of combining

elements claimed in the invention; (4) whether the prior art teaches away from combining elements in the claimed invention; (5) whether it would have been obvious to try the combinations of elements, such as when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions; and (6) whether the change resulted more from design incentives or other market forces.

41. I understand that impermissible hindsight is not allowed in an obviousness analysis. I also understand that, when considering the obviousness of a patent claim, I should consider whether a teaching, suggestion, or motivation to combine the references exists, and that this can also be a safeguard against impermissibly applying hindsight when considering the prior art. I understand that this test should not be applied rigidly, but that the test can be important to avoid such hindsight.

X. OPINIONS REGARDING PATENTABILITY

42. In my opinion, the Claims 1-20 of the '391 Patent are not novel and/or obvious based on the following grounds:

- Claims 1, 4-8, 11-15, and 18-20 are obvious over Kimura alone.
- Claims 2, 5, 9, 12, 16 are obvious over Kimura in view of Hotta.
- Claims 3, 10, and 17 are obvious over Kimura in view of King.
- Claims 1, 2, 4-9, 11-16, and 18-20 are anticipated by Keith.

- Claims 3 and 8-19 are obvious over Keith alone.
- Claims 6 and 13 are obvious over Keith in view of Nor.

43. I have based my opinion on the following references:

- Kimura: “Apparatus and Method for Charging an Electric Vehicle,” authored by Takashi Kimura *et al.* (“Kimura,” Ex-1002) was published at least as early as January 1, 1997. *See* Ex-1002. I understand that Kimura is prior art to the ’391 Patent.
- Hotta: “Apparatus for Controlling a Charging Start Time and Charging Period for a Storage Battery in an Electric Vehicle to Complete Charging at a Scheduled Boarding Time,” authored by Yoshihiko Hotta (“Hotta,” Ex-1003) was published at least as early as July 22, 1997. *See* Ex-1003. I understand that Kimura is prior art to the ’391 Patent.
- King: “Intelligent Battery Charger for Electric Drive System Batteries,” authored by Robert Dean King (“King,” Ex-1004) was published at least as early as August 19, 1997. *See* Ex-1004. I understand that Kimura is prior art to the ’391 Patent.
- Keith: “Charging Batteries of Electric Vehicles,” authored by Arlie L. Keith (“Keith,” Ex-1005) was published at least as early as December 9, 1997. *See* Ex-1005. I understand that Kimura is prior art to the ’391 Patent.

- Nor: “Universal Charging Station and Method for Charging Electric Vehicle Batteries,” authored by Jiri K. Nor *et al.* (“Nor,” Ex-1006) was published at least as early as August 20, 1996. *See* Ex-1006. I understand that Kimura is prior art to the ’391 Patent.

XI. MY OPINIONS REGARDING CLAIMS 1-20

A. My Opinions as to the Obviousness of Claims 1, 4-8, 11-15, and 18-20 in View of Kimura Alone

1. Claim 1

44. In my opinion, Claim 1 is rendered obvious by Kimura. Claim 1 of the ’391 Patent includes the following features, each of which I address in my analysis below:

1[P] A computer implemented method of managing a charging process of an electric vehicle, the computer implemented method comprising:

1[A] responsive to receiving, from an energy transaction execution engine, a request signaling a start of the charging process, monitoring a set of operational parameters of the charging process during the flow of electricity for one or more interruptions;

1[B] detecting the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions, 1[C] wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data services interruption; and

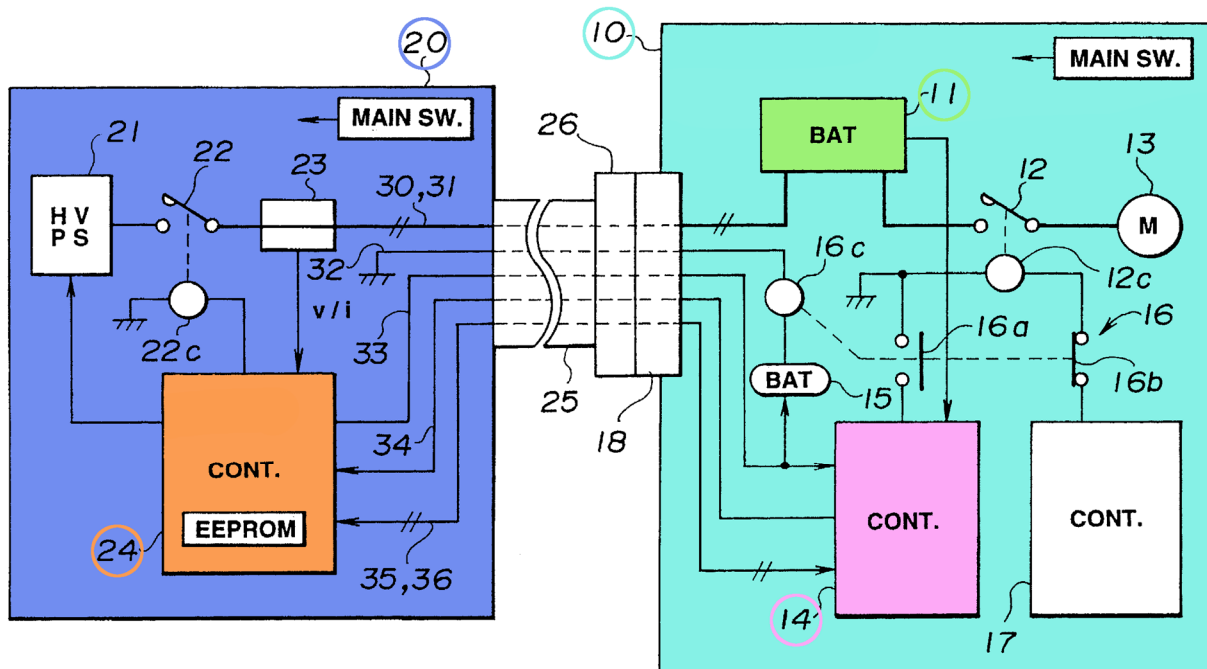
1[D] responsive to detecting the one or more interruptions, sending a response to the energy transaction execution engine to terminate the charging process.

45. I again note that I have italicized claim language to distinguish it from other

text and quoted material discussed in my declaration.

a. 1[P]

46. If the preamble is limiting, it is my opinion that Kimura teaches or implies it. Kimura recites “a charging apparatus and method of charging a battery of an electric car [vehicle].” Ex-1002, 1:11-13. In Figure 1, Kimura illustrates using a charger 20 (purple) with a charger controller 24 (orange) to charge the battery 11 (green) of an electric vehicle 10 (turquoise) with a battery controller 14 (pink).



Ex-1002, Fig. 1.

47. The battery controller 14 and the charger controller 24 communicate with each other over control lines 33-36, which Kimura explains “are control lines to transmit various control signals between the battery controller 14 ... and the [charger] controller 24.” *Id.*, 3:49-52.

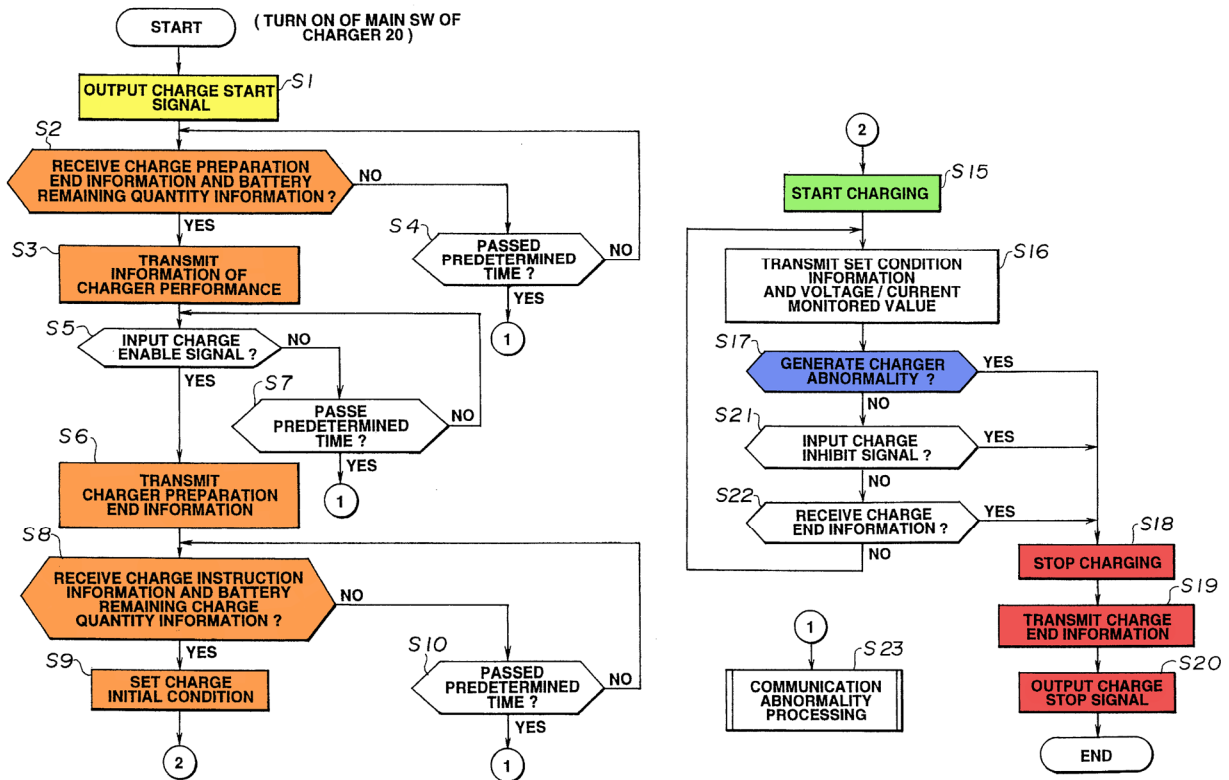
48. In my opinion, Kimura teaches that charger controller 24 executes a charge control program (Figures 10A-10C) and battery controller 14 executes an electric vehicle charge control program (Figures 12-13). *Id.* at 2:49-61. Accordingly, Figures 10A-10C and 12-13, and the descriptions thereof, collectively illustrate a method of managing a charging process of the electric vehicle 10. Ex-1002, 6:9-10:65.

49. I pause here to discuss the claim term *charging process*. It is my opinion that this term, as used in the '391 Patent, refers to a process that includes, but is not limited to, the transfer of electricity. For example, the patent states that “[T]he activities of charging process 318 may include ... **any other event** or condition that is directly related to or incidental to the exchange of electricity.” *Id.*, 9:1-5. Accordingly, the ordinary meaning that I ascribe to the *charging process* referred to in the claims includes various operations in addition to those directly involved in the transfer of electricity. To the extent the Patent Owner or its expert disagree and try to narrow the *charging process*, the reasons I present below with respect to both Kimura and Keith are sufficient to show that the claims are not novel (and/or obvious) under any understanding of *charging process*.

50. Beginning at S1, Kimura’s charger controller 24 outputs a charge start signal (yellow). Then, charging parameters are established through an exchange of information between the charger and battery controllers 24 and 14 (e.g., S2, S3, S6,

S8, and S9 on the charger side, orange). Kimura then initiates the flow of electricity, S15 (green); monitors for charger-side interruptions, S17 (purple); and eventually terminates the charging process after an interruption, S18-S20 (red).

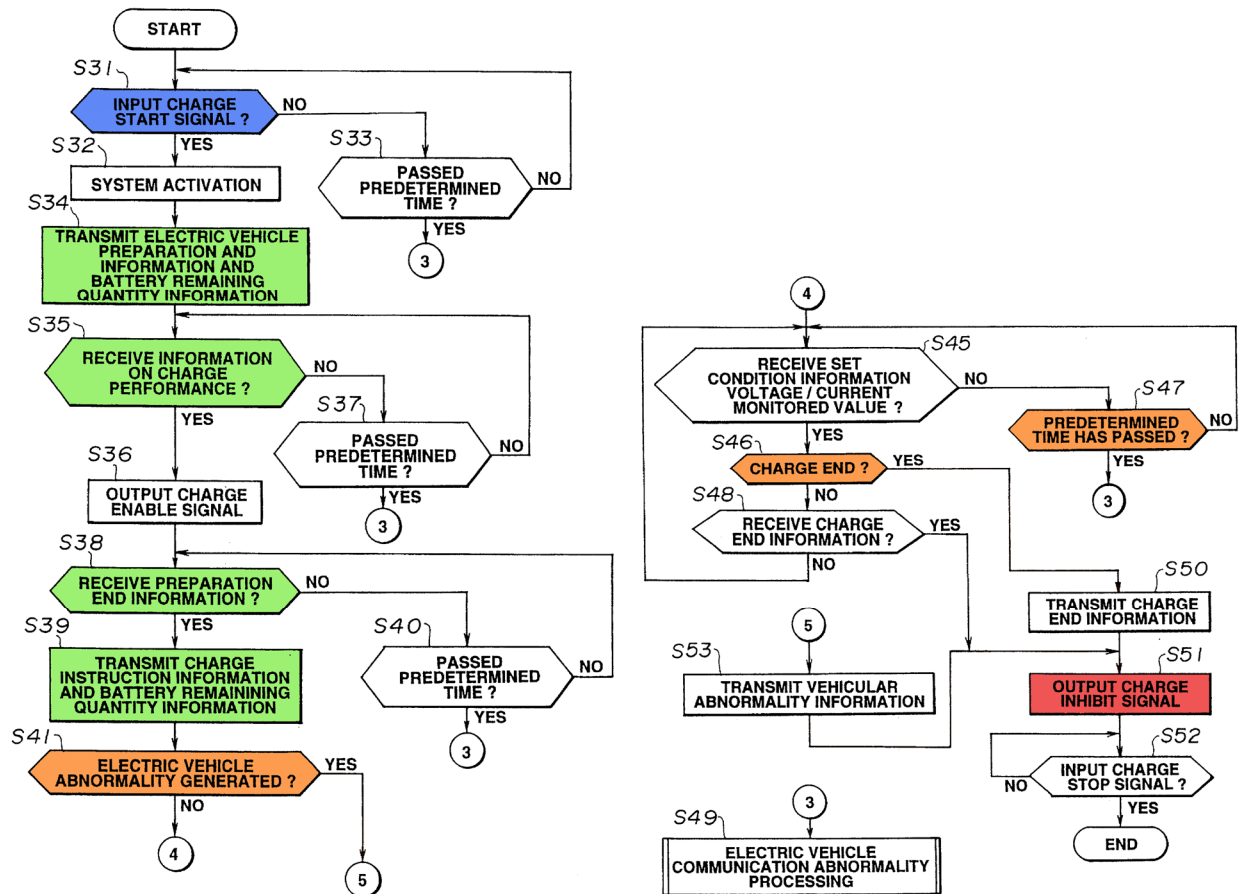
Id., Figs. 10A-10B.



Ex-1002, Figs. 10A-10B.

51. On the vehicle side, the charge start signal is received at S31 (blue), and vehicle-side steps occur for the exchange of information regarding initial charging conditions (e.g., S34, S35, S38, and S39, all green). While electricity is flowing, Kimura's charging process monitors for vehicle-side interruptions at S41, S46, and S47 (orange), and detected interruptions lead to transmission of a charge inhibit

signal at S51 (red) and eventual termination of the charging process.



Ex-1002, Figs. 12-13.

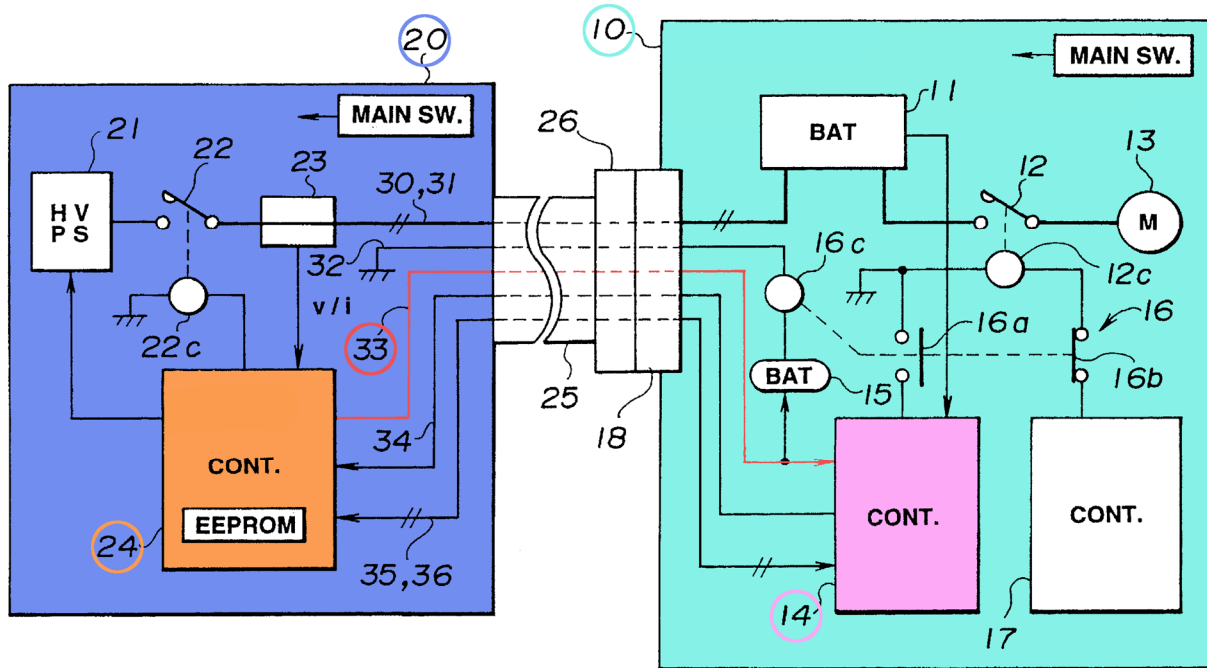
52. Portions of Kimura's charging process related to Figures 10A-10B are implemented by "a **microcomputer** of the charger controller 24" (*id.*, 6:9-15 and 6:13-15), whereas other portions related to Figures 12-13 of the charging process are implemented by a microcomputer of the battery controller 14 (*id.*, 9:9-19 and 8:66-9:6).

53. Therefore, in my opinion, Kimura teaches or implies *a computer* (e.g., the charger controller 24 and/or the battery controller 14, or at least portions thereof)

implemented method of managing a charging process (e.g., control programs implementing Figures 10A, 10B, 12, and 13) *of an electric vehicle* (i.e., the electric vehicle 10).

b. 1[A]

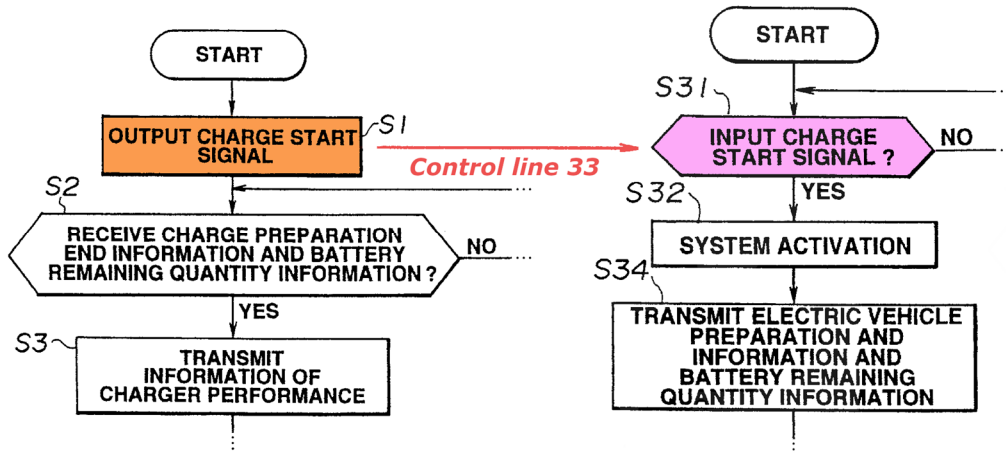
54. The charging process in Kimura begins when the charger controller 24 (orange) transmits a charge start signal to the battery controller 14 (pink) via control line 33 (red). Ex-1002, 3:54-56 and 6:13-19. It is noted that Kimura once mentions transmitting the charge start signal “via the control line **32**” (Ex-1002, 6:13-19), but I believe this to have just been a typo of some kind. Kimura says more than once that the signal is communicated **via control line 33**. *Id.*, 9:30-32 and 3:53-55; *cf.* 3:45-48.



Ex-1002, Fig. 1.

55. It is my opinion that the charge start signal acts as a request to the battery controller 14 signaling the start of the charging process. The '391 Patent does not explicitly indicate what is being requested by the *request signaling the start of the charging process*. As discussed herein, the charge start signal of Kimura initiates vehicle-side charging operations, including the monitoring of operational parameters. Accordingly, its teachings are sufficient for any understanding of what is being requested. Transmission and receipt of this signal are illustrated in Kimura's Figures 10A and 12, respectively, with the charger controller 24 transmitting the charge start signal at S1 (orange) and the battery controller 14 receiving the signal at S31 (pink). *Id.*, Figs. 10A and 12. The charging process

then continues (*id.*, 6:14-18).



Ex-1002, Figs. 10A and 12 (excerpted).

56. Confirming my opinion as to the presence of a *request signaling the start of the charging process* in Kimura, standards pre-dating the '391 Patent (e.g., SAE J1772) demonstrate that a request signaling the start of the charging process was part of the common general knowledge for a POSA and would have been necessary in the design of charging systems (including Kimura's) at the time to be standards-compliant. *See, e.g.,* EX-1011, 14. As one example, noted on page 14 of the SAE J1772 standard, it is explained that the "charge process shall commence sequentially" and then outlines a number of steps, including steps on the charger side to signal starting of the process (e.g., "EVSE indicates that it is ready to supply energy by turning on the oscillator and supplying square wave pilot signal to the EV") and on the vehicle side to signal starting of the process (e.g., "EV indicates that it is ready to accept energy from the EVSE by closing switch S2 and

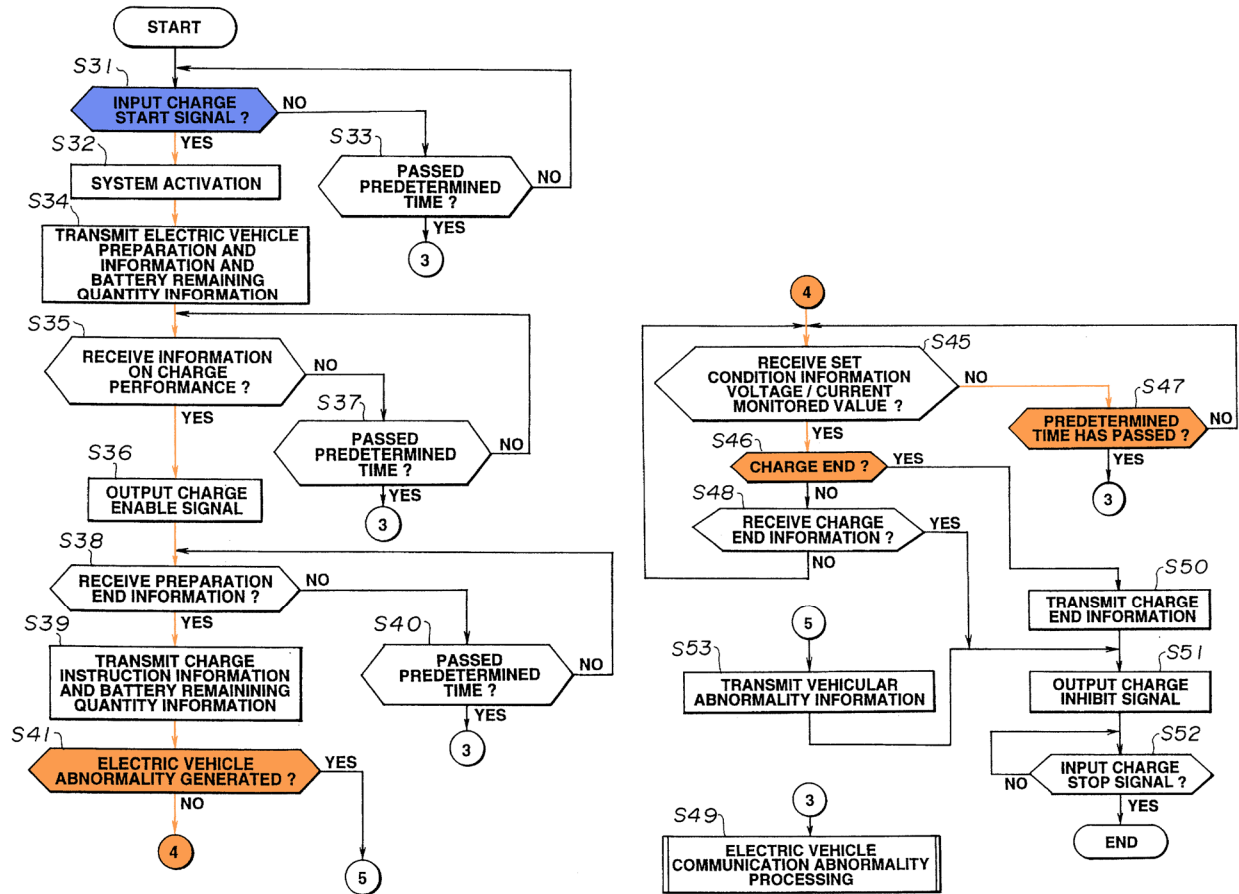
providing vehicle ventilation information to the EVSE”). *Id.* Similarly, it is also noted that the SAE J1772 standard discusses on page 11 signaling aspects related to the EVSE being ready to supply energy and the EV being ready to accept energy. *Id.*, 11. As I noted above, Kimura expressly teaches the recited request of claim 1, and, in view of the common general knowledge of a POSA (as reflected for example in J1772) such a feature was also obvious.

57. In my opinion, the source of the charge start signal, including portions of charger controller 24 implementing S1, qualifies as an *energy transaction execution engine*, as it executes energy transactions and the claim language requires nothing more. Kimura’s charger 20 includes its controller 24 and therefore qualifies as an *energy transaction execution engine* for similar reasons. Embodiments of the energy transaction execution engine in the ’391 Patent are likewise broad, with generic depictions in figures and general discussions in the text. *See, e.g.*, Ex-1001, 8:60-9:11, 12:11-19, and Figs 3-4.

58. Moreover, the charger controller 24 and the *energy transaction execution engine* from the ’391 Patent perform similar functions, including initiation and termination of the charging process (*compare* Ex-1002 6:16-18 and 7:44-50 *with* Ex-1001, 8:63-65 and 12:9-14), in the same way and to achieve the same result (safely charging an electric vehicle) (*compare* Ex-1002 7:23-26 *with* Ex-1001, 1:66-2:13).

59. I have been informed that this term, *energy transaction execution engine*, could be in something referred to as means-plus-function format, which I have also been informed could mean that this term would be limited to the corresponding structure in the specification and equivalents. That would be energy transaction execution engine 316 and any implementing algorithm. In my opinion, this structure is taught by the charger controller 24 of Kimura, for the reasons discussed herein regarding the functionality of, and results achieved by, the energy transaction execution engine 316 and the charger controller 24.

60. After the battery controller 14 receives the charge start signal from the charger controller 24, according to my understanding of Kimura, the battery controller 14 then monitors operational parameters responsive to receiving the signal. Ex-1002, 9:31-35 (describing receipt of and response to reception of the charge start signal), 10:19-50 (describing monitoring of the operational parameters), and Figs. 12-13 (illustrating the monitoring operations, e.g., at S41, S46, and S47, as being downstream from reception of the charge start signal, at S31).

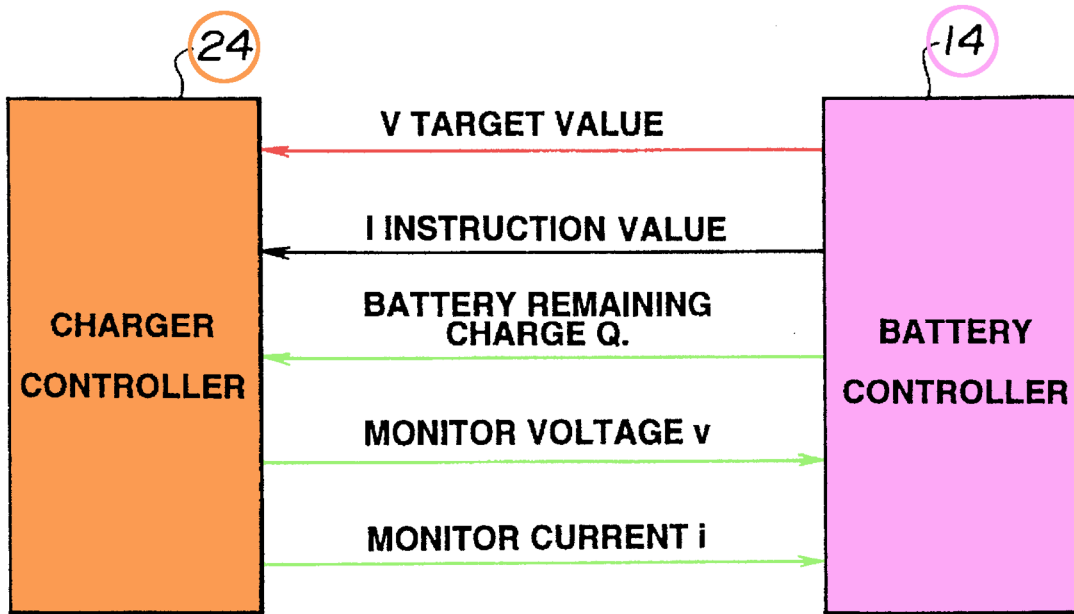


Ex-1002, Figs. 12-13.

61. I understand the operational parameters monitored by the battery controller 14 as including an amount of power leakage (e.g., battery charging losses) in the electric vehicle 10, a state of the battery 11, a state of the charge circuit, a voltage of the battery 11, quantity of the battery 11, and a communication delay time. *Id.*, 10:19-48. In this regard, Kimura’s teachings line up closely with those in the patent when it broadly indicates that operational parameters include “data generated by components of an electric vehicle transaction infrastructure.” Ex-1001, 11:20-22. Monitoring of voltage and current, for instance, is depicted in

Figure 6 of Kimura, which illustrates the exchange of a voltage value, a current value, and a battery charge value (green), as well as a voltage threshold value (red).

Ex-1002, 5:14-17; *see also id.*, Fig. 8 (similar illustration for different mode).



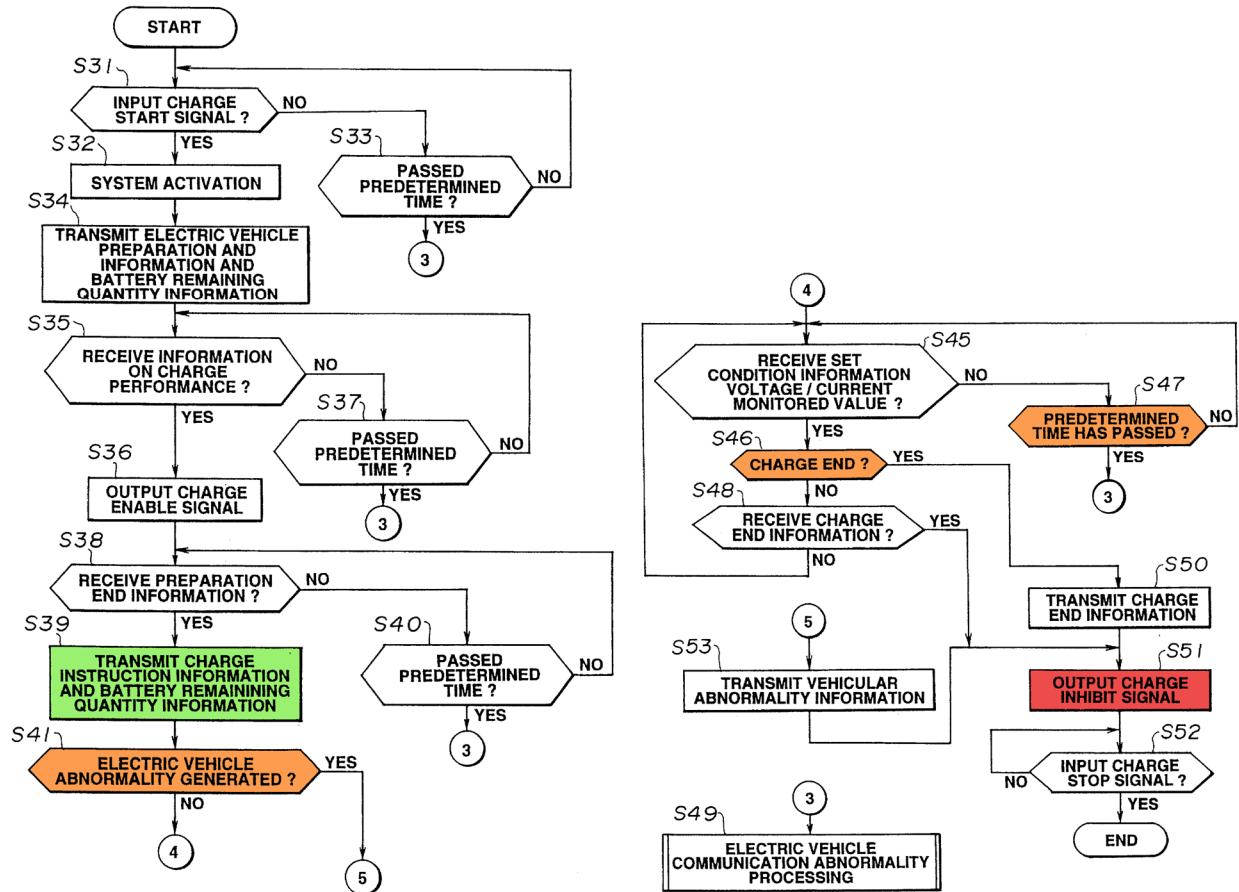
Ex-1002, Fig. 6.

62. Electricity begins to flow after the battery controller 14 and the charger controller 24 exchanges information regarding charge instructions and battery quantity. Ex-1002, 7:3-5, 10:7-13, and Figs. 10A and 12. In Figure 12, this exchange is indicated by S39 (green). *Id.*, Fig. 12. After the information is received at the charger controller 24, “a switch coil 22c is energized to turn on the switch 22 and the charging operation is started by controlling the high voltage power supply 21.” *Id.*, 10:13-26. In Figure 12, each of the vehicle-side monitoring operations, S41, S46, and S47, occurs while electricity is flowing and prior to

transmission of a charge inhibit signal at S51 (red). *Id.*, Fig. 12.

63. Regarding S46, Kimura states that “the controller 14 determines whether the charge operation is ended on the basis of the voltage and remaining quantity of the battery 11.” Ex-1002, 10:46-49. If the Patent Owner or its expert try to say that monitoring at S46 does not occur during the flow of electricity, that would be inconsistent with the quoted text above and temporally impossible. I note here that a positive determination at S46 leads the battery controller 14 to transmit a charge inhibit signal to the charger controller 24, which then causes the charger controller 24 to terminate the charging process. *Id.*, 10:46-59, 7:50-55, 7:66-8:2; *see also id.*, Figs. 10B and 13.

64. Further, Kimura indicates that electricity is flowing at least as early as the first monitoring step, at S41 (orange). *See id.*, 10:19-30 (describing transmission of a charge inhibit signal and termination of the charging process responsive to detection of an abnormality at S41). The remaining two monitoring steps S46 and S47 (both orange) likewise occur during the flow of electricity. *Id.*, 10:45-59. This is illustrated in Figure 12, which shows each of S41, S46, and S47 as occurring prior to transmission of a charge inhibit signal at S51 (red). *Id.*, Fig. 12.



Ex-1002, Figs. 12-13.

65. As Kimura explains, the battery controller 14 monitors the operational parameters to determine when to terminate. Ex-1002, 10:45-48. In other words, the monitoring operation involves monitoring for interruptions to the charging process. My understanding here is confirmed by how closely this lines up with the '391 Patent, which explains that interruptions include events or circumstances that warrant termination of the charging process. Ex-1001, 11:8-12.

66. Moreover, according to my understanding of Kimura, vehicle-side interruptions can be caused by power leakage in the electric vehicle 10, failure of

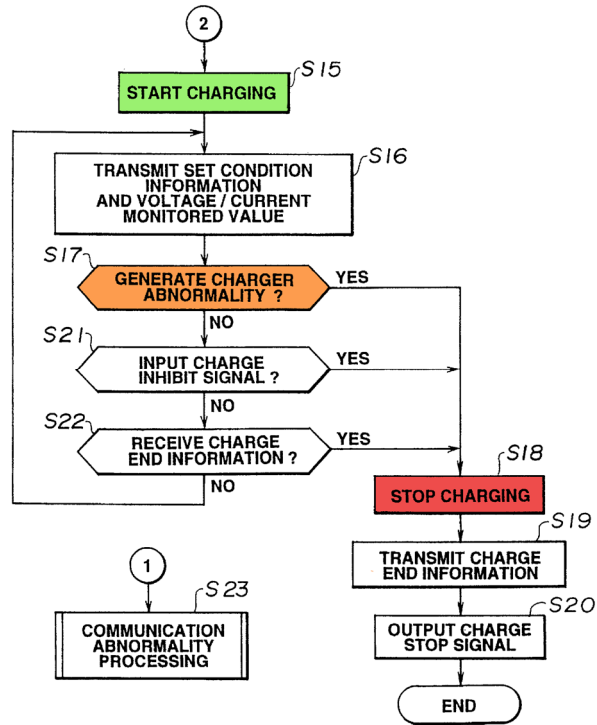
the battery 11, a break in the charge circuit, a communication failure with the charger controller 24, or the voltage or capacity of the battery 11 reaching a predetermined amount. Ex-1002, 10:19-48.

67. Therefore, in my opinion, Kimura teaches or implies *responsive to receiving, from an energy transaction execution engine* (e.g., the charger controller 24), *a request signaling a start of the charging process* (e.g., the charge start signal), *monitoring* (e.g., at the battery controller 14) *a set of operational parameters* (e.g., amount of power leakage in the electric vehicle 10, state of the battery 11, state of the charge circuit, voltage of the battery 11, quantity of the battery 11, and communication delay time) *of the charging process during the flow of electricity for one or more interruptions* (e.g., caused by power leakage in the electric vehicle 10, failure of the battery 11, a break in the charge circuit, a communication failure with the charger controller 24, or the voltage or capacity of the battery 11 reaching a predetermined amount).

68. Confirming my opinion, standards pre-dating the '391 Patent (e.g., SAE J1772) demonstrate that monitoring operational parameters during the flow of electricity was within the common knowledge for a POSA and would have been necessary in the design of charging systems (including Kimura's) at the time to be standards-compliant.. *See, e.g.,* EX-1011, 4, 10, 11, 14. In one instance, the SAE J1772 standard explains that “conditions shall be monitored continuously during

the charge process” and the “EVSE must terminate the charge process” should one of the conditions fail to “satisfy specified requirements.” *Id.*, 14. As I noted above, Kimura expressly teaches these features, and, in view of the common knowledge of a POSA (as reflected for example in J1772) such a feature was also obvious.

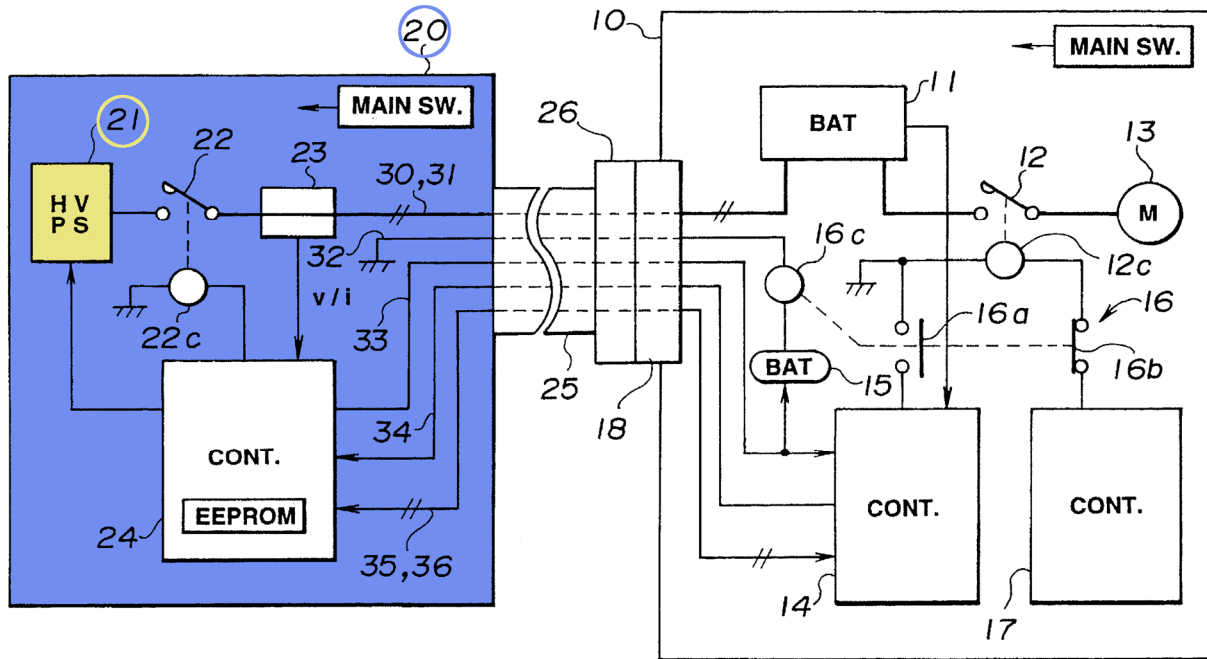
69. If the Patent Owner argues that the claims require monitoring and/or interruption detection at the charger side, Kimura teaches this. Kimura describes charger controller 24 monitoring operational parameters for interruptions during the flow of electricity. Ex-1002, 7:23-26 (indicating electricity begins to flow at S15, green), 7:33-39 (describing monitoring of the charging process, at S17), 7:40-44 (indicating charging electricity is cut off at S18, red).



Ex-1002, Fig. 10B.

70. It is my opinion that S17 (orange) denotes monitoring for charger-side interruptions. Kimura refers to these interruptions as “charger abnormalit[ies].”

Id. In Kimura, charger-side interruptions can be caused by “a leakage in ... current of the charger 20 [purple], [or] a breakdown, overheat, or power failure in the high voltage power supply 21 [yellow].” *Id.*, 7:33-39.



Ex-1002, Fig. 1.

71. Detection of these charger-side abnormalities leads to charging-process termination. *Id.*, 7:33-39 and Fig. 10B (illustrating termination of the charging process, at S20, following detection of a charger abnormality, at S17); *cf.* Ex-1001, 11:8-12.

72. In my opinion, the monitoring performed at the charger controller 24 involves monitoring various operational parameters of the charging process. Ex-1002, 7:33-39. These operational parameters include the amount of current leakage in the charger 20 and the state of the high-voltage power supply 21. *Id.*

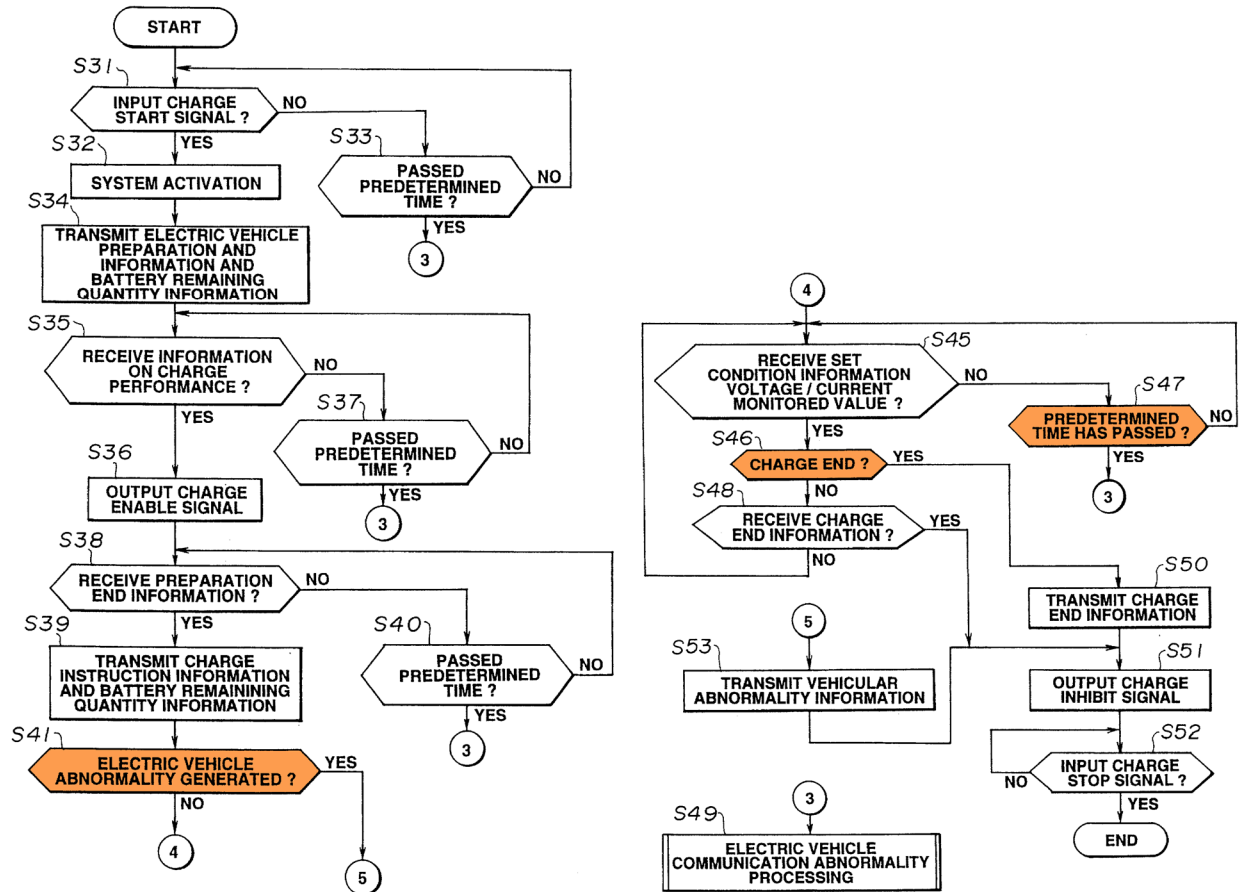
73. The charger side of Kimura's system also receives a charge enable signal at S5, which is also a *request signaling the start of the charging process*, and that

charge enable signal is “transmitted from the electric vehicle 10 via the control line 34” (i.e., the portions of the electric vehicle 10 responsible for transmitting the charge enable signal would be portions of the *energy transaction execution engine*). Ex-1002, 6:44-57.

74. As noted above with respect to vehicle-side monitoring, published standards that pre-date the '391 Patent make clear that it was common knowledge to monitor operational parameters of the charging process for one or more interruptions during the flow of electricity. *See, e.g.*, EX-1011, 4, 10, 11, 14. This is equally true for charger-side monitoring (as well as charger-side detecting and sending operations, which I discuss below).

c. 1[B]

75. In my opinion, Kimura explains that interruption detection involves determining whether the monitored operational parameters (assessed at S41, S46, S47, orange) conform to predefined interrupt conditions.



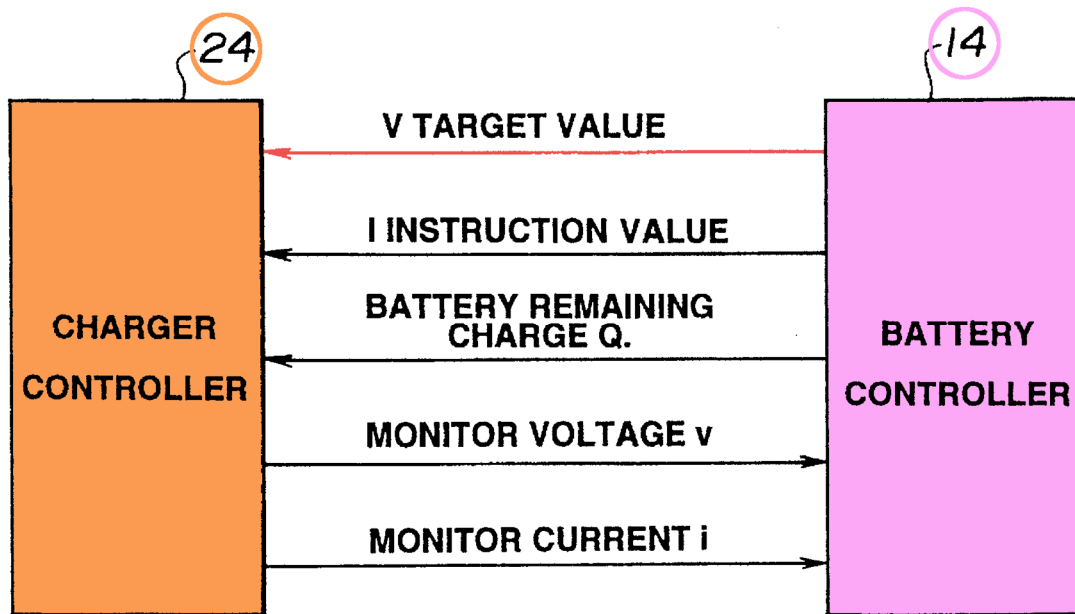
Ex-1002, Figs. 12-13.

76. For example, the battery controller 14 detects “communication abnormalit[ies],” based on whether a communication-delay parameter satisfies “[a] **predetermined** period of time.” *Id.*, 10:42-45. Specifically, the battery controller 14 determines that an interruption has occurred when the charger controller 24 fails to communicate with the battery controller 14 within the predetermined amount of time. *Id.*

77. As another example, the battery controller 14 detects “electric vehicle abnormalit[ies]” caused by “leakage of power in the electric vehicle 10,

battery [11] failure, and/or charge circuit breakage.” *Id.*, 10:19-22 and Figure 12 (“electric vehicle abnormalities,” S41).

78. To detect these abnormalities, according to my understanding of Kimura, information exchanged between battery controller 14 (pink) and charger controller 24 (orange) establishes relevant thresholds (e.g., a voltage target value, red) for detection of predefined interrupt conditions. *See, e.g., id.*, 7:27-31 (describing S16 at which set values of voltage or current and monitored values for those operational parameters are exchanged) and 10:32-37; *see also id.*, Fig. 8 (illustrating exchange of a current target value).



Ex-1002, Fig. 6.

79. For instance, Kimura describes “a step S45 in which the battery controller 14 determines whether **the set values of the voltage and current from the**

charger 20 via the control lines 35 and 36 and **the monitored values of the voltage and current** have [been] received from the charger 20.” *Id.*, 10:33-37.

The battery controller 14 then monitors for abnormalities “on the basis of the voltage and [the] remaining quantity of the battery 11.” *Id.*, 10:45-48.

80. Accordingly, in my opinion, the interrupt condition in Kimura is a threshold (e.g., the set values described above) or, in some instances, a state defining (e.g., received at S45), for instance, whether the battery 11 has failed or whether the amount of leakage in the electric vehicle 10 is sufficient for termination of the charging process. *Id.*, 10:19-22. Accordingly, detecting predefined interrupt conditions in Kimura involves comparing monitored values against the set values or against defined states. *Id.*, 8:66-9:2 (“[T]he **[battery] controller 14 always monitors whether a predetermined charge quantity is reached** on the basis of a terminal voltage across the battery 11 **during the charging operation.**”).

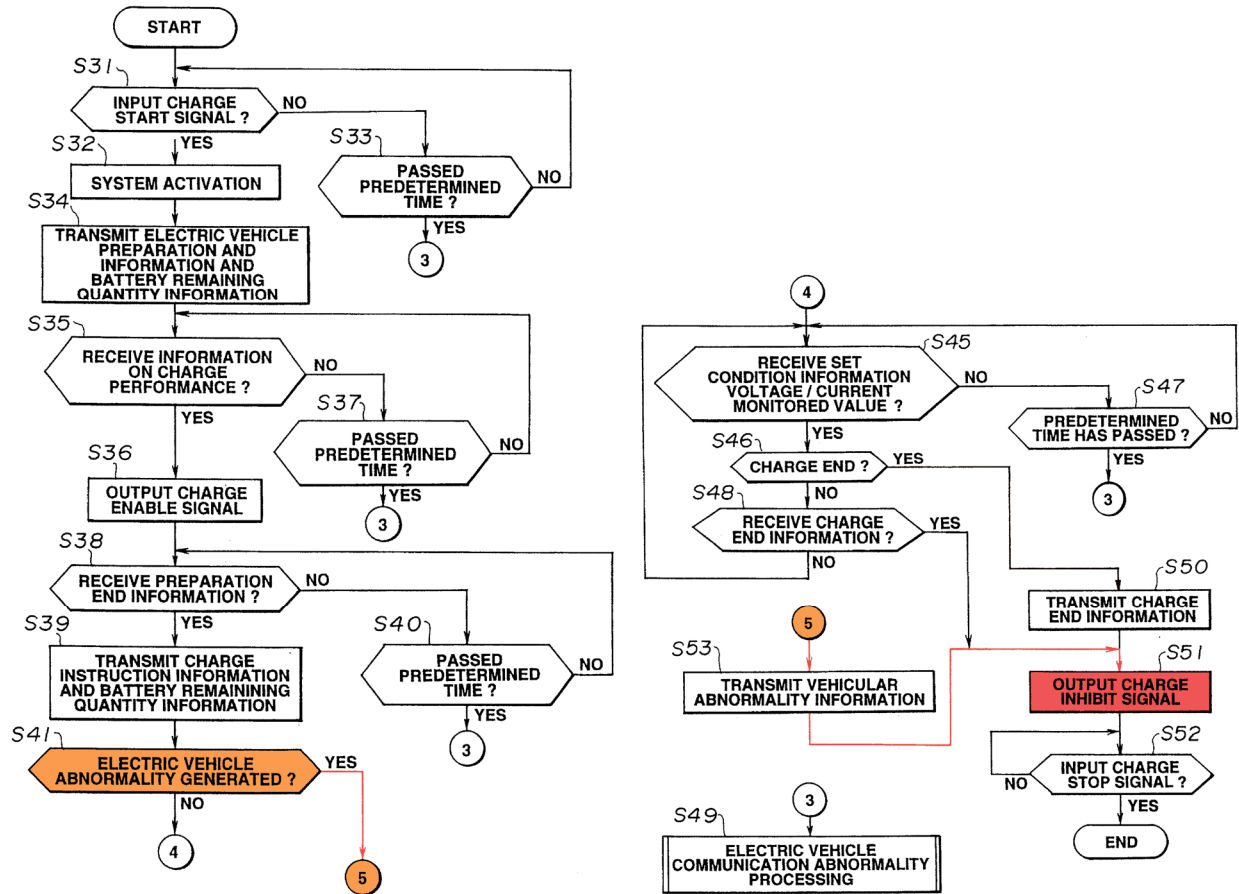
81. At a minimum, detecting electric-vehicle abnormalities during the charging process would have been necessary to compare operational parameters against corresponding, predefined values indicative of an interruption (e.g., if the parameter is out of range or otherwise indicates an abnormality).

82. Therefore, in my opinion, Kimura teaches or implies *detecting the one or more interruptions* (e.g., the communication abnormality, the electric vehicle abnormalities, or the interruptions caused by the voltage or quantity of the

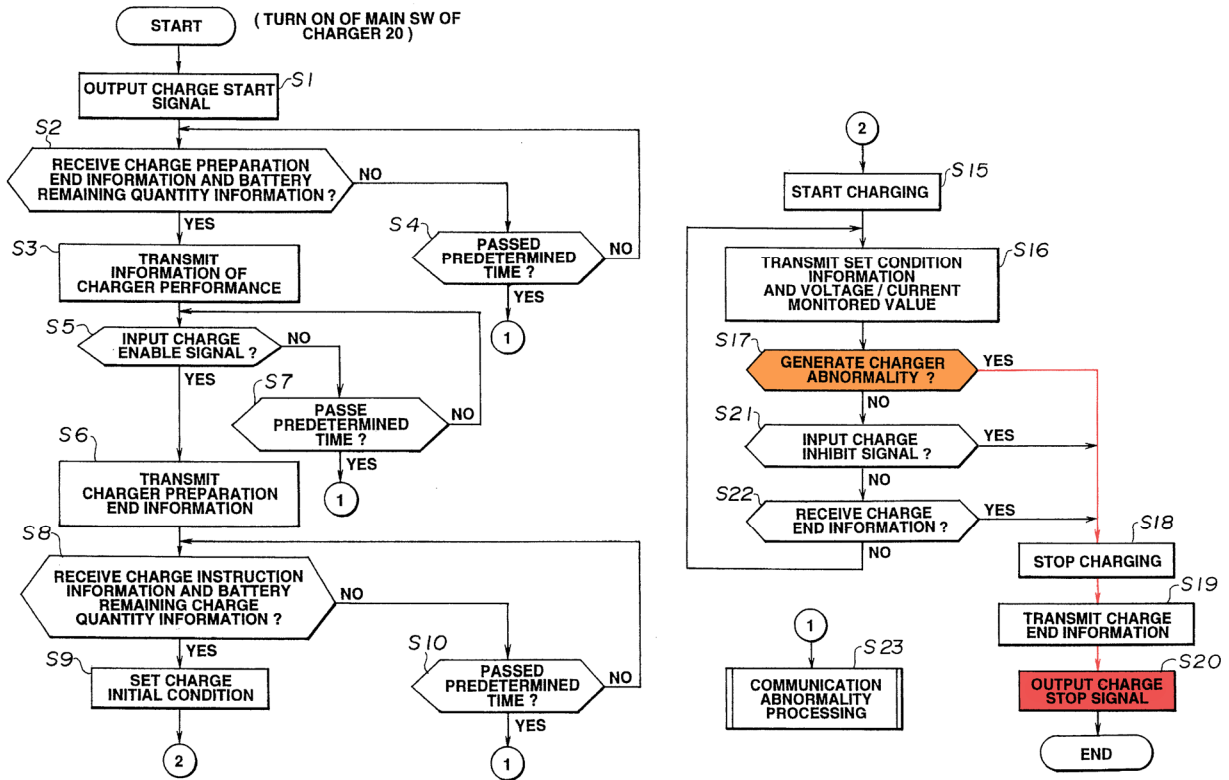
battery 11 reaching the respective predefined thresholds) *during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions* (e.g., the thresholds or states defining unacceptable values or limits for Kimura's parameters). As I noted above (see pages 34-37), Kimura teaches charger-side monitoring and interruption detection too and those discussions are pertinent here as well.

d. 1[C]

83. It is my opinion that the electric-vehicle and charger abnormalities in Kimura include device capabilities interruptions. These abnormalities lead to termination of the charging process based on capabilities of the devices involved. Ex-1002, 10:19-22, Figs. 12-13 (on vehicle side, illustrating transmission of the charge inhibit signal, S51 (red), as occurring responsive to detection of a device capabilities interruption, S41 (orange)), 7:33-36, and Figs. 10A-10B (on charger side, illustrating termination of the charging process, S20 (red), as occurring responsive to detection of a device capabilities interruption, S17 (orange)).

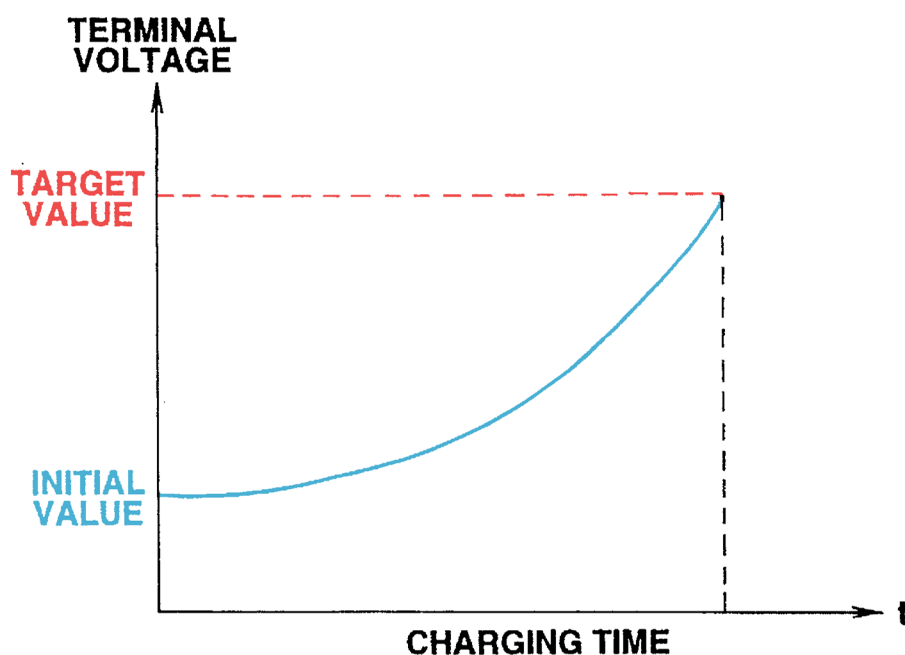


Ex-1002, Figs. 12-13.



Ex-1002, Figs. 10A-10B.

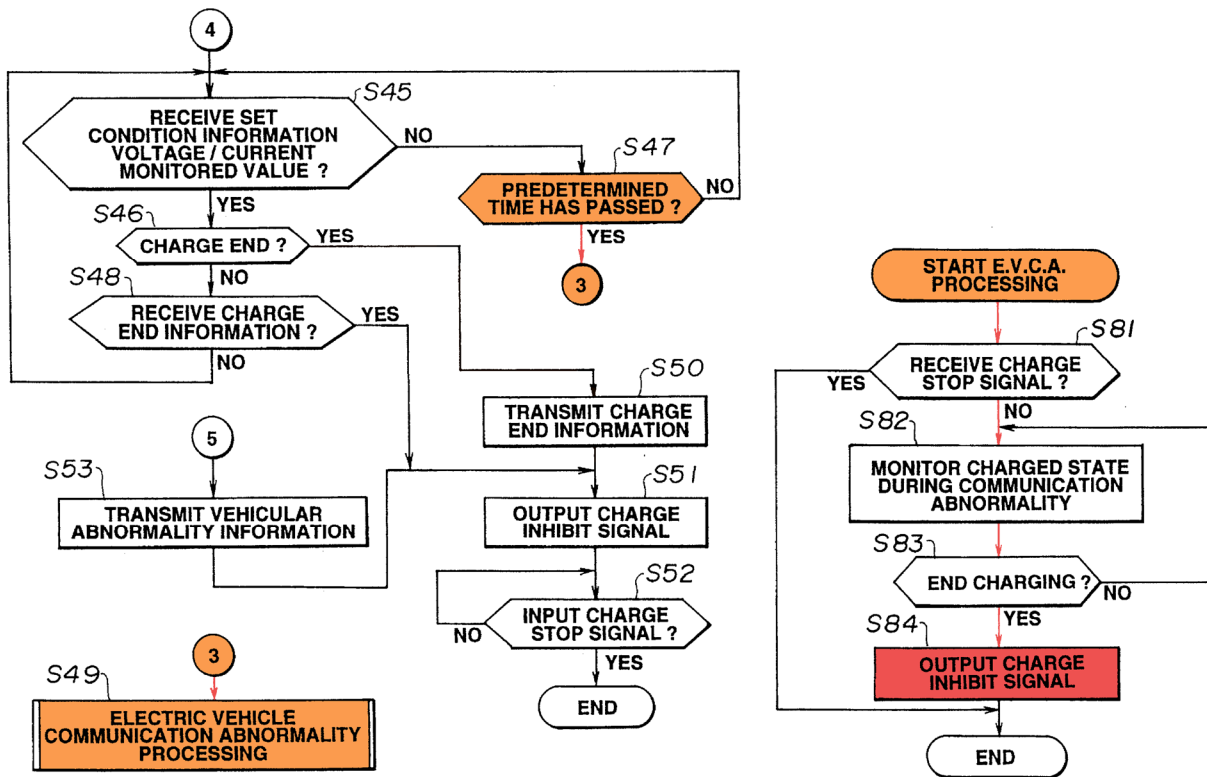
84. According to my understanding of Kimura, preference interruptions, which can occur based on third-party defined preferences (Ex-1001, 13:22-33), occur in Kimura when the voltage of the battery 11 reaches a threshold set by a third-party. In Kimura, the terminal voltage is “set according to the type of the battery.” Ex-1002, 5:21-27. Kimura further explains that “target values of the voltages and currents ... may be set through a DIP switch and/or jumper switch.” *Id.*, 6:3-8.



Ex-1002, Fig. 7.

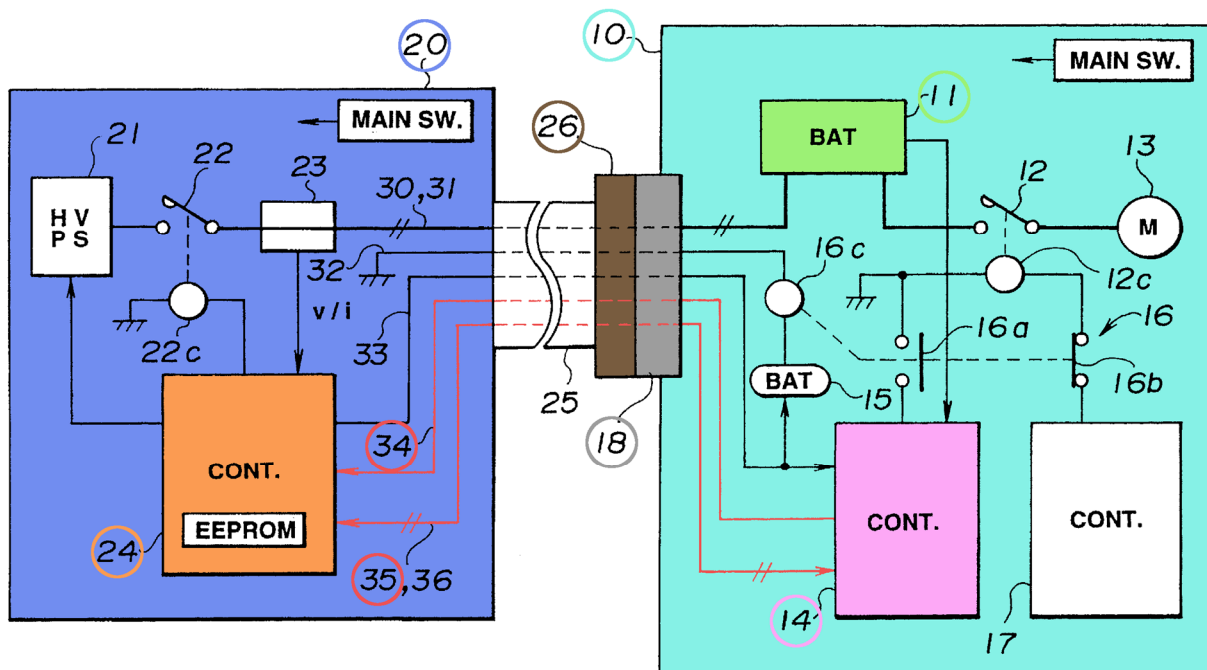
85. In my opinion, set voltage or current values constitute a preference with respect to the charging process, the violation of which causes a preference interruption. *Cf.* Ex-1001 7:64-8:3. Accordingly, as illustrated in Figure 7 for the particular case of a lead-acid battery, Kimura indicates that the charging process is terminated after detecting that “the terminal voltage [of the battery 11] exceeds a **predetermined threshold value.**” Ex-1002, 5:21-27

86. It is my opinion that Kimura also teaches data services interruptions, with an example being communication abnormalities. As in the '391 Patent, these abnormalities lead to termination of the charging process due to a communication failure between data sources, namely the battery controller 14 and the charger



87. My opinion is that another data services interruption occurs when a loose connection is detected between the charger connector 26 (brown) and the vehicle-

side connector 18 (gray). Data signals are conveyed by way of control lines 34 and 35 (red), which “are communication lines used to perform the information receipt and transmission related to various types of charges in accordance with a communication format previously prescribed between the battery controller 14 [pink] of the electric vehicle [10] [turquoise] and charger controller 24 [orange] of the charger 20 [purple].” Ex-1005 at 3:60-65.

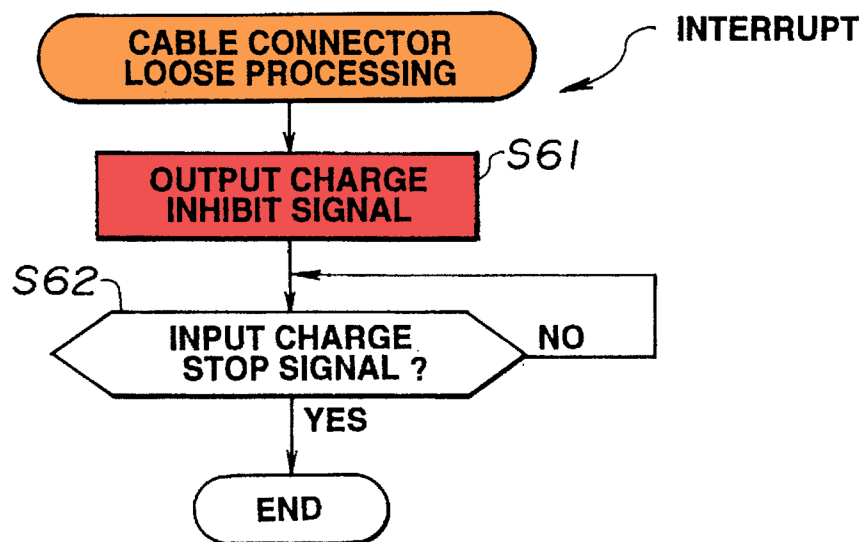


Ex-1002, Fig. 1.

88. To detect this data services interruption, in my opinion, an operational parameter in the form of “control current flowing through the control line 32 is detected,” and, “[i]f the control current is interrupted, the controller determines that the loose [sic] in the connectors 18 and 26 [has occurred] and immediately

interrupts the charge current.” Ex-1005 at 4:53-59; *see also id.*, 4:48-63 (noting that detecting this loose connection interruption helps to avoid occurrence of large sparks in the control lines).

89. Kimura’s Figure 15 provides more details on this data services interruption and explains that the routine of Figure 15 is executed by the microcomputer of the vehicle charge computer 24 and also that detection of this interruption (orange) leads the vehicle charge computer 24 to send the charge inhibit signal (red) to the energy transaction execution engine in Kimura (i.e., portions of the charger controller 14), thereby causing termination of the charging process.



Ex-1002, Fig. 15.

90. Similarly, because the connectors 26 and 18 also allow for delivering the flow of electricity to the vehicle battery, a loose connection at those connectors can

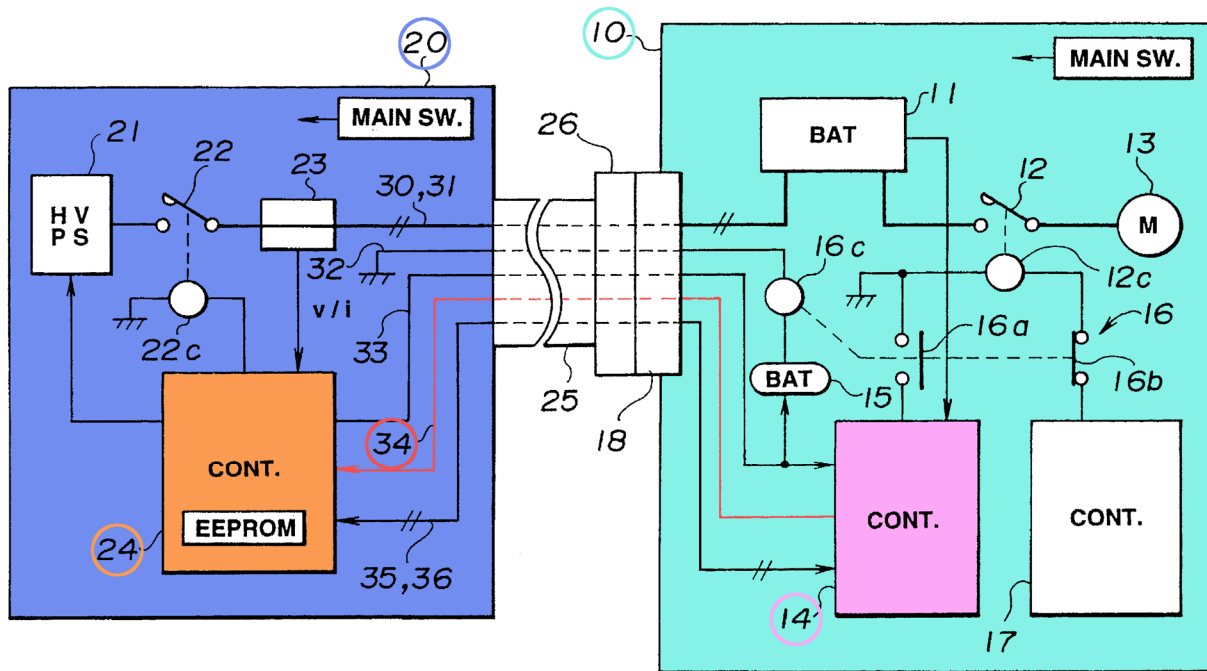
also (or alternatively) indicate a device capabilities interruption—namely that the charger device in Kimura is no longer able to properly deliver a charge to the vehicle. In my view, the patent’s claims and its described embodiments do not preclude the interpretation I provide above in which an interruption can qualify as more than one type of interruption.

91. Therefore, in my opinion, Kimura teaches or implies *wherein the one or more interruptions comprises at least one of a device capabilities interruption* (e.g., the electric vehicle abnormalities or loose connection impacting control lines 30 and/or 31), *a preference interruption* (e.g., caused by the terminal voltage of the battery 11 reaching a predefined voltage level), *and a data services interruption* (e.g., the communication abnormalities or loose connection impacting data services).

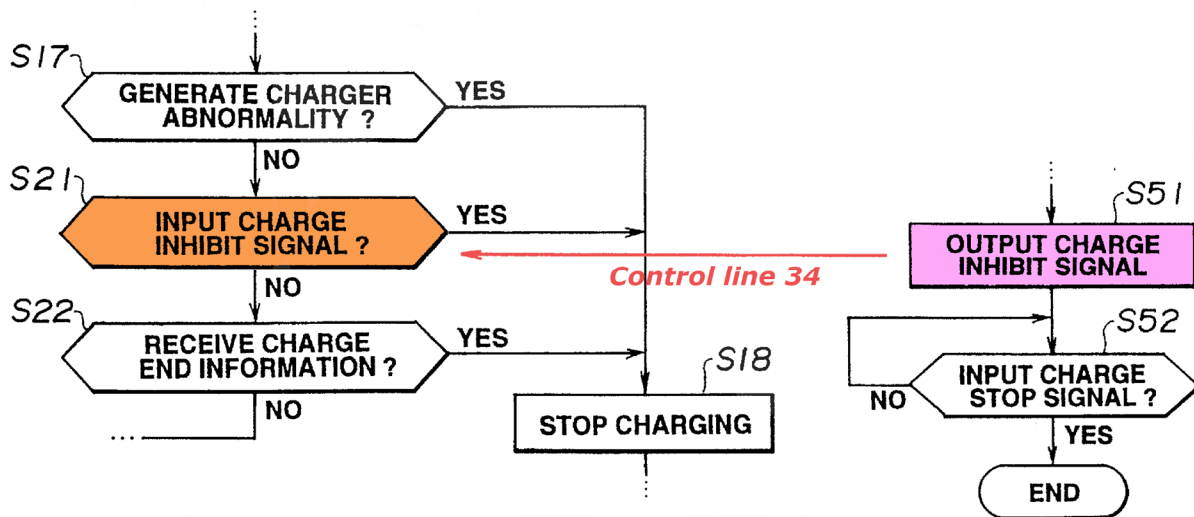
e. 1[D]

92. In Kimura, battery controller 14 (pink) sends a charge inhibit signal to charger controller 24 (energy transaction execution engine) via a control line 34 (red) after detecting an interruption. Ex-1002, 11:30-33. In my opinion, this signal is a response to terminate because it causes the charger controller 24 (orange) to terminate the charging process. *Id.*, 7:55-61 (stating that, “[i]n the case where **the charge inhibit signal is received** from the electric vehicle 10, some abnormality occurs in the electric vehicle 10 **so that a charge halt processing is executed** after

the steps from the step S18.”).

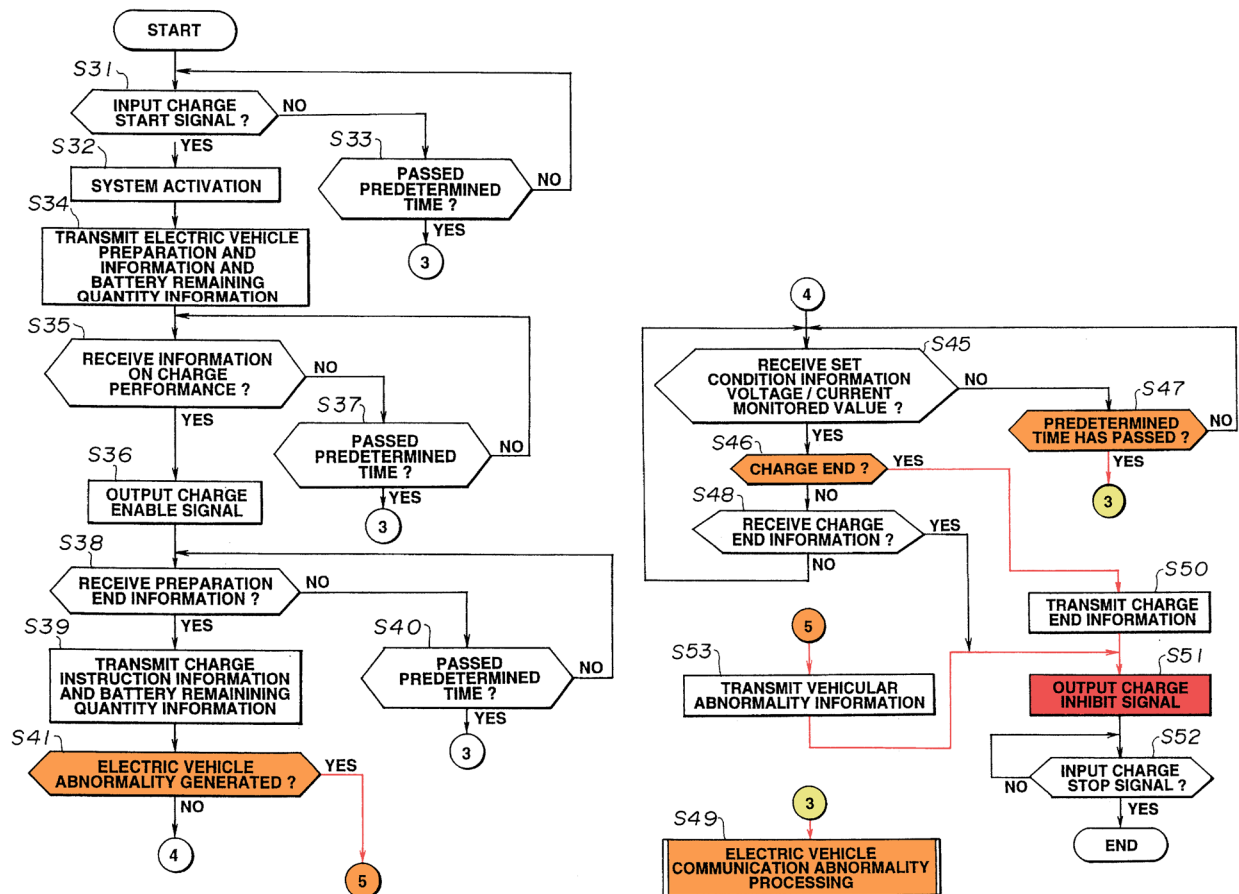


Ex-1002, Fig. 1.

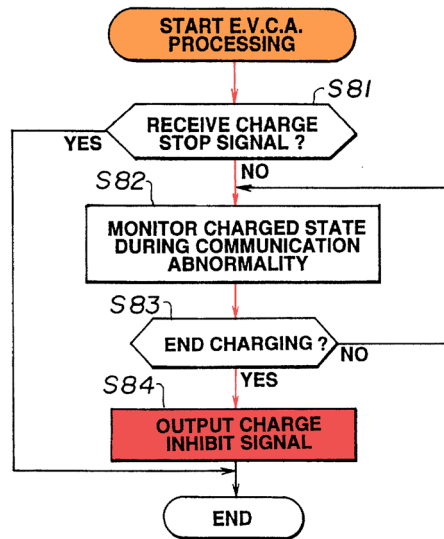


Ex-1002, Figs. 10B and 13 (excerpted).

93. Figures 12-14 show controller 14 sending the charge inhibit signal to controller 24 in response to detecting an interruption. *Id.*, Figs. 12-13 (illustrating transmission of the charge inhibit signal, at S51 and S84 (both red), as being downstream from interruption detection, at S41, S46, and S47-S49 (each orange)). Note also that the pathway after S47 has the battery controller 14 intervening in the response to terminate the charging process if the charger controller 24 has already started termination (S81-Yes). There is also a pathway where controller 14 sends that response (S81-No, pathway marked in red in Figure 14 below).



Ex-1002, Figs. 12-13.



Ex-1002, Fig. 14.

94. Therefore, in my opinion, Kimura teaches or implies *responsive to detecting the one or more interruptions* (e.g., at the battery controller 14), *sending a response* (e.g., the charge inhibit signal) *to the energy transaction execution engine* (e.g., the charger controller 24) *to terminate the charging process*. It is also worth observing here that on the charger side (see pages 34-37), Kimura sends a response to terminate responsive to detecting an interruption. See Ex-1002, 7:33-44 and Fig. 10B (signal transmission between S17 to S18).

* * * *

95. As discussed above, Kimura renders limitation [D] of Claim 1 obvious.

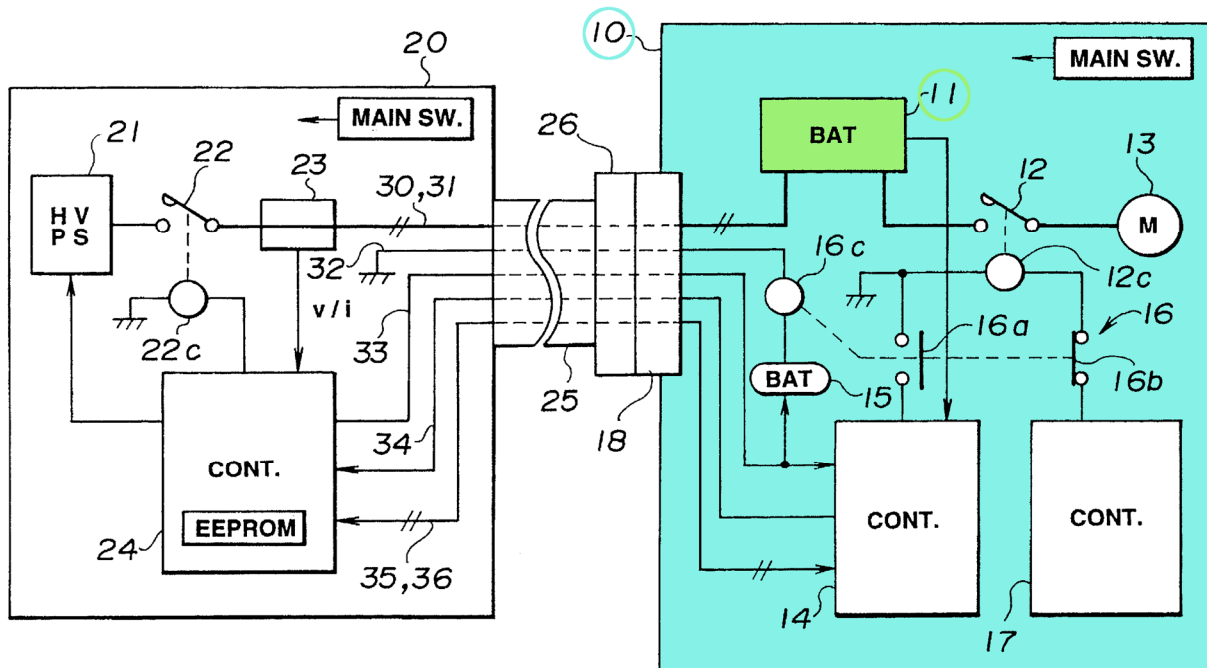
2. Claim 4

96. Claim 4 depends on Claim 1, which Kimura renders obvious for the reasons I discussed above. Claim 4 adds *wherein the one or more interruptions is the*

device capabilities interruption, and the device capabilities interruption originates from at least one component of an electric vehicle transaction infrastructure.

Kimura teaches or implies this.

97. Of Kimura's device capabilities interruptions, discussed in more detail above, it is my opinion that some arise from power leaking from the electric vehicle 10 (turquoise), failure of the battery 11 (green), and a break in the charge circuit. Ex-1002, 10:19-22.



Ex-1002, Fig. 1.

98. Each of these device capabilities interruptions, in my opinion, originates from a component of Kimura's infrastructure used to enable the charging of an electric vehicle, including the electric vehicle (and/or the charger), the battery, and

the charge circuit. That these components of Kimura qualify as part of an electric vehicle transaction infrastructure is consistent with the '391 Patent. It describes “a charging infrastructure for managing all phases of an electric vehicle transaction,” and also indicates that the example electric vehicle transaction infrastructure “may be implemented on a data processing system associated with an electric vehicle.” Ex-1001, 7:32-34 and 9:61-67. The respective controllers on the vehicle and charger side process data and are thus data processing systems associated with Kimura’s electric vehicle, and those controllers are used to detect/originate the device capabilities interruptions.

99. Therefore, in my opinion, Kimura renders obvious *wherein the one or more interruptions is the device capabilities interruption* (e.g., caused by power leaking from the electric vehicle 10, failure of the battery 11, or the charge circuit breakage), *and the device capabilities interruption originates from at least one component* (e.g., the electric vehicle 10, the battery 11, the charge circuit, or the battery controller 14 detecting the interruption) *of an electric vehicle transaction infrastructure* (e.g., including the charge circuit, as well as the electric vehicle 10 and the components thereof).

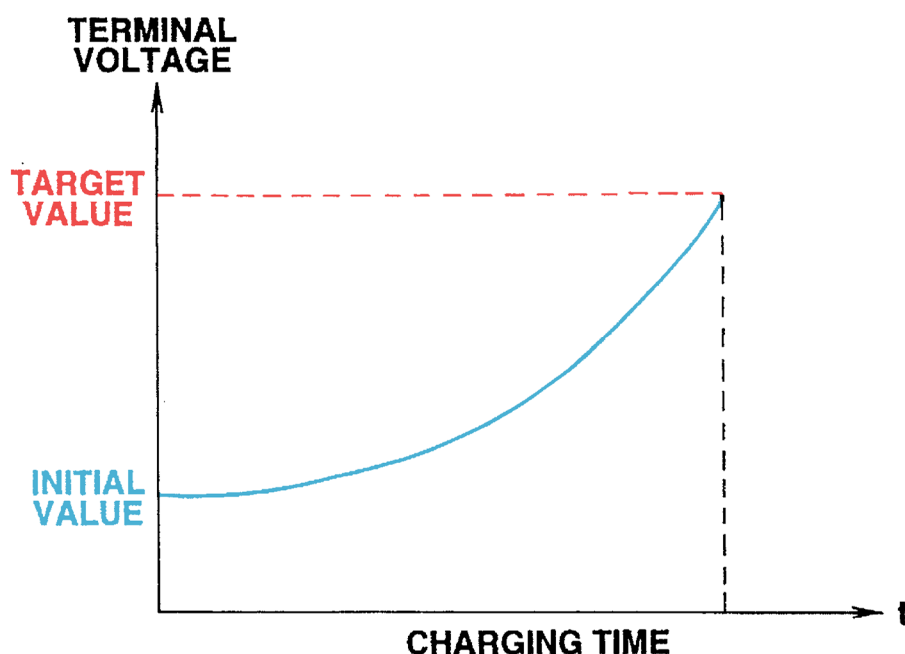
3. Claim 5

100. Claim 5 depends on Claim 1, which Kimura renders obvious for the reasons I discussed above. Claim 5 adds *wherein the one or more interruptions is the*

preference interruption, and the preference interruption is detected from a violation of a preference selected by a participant to the charging process.

Kimura teaches or implies this.

101. As I discussed previously, and as illustrated in Figure 7, one preference interruption in Kimura involves voltage (blue) reaching a predetermined target value (red). Ex-1002, 5:21-27 and 11:24-28 (referring to the threshold as a “preset voltage level”).



Ex-1002, Fig. 7.

102. It is my opinion that setting the voltage threshold constitutes participation in the charging process—regardless of whether the voltage threshold is set by a user, a third party, or by a computer entity (e.g., controllers 14 or 24). Accordingly, the

voltage threshold is, at a minimum, necessarily set by a participant to the charging process. I noticed that the phrase *participant to the charging process* is twice mentioned (Claims 5 and 12). The claims separately recite *participant* and *user*. Human users and electronic participants in the process would therefore both qualify as participants. This can be compared with Ex-1001, 13:21-36 to underscore the correctness of such an interpretation, as that part of the patent says that preferences can be set by “users or third parties.”

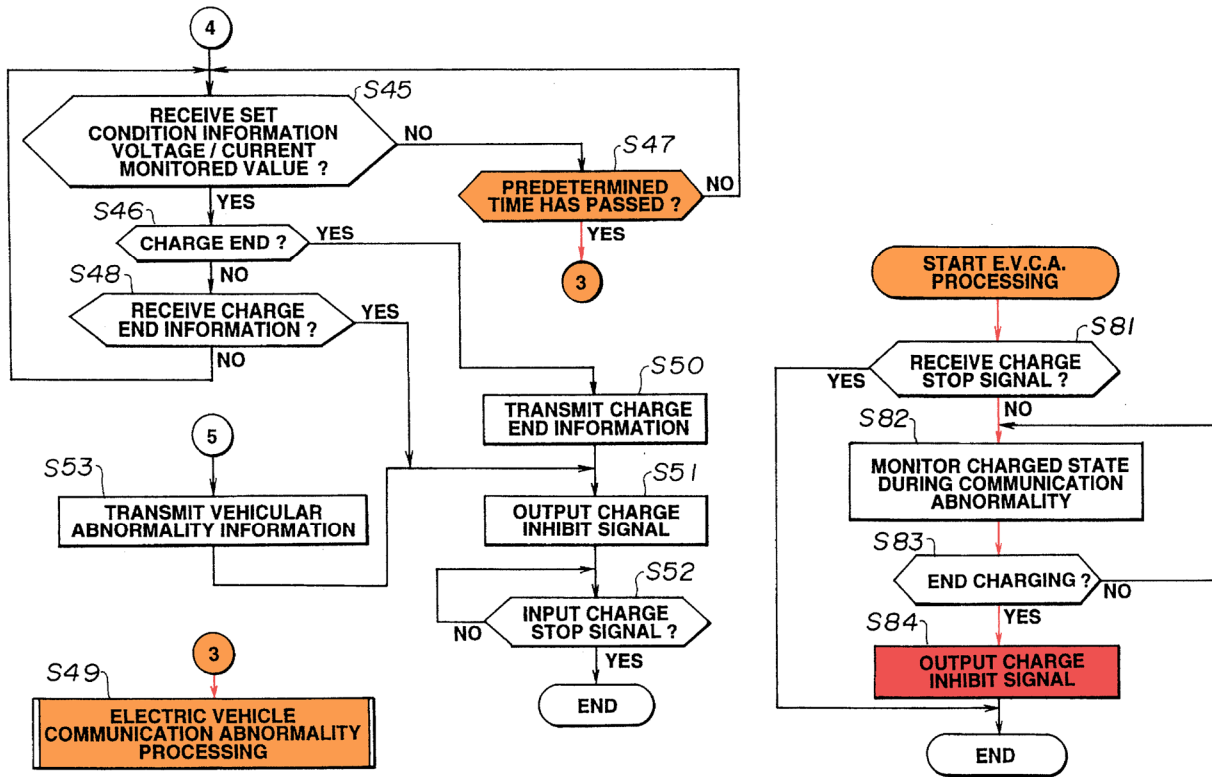
103. Therefore, in my opinion, Kimura renders obvious *wherein the one or more interruptions is the preference interruption* (e.g., caused by the terminal voltage of the battery 11 reaching the predefined threshold), *and the preference interruption is detected from a violation of a preference selected by a participant to the charging process* (e.g., entity that selected the preference).”

4. Claim 6

104. Claim 6 depends on Claim 1, which Kimura renders obvious for the reasons I discussed above. Claim 6 adds *wherein the one or more interruptions is the data services interruption, and the data services interruption originates from a failure in data transmission*. Kimura teaches or implies this.

105. In my opinion, one of Kimura’s data services interruptions occurs when the charger controller 24 fails to communicate with the battery controller 14 within a predetermined amount of time (S47-Yes and S49, orange). Ex-1002, 10:41-44.

This originates from a failure in data transmission, namely, the failure of the charger controller 24 to communicate threshold values and corresponding operational parameters for the charging process to the battery controller 14. *Id.*



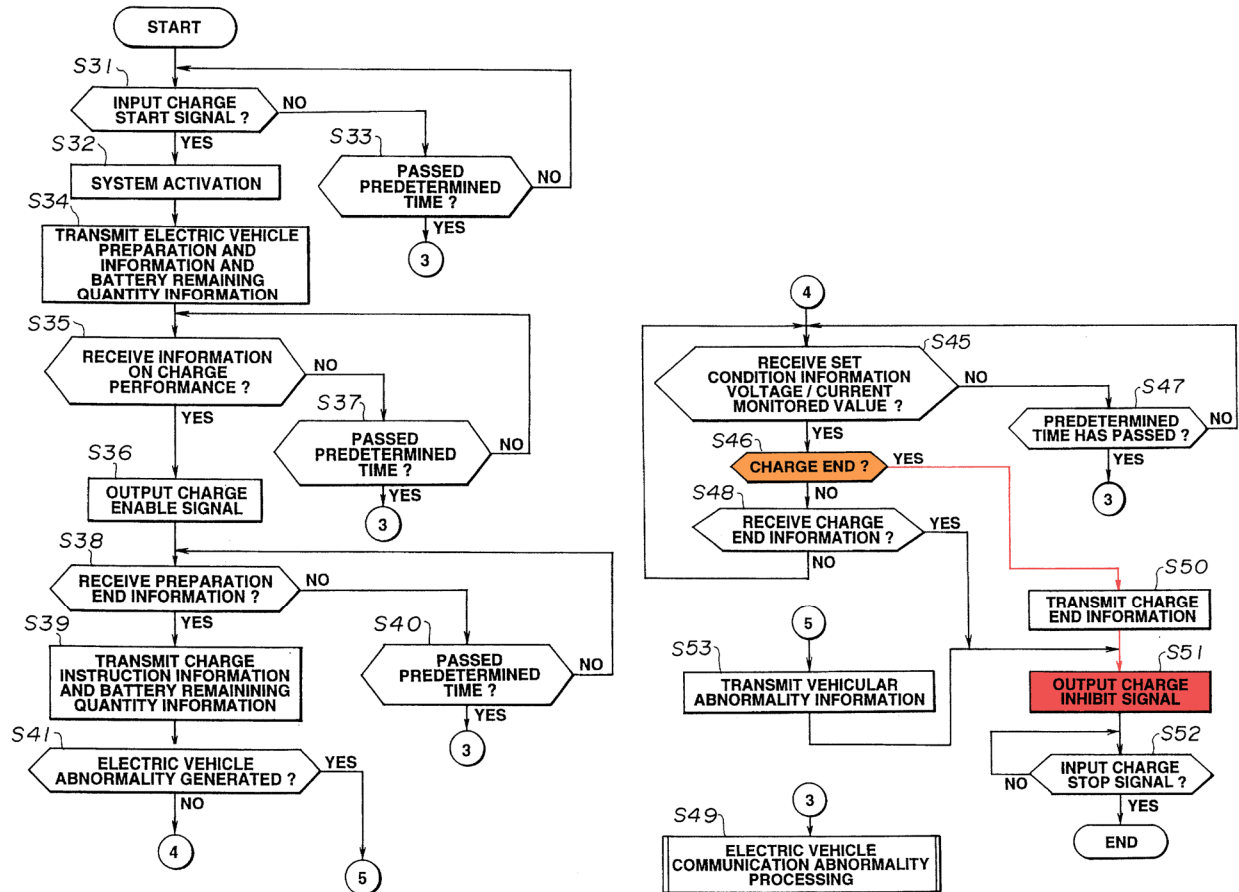
Ex-1002, Figs. 13-14.

106. Therefore, in my opinion, Kimura renders obvious *wherein the one or more interruptions is the data services interruption* (e.g., caused by failure of the charger controller 24 to communicate with the battery controller 14 within a predetermined period of time), *and the data services interruption originates from a failure in data transmission* (e.g., the failure in the transmission of data regarding threshold values and corresponding operational parameters for the charging process).

5. Claim 7

107. Claim 7 depends on Claim 1, which Kimura renders obvious for the reasons I discussed above. Claim 7 adds *wherein the one or more interruptions are detected by identifying an operational parameter from the set of operational parameters that conform to the set of predefined interrupt conditions*. This largely repeats features in Claim 1, while adding *the ... interruptions [being] detected by identifying an operational parameter*. Kimura teaches or implies this.

108. An example of this is when the battery controller 14 detects that the voltage of the battery 11 (operational parameter) conforms to a predetermined voltage threshold (predefined interrupt). Ex-1002, 10:45-48. As Kimura explains, after the voltage exceeds the voltage threshold, the charger controller 14 outputs a charge inhibit signal, which ultimately causes termination of the charging process. Ex-1002, 10:45-48 and 10:54-56.



Ex-1002, Figs. 12-13.

109. Therefore, in my opinion, Kimura teaches or implies *wherein the one or more interruptions are detected by identifying an operational parameter (e.g., the voltage of the battery 11) from the set of operational parameters that conform to the set of predefined interrupt conditions (e.g., an interrupt condition that occurs in Kimura when the voltage of the battery 11 exceeds the predetermined voltage threshold).*

6. Claim 8

110. In my opinion, Claim 8 is rendered obvious by Kimura. Claim 8 of the '391

Patent includes the following features, each of which I address in my analysis below:

8[P] *A computer program product for managing a charging process of an electric vehicle, the computer program product comprising:*

8[A] *a tangible computer-recordable storage medium;*

8[B] *first program instructions to monitor a set of operational parameters of the charging process during the flow of electricity for one or more interruptions in response to receiving, from an energy transaction execution engine, a request signaling a start of the charging process;*

8[C] *second program instructions to detect the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions,*
8[D] *wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data services interruption;*

[E] *third program instructions to send a response to the energy transaction execution engine to terminate the charging process in response to detecting the one or more interruptions; and* 8[F] *wherein the first program instructions, the second program instructions, and the third program instructions are stored on the tangible computer-recordable storage medium.*

a. 8[P]

111. If the preamble is limiting, it is my opinion that Kimura teaches or implies it. Kimura teaches “a charger control program” executed by charger controller 24, and “an electric vehicle charger control program” executed by battery controller 14. Ex-1002, 2:49-61 (indicating Figures 10A-10B depict the charger control program and Figures 12-13 depict the electric vehicle charge control program).

112. Therefore, in my opinion, Kimura teaches or implies *a computer program product* (e.g., the charger and electric vehicle charge control programs) *for managing a charging process* (e.g., the process of Figures 10A and 10B, as well as that of Figures 12-13) *of an electric vehicle* (e.g., the electric vehicle 10).

b. 8[A]

113. Feature 8[A] recites *a tangible computer-recordable storage medium*. A computer must include some form of a tangible, computer-recordable storage medium. Further specification is not needed, but Kimura also teaches or implies this, explaining that “the microcomputer of the charger controller 24 starts the control program shown in FIGS. 10A and 10B” and that “the microcomputer in the battery controller 14 starts the execution of the control program shown in FIGS. 12 and 13.” Ex-1002 at 6:13-15 and 9:17-19.

114. Because the microcomputers are able to start control programs, this implies that those respective control programs are expressly, or at least necessarily, stored on one or more tangible, computer readable storage media. At a minimum, a POSA would have recognized that these respective control programs had to be stored on one or more tangible computer readable storage media.

115. Therefore, in my opinion, Kimura teaches or implies *a tangible computer-recordable storage medium* (e.g., tangible, computer-recordable media that store the charger and electric vehicle charge control programs).

c. 8[B]-[E]

116. Features 8[B]-[E] are substantively identical to 1[A]-[D], respectively, while adding *first, second, and third program instructions*. Kimura teaches or implies the added recitations.

117. Each of the operations being associated with program instructions is taught in Kimura through its control programs executed by charger and battery controllers 24 and 14. A program executed by a microcomputer, as Kimura's control programs are, includes instructions for each of its operations, so each of the operations that is a part of Kimura's control programs also includes (at least necessarily) corresponding instructions within the control programs.

118. In seeking to build Kimura's system, it is my opinion that a POSA would have recognized that the computer instructions of Kimura's control programs existed on a tangible computer-recordable storage medium, since program storage is required for any programmable computation device. To allow for the execution of these control programs taught by Kimura, storage was a necessary prerequisite.

119. Therefore, in my opinion, Kimura teaches or implies the features regarding *first ..., second ..., and third program instructions* (e.g., instructions that, when executed, cause performance of Kimura's charger and electric vehicle control programs).

d. 8[F]

120. Feature 8[F] recites *wherein the first program instructions, the second program instructions, and the third program instructions are stored on the tangible computer-recordable storage medium*. Kimura teaches or implies this feature, as I explained above for 8[A].

* * * *

121. As discussed above, Kimura renders Claim 8 obvious. The conclusions I have drawn concerning the obviousness of the added features of Claim 8, discussed above, are entirely consistent with the '391 Patent itself, which indicates that these aspects are left to the common knowledge of a POSA and are not at all inventive; in fact, they are completely routine and conventional, taught in any elementary computer programming class. Ex-1001, 3:33-37 and 15:66-16:3.

7. Claims 11-14

122. Claims 11-14 depend from Claim 8, which Kimura renders obvious for the reasons I discussed above. Claims 11-14 are analogous in substance to Claims 4-7, respectively, and likewise obvious for the reasons discussed above with respect to Claims 4-7.

8. Claim 15

123. In my opinion, Claim 15 is rendered obvious by Kimura. Claim 15 of the '391 Patent includes the following features, each of which I address in my analysis

below:

15[P] *An apparatus comprising:*

15[A] *a bus system;*

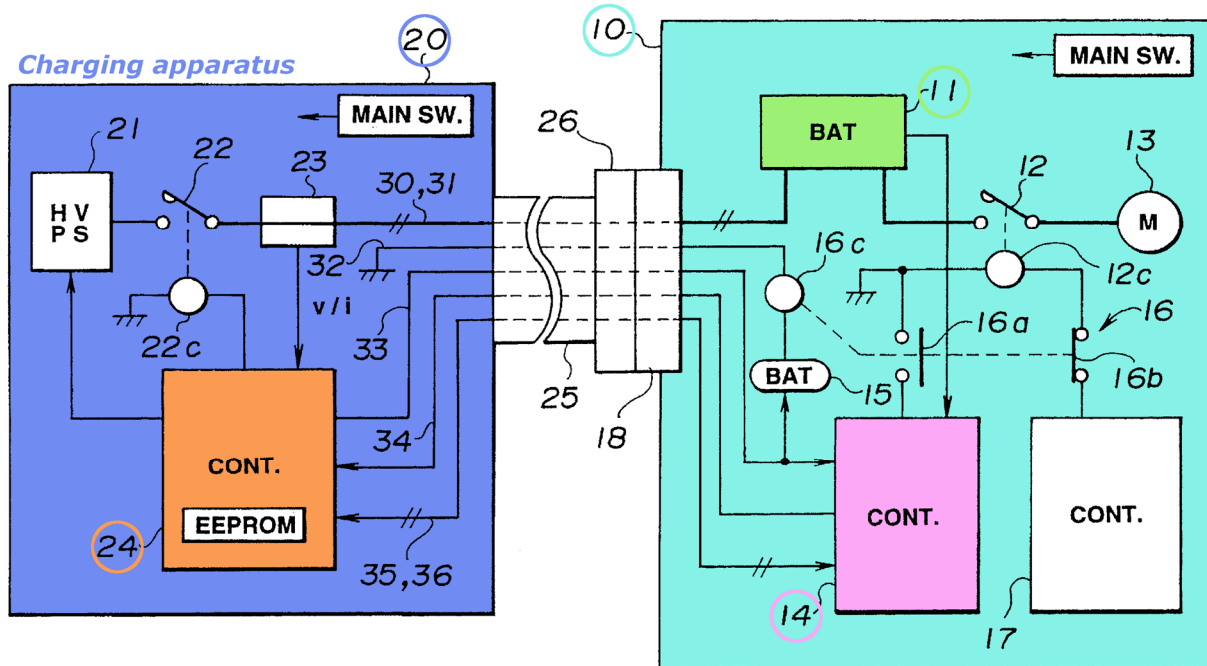
15[B] *a memory connected to the bus system, wherein the memory includes a computer usable program code; and*

15[C] *a processing unit connected to the bus system, wherein the processing unit executes the computer usable program code to*
15[D] *monitor a set of operational parameters of a charging process during the flow of electricity for one or more interruptions in response to receiving, from an energy transaction execution engine, a request signaling a start of the charging process; 15[E] detect the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions,*
15[F] *wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data services interruption; and 15[G] send a response to the energy transaction execution engine to terminate the charging process in response to detecting the one or more interruptions.*

a. 15[P]

124. If the preamble is limiting, it is my opinion that Kimura teaches or implies it.

Figure 1 of Kimura illustrates “a schematic circuit block diagram of a **charging apparatus** for an electric vehicle.” Ex-1002, 2:19-22.



Ex-1002, Fig. 1.

125. Therefore, in my opinion, Kimura teaches or implies *an apparatus* (e.g., the charging apparatus).

b. 15[A]-[C]

126. Features 15[A]-[C] recite *a bus system; a memory connected to the bus system, wherein the memory includes a computer usable program code; and a processing unit connected to the bus system, wherein the processing unit executes the computer usable program code*. Aside from the fact that this simply recites aspects of a computer that were common knowledge at the time, Kimura teaches or implies this.

127. The '391 Patent indicates that its bus system “may be implemented using any suitable type of architecture that provides for a transfer of data between

different components or devices attached to the bus system.” Ex-1001, 6:51-54.

Kimura includes architecture that transfers data between the battery controller 14 and the charger controller 24, including respective buses necessary to Kimura’s microcomputers for exchanging data using control lines 33, 34, 35, and 36. Ex-1002, 3:50-65.

128. Kimura further indicates that the microcomputers associated with its controllers 14 and 24 include “peripheral parts,” (*id.*, 3:15-18), which I believe a POSA would have understood to refer to aspects of the bus system to facilitate transferring data via the control lines. Moreover, Kimura indicates that the controllers 14 and 24 execute computer usable program code stored in a memory, as discussed above with respect to Claim 8.

129. The microcomputers in Kimura form a processing unit (or one or more processing units) as those microcomputers execute (process instructions for) respective control programs on the vehicle and charger sides of Kimura’s apparatus. *See id.*

130. At a minimum, in my opinion, a POSA would have been motivated by these teachings to utilize buses of Kimura’s microcomputers, the EEPROM (or other memory taught by Kimura, discussed above) as a memory, and the microcomputers as a processing unit. (Note, EEPROM is short for Electronically Erasable Read Only Memory. It was an improvement upon previous memory

structures that required exposure of the integrated circuit to strong ultraviolet light to erase it.) This is consistent with the '391 Patent, which states that its bus system “may be implemented using any suitable type of architecture that provides for a transfer of data between different components or devices attached to the bus system.” Ex-1001, 6:51-54. Further, this is also consistent with common knowledge in the art, where computer programs were stored in memory and executed by computers such as the microcomputers of Kimura.

131. Therefore, in my opinion, Kimura teaches or implies *a bus system* (e.g., the control lines 33-36 and the peripheral parts); *a memory connected to the bus system, wherein the memory includes a computer usable program code; and a processing unit* (e.g., the microcomputers) *connected to the bus system, wherein the processing unit executes the computer usable program code.*

c. 15[D]-[G]

132. Features 15[D]-[G] are substantively identical to 1[A]-[D], respectively, and those substantively-identical portions are disclosed by Kimura for analogous reasons to those discussed above with respect to 1[A]-[D].

* * * *

133. As discussed above, Kimura teaches or implies each and every limitation of Claim 15. The conclusions I have drawn concerning the obviousness of the added features of Claim 15, discussed above, are entirely consistent with the '391 Patent

itself, which indicates that these aspects are left to the common knowledge of a POSA and are not at all inventive; in fact, they are completely routine and conventional. Ex-1001, 3:33-37 and 15:66-16:3.

9. Claims 18-19

134. Claims 18 and 19 depend from Claim 8, which Kimura teaches or implies for the reasons I discussed above. Claims 18 and 19 are analogous to Claims 4 and 7, respectively, and are therefore rendered obvious for the reasons that I discussed above.

10. Claim 20

135. In my opinion, Claim 20 is rendered obvious by Kimura. Claim 20 of the '391 Patent includes the following features, each of which I address in my analysis below:

20[P] *A system for managing a charging process of an electric vehicle, the system comprising:*

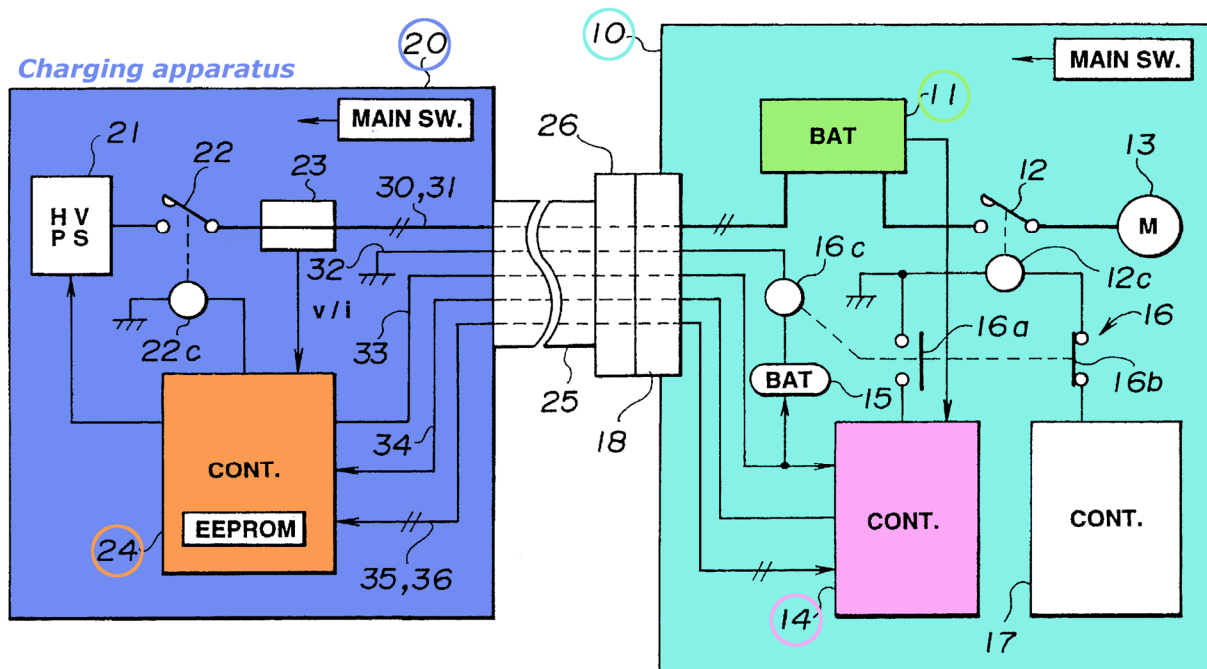
20[A] *an energy transaction execution engine, wherein the energy transaction execution engine executes the charging process;*

20[B] *an energy transaction interrupt monitor, 20[C] wherein the energy transaction interrupt monitor monitors a set of operational parameters of the charging process during the flow of electricity for one or more interruptions in response to receiving, from the energy transaction execution engine, a request signaling a start of the charging process; 20[D] detects the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions, 20[E] wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data*

services interruption; and 20[F] sends a response to the energy transaction execution engine to terminate the charging process in response to detecting the one or more interruptions.

a. 20[P]

136. If the preamble is limiting, it is my opinion that Kimura teaches or implies it. Kimura describes a “**charging apparatus** for an electric vehicle.” Ex-1002, 2:19-22. Kimura’s charging apparatus includes components associated with the vehicle 10 (turquoise) and components associated with the charger 20 (purple), and the components of either side of the system (e.g., the respective controllers 14 and 24) are collectively used to manage Kimura’s charging process.



Ex-1002, Fig. 1.

137. Therefore, in my opinion, Kimura teaches or implies *a system* (e.g., including the electric vehicle 10 and its battery controller 14, as well as the

charger 20 and its controller 24) *for managing a charging process of an electric vehicle* (e.g., the electric vehicle 10).

b. 20[A]

138. Feature 20[A] recites *an energy transaction execution engine, wherein the energy transaction execution engine executes the charging process*. Kimura's energy transaction execution engine is the charger controller 24 (or portions thereof). The charger controller 24 in Kimura executes the charger control program in Kimura, which, alongside the electric vehicle charger control program, allows for executing the charging process in Kimura.

c. 20[B]-[F]

139. Features 20[B]-[F] recite *an energy transaction interrupt monitor, wherein the energy transaction interrupt monitor ... performs the operations of 1[A]-[D]*. The interrupt monitor in Kimura is the vehicle controller 24 (or portions thereof), which executes the electric vehicle charge control program to monitor for interruptions to Kimura's charging process, as explained previously.

140. Monitoring functions occur on the charger side too, so those portions of the charger controller 24 involved with monitoring functions (e.g., portions of the charger controller 24 associated with S17) not only can be considered as part of the *energy transaction execution engine*, but they also, or alternatively, can be considered a part of both the execution engine and the interrupt monitor as the

claims do not preclude this, nor do the examples in the patent.

* * * *

141. As discussed above, Kimura renders Claim 20 obvious.

B. My Opinions as to the Obviousness of Claims 2, 5, 9, 12, and 16 in View of Kimura and Hotta

1. Motivation to Combine Kimura and Hotta

142. Kimura and Hotta share a field of endeavor with the '391 Patent—charging processes for electric vehicles. Ex-1001, 1:8-14 (mentioning “managing electric vehicle charging transactions”); Ex-1002, 1:7-8 (mentioning “a charging apparatus and method for charging a battery of an electric [vehicle]”); Ex-1003, 1:12-17 (mentioning “an apparatus for controlling the charging of a storage battery for use as a drive energy source on an electric vehicle”). It is my opinion that Kimura and Hotta are at least reasonably pertinent to at least one problem of the '391 Patent—designing charging processes that work for complex sets of circumstances. Ex-1001, 6:60-7:11 (stating current technologies only provide “for the most rudimentary charging scenarios” and alleging described embodiments can handle “broader and more complex sets of circumstances”); Ex-1002, 7:33-49 and 10:18-31 (describing handling of various abnormalities during a charging process); Ex-1003, 1:64-2:63 (describing “controlling the charging of a storage battery ... so as to prevent the storage battery from being self-discharged when left to stand for a long time after it has been charged ... and so as to minimize a reduction in the

temperature of the storage battery”).

143. Ample motivation-to-combine also existed, and I explain this below.

144. First, Kimura provides express motivation for a POSA to seek out “various changes and modifications” that “may be made without departing from the scope of” Kimura’s invention (Ex-1002 at 12:30-34) and also provides a description of certain aspects, including a mention of “a main switch (not shown) of the charger 20,” without complete implementation details (*id.*, 6:13-15). In view of the express motivation and the minimal detail provided around certain aspects, a POSA would have been motivated to look to analogous references (including Hotta), e.g., to help understand these certain aspects including related to the purposes that might be served by Kimura’s “main switch.”

145. Upon reviewing the analogous Hotta reference, I believe a POSA would have seen its teaching of the use of command keys (a charging start command key and a charging stop command key (Ex-1003, 1:19-26)), as well as the use of a scheduled boarding time setting key switch, and would have would have been motivated to modify Kimura’s system to include such keys (and/or its existing main switch could have been used in accordance with Hotta’s teachings).

146. Allowing for manual control for a user to stop Kimura’s charging process would have been a desirable feature to ensure consistency with teachings from relevant standards, such as SAE J1772 (discussed below). This would have further

motivated a POSA to implement it to assure a safe and commercially-desirable system. Likewise, my opinion is that allowing for the use of a key switch, like Hotta's boarding time setting key switch, would have enhanced the prospects of creating a commercially successful device, thus motivating the inclusion of such a feature.

147. Second, at a minimum, making use of Hotta's command keys in Kimura's system would have been obvious to try: there are only a finite number of predictable solutions for providing manual inputs to a charging system, including by using Hotta's command keys. Or it would have been a simple substitution of one known element (Kimura's lightly-described main switch) for another known element (Hotta's command keys) to achieve predictable results (a charging process that can be stopped by pressing Hotta's charging stop command key and/or added features to allow users to set scheduling boarding times).

148. Adding Hotta's command keys to Kimura's system, or modifying Kimura's main switch in accordance with the functions of Hotta's command keys, would have been routine for a POSA exercising only ordinary skill, so the modification would have been achieved with a reasonable expectation of success and the manual interruption would have been handled like any other interruption in Kimura.

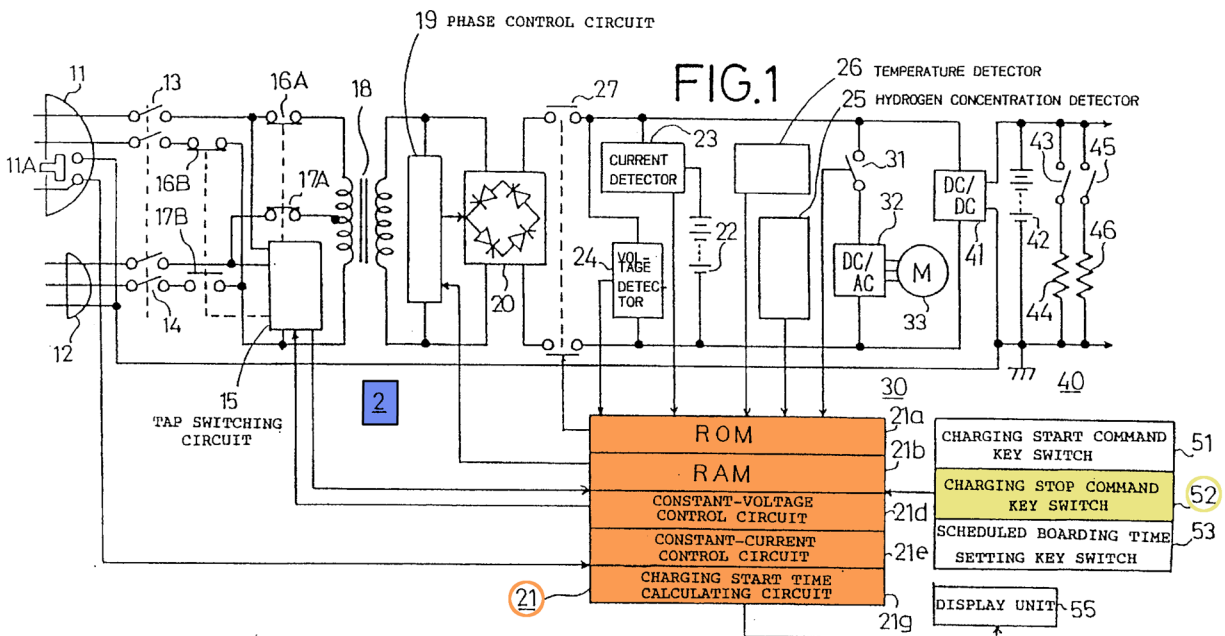
2. Claim 2

149. Claim 2 depends on Claim 1, which Kimura teaches or implies as discussed

above, and Kimura-Hotta retains those aspects of Kimura relied on against Claim

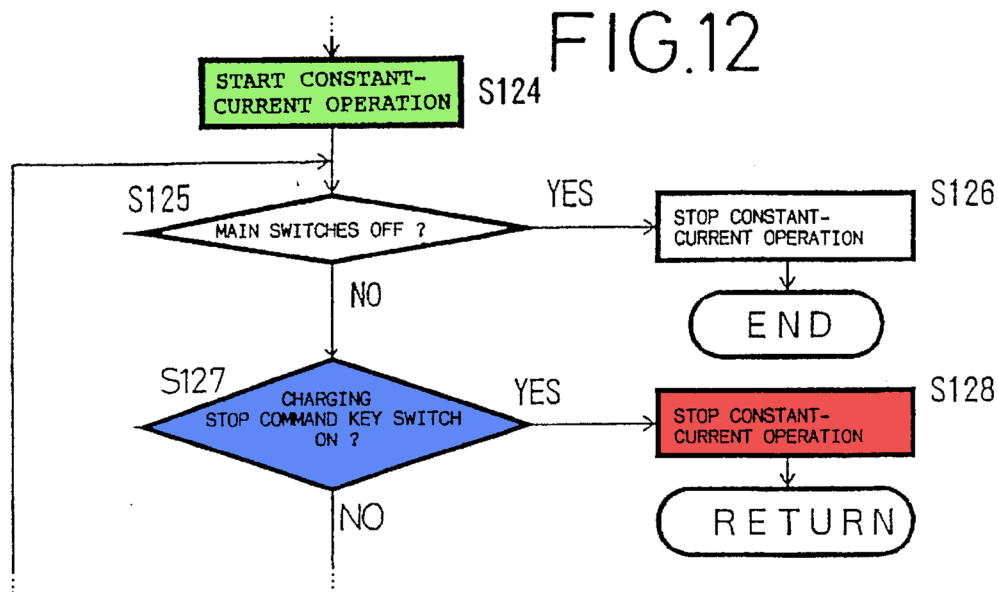
1. Claim 2 specifies *a manual override interruption* and that, *responsive to receiving, from a user, the manual override interruption, terminating the charging process*. Hotta discloses this.

150. In Hotta, an electric vehicle charger 2 (purple) includes a controller 21 (orange) with a charging stop command key switch 52 (yellow). Ex-1003, Fig. 1 and 3:30-31. “If the charging stop command key switch 52 is turned on,” Hotta explains, “then the constant-current operation is stopped in a step S105.” *Id.*, 15:42-47. A POSA would recognize that constant-current charging refers to the initial phase of charging conventional lead-acid, NiCad or NiMh batteries, but the strategy of primarily controlling current rather than voltage during the early stage of charging is similar for modern lithium-based batteries.

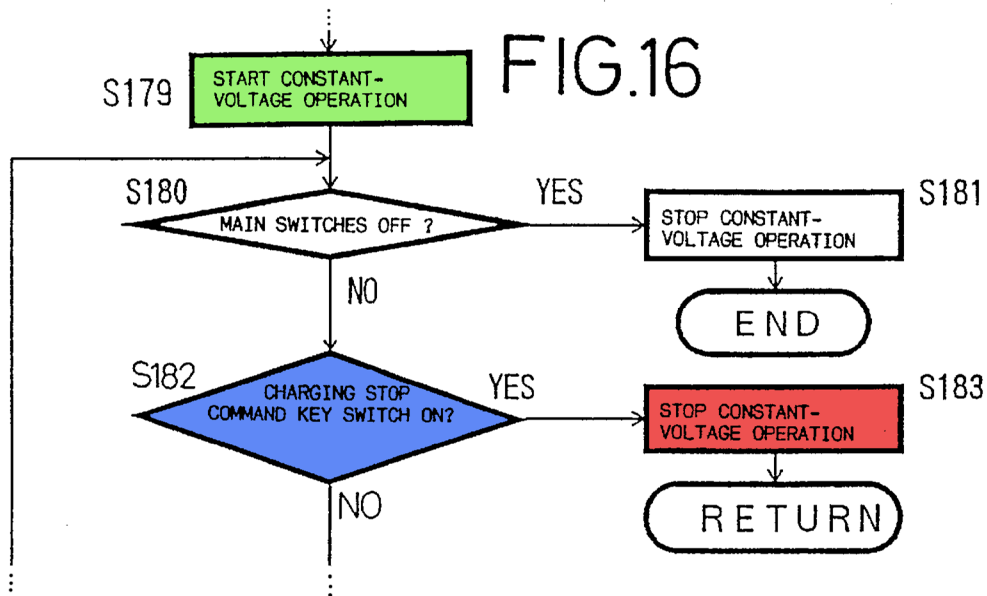


Ex-1003, Fig. 1.

151. It is my opinion that turning on charging-stop-command key switch 52 is a manual override interruption in part because it causes termination. *Cf.* Ex-1001, 12:26-28. Hotta shows in its figures that manual pressing on the charging stop command key switch at S127 and S182 (blue) leads to a stopping of its respective charging operation S128 or S183 (red), and that detection of this interruption occurs during both the constant-current and constant-voltage charging operations in Hotta, with charging starting at S124 and S179 (green).



Ex-1003, Figs. 11-12 (excerpted).



Ex-1003, Figs. 15-16 (excerpted).

152. Hotta indicates that the charging stop command key switch 52 is “for stopping charging the storage battery” and that this occurs when “the charging stop command key is manually pressed,” e.g., by an operator/user of a vehicle involved in the charging process. Ex-1003 at 1:22-26.

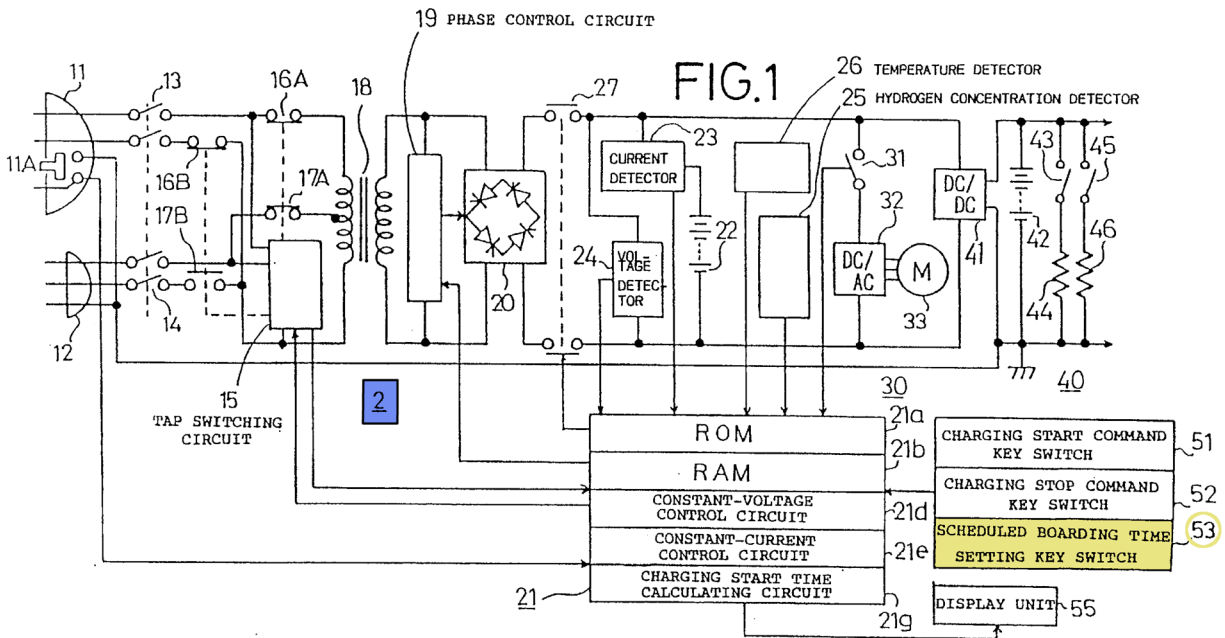
153. Therefore, in my opinion, Kimura-Hotta renders obvious *wherein the one or more interruptions is a manual override interruption* (e.g., caused by manually pressing Hotta’s charging-stop-command key switch 52, or by pressing Kimura’s main switch that functions as taught for Hotta’s stop command key), *and wherein the computer implemented method further comprises: responsive to receiving, from a user* (e.g., the manual pressing of the stop command key), *the manual override interruption, terminating the charging process.*

154. A POSA would have been motivated with reasonable expectation of success in adding a manual override switch to Kimura in view of Hotta. In this regard, standards at the time (e.g., SAE J1772 and others) show that this was part of common general knowledge for a POSA. For example, the SAE J1772 standard specifically states that, “[t]o terminate the charge process, turn the EVSE on/off switch to the off position and/or remove the connector from the vehicle inlet,” showing that the general knowledge (and common sense) dictated some form of manual ON/OFF override.. EX-1011, 14.

3. Claim 5

155. Claim 5 depends on Claim 1, which Kimura teaches or implies as discussed above, and Kimura-Hotta retains those aspects of Kimura relied on against Claim 1. Claim 5 specifies *the one or more interruptions is the preference interruption, and the preference interruption is detected from a violation of a preference selected by a participant to the charging process*. Kimura-Hotta renders this obvious.

156. Hotta regards a charger 2 (purple) configured to ensure that the charging of an electric vehicle is completed by “[an] indicated scheduled boarding time.” Ex-1003, 2:4-21. This “boarding time” is set by the user of the electric vehicle via a key switch 53 (yellow) (*id.*, Abstract, 2:4-21, and Claim 12), and it corresponds to a time at which the user intends to use the vehicle, (*id.*, 2:4-21).



Ex-1003, Fig. 1.

157. Accordingly, I believe that Hotta teaches or implies user selection of a preference for a charging process. Applying this to Kimura, it is my opinion that it would have been obvious for a POSA to allow for user selection of preferences, including the voltage, current, and other battery-specific preferences that could be read from Kimura's DIP switch or from user inputs. Note, a DIP (Dual In-line Package) switch is a set of seven or eight miniature switches in the form of a DIP integrated circuit. It is common to use this type of switch to manually set values of seldom-changed parameters for control of an electric system.

158. It also would have been obvious to combine Kimura with the boarding-time-selection functionality of Hotta, thereby allowing the user of the charging process to indicate preferences for that as well. Given Kimura's teachings regarding

terminating the charging process based on various thresholds and other parameters, a POSA would logically allowed the user to terminate the charging process based on their preferences, such as a preference of a time at which the charging process should terminate (i.e., the “boarding time” of Hotta).

159. Therefore, in my opinion, Kimura in view of Hotta renders obvious *wherein the one or more interruptions is the preference interruption* (e.g., caused by voltage or current reaching a corresponding threshold), *and the preference interruption is detected from a violation of a preference* (e.g., the corresponding threshold) *selected by a participant to the charging process* (i.e., user selected, per Hotta).

4. Claims 9, 12, and 16

160. Claims 9, 12, and 16 are analogous to Claims 2 or 5. Therefore, in my opinion, Claims 9, 12, and 16 are rendered obvious by Kimura-Hotta for reasons discussed above.

C. My Opinions as to the Obviousness of Claims 3, 10, and 17 in View of Kimura and King

1. Motivation to Combine Kimura and King

161. Kimura and King are both related to charging processes for electric vehicles. Ex-1001, 1:8-14 (mentioning “managing electric vehicle charging transactions”); Ex-1002, 1:7-8 (mentioning “a charging apparatus and method for charging a battery of an electric [vehicle]”); Ex-1004, 1:4-6 (mentioning “a battery charger for

use in charging batteries used in electrically propelled vehicles”). In my opinion, Kimura and King are at least reasonably pertinent to at least one problem allegedly solved by the ’391 Patent—designing charging processes that work for multiple complex circumstances. Ex-1001, 6:60-7:11 (stating current technologies only provide “for the most rudimentary charging scenarios” and alleging described embodiments can handle “broader and more complex sets of circumstances”); Ex-1002, 7:33-49 and 10:18-31 (describing handling of various abnormalities during a charging process); Ex-1004, 1:64-2:2 (describing handling of various faults during a charging process). There was also ample motivation for a POSA to modify Kimura in view of King.

162. First, Kimura provides express motivation for a POSA to seek out “various changes and modifications” that “may be made without departing from the scope of” Kimura’s invention (Ex-1002 at 12:30-34). In seeking to build Kimura’s charger, and provided with the express motivation to seek out changes and modifications, a POSA would have been provided with ample motivation to look to analogous references (including King), e.g., to understand aspects related to the storing of operational parameters.

163. Upon reviewing the analogous King reference, I believe that a POSA would have seen its teachings related to non-volatile memory 34 and its use for storing “such data as battery temperature profile, ampere-hours of charge, battery profile,

and charger status.” Ex-1004 at 4:44-5:6. That King teaches doing this “[d]uring battery charging” (*id.*) would have provided a POSA with the understanding to use King’s non-volatile memory 34 to store all of Kimura’s operational parameters during Kimura’s charging operation. This combination was also a natural one as Kimura already teaches an EEPROM, which is a type of non-volatile memory as well.

164. Second, at a minimum, making use of King’s memory 34 to store all operational parameters would have been obvious to try (finite number of predictable solutions for implementing storage of parameters, including by using King’s memory 34) or would have been a simple substitution of one known element (Kimura’s EEPROM) for another known element (King’s memory 34) to achieve predictable results (storing of operational parameters for use during electric-vehicle charging processes).

165. Adding King’s memory 34 to Kimura’s microcomputer system, or substituting King’s memory 34 for Kimura’s EEPROM to would have been routine for a POSA exercising only ordinary skill to implement storage using various available memory devices, the modification being achieved with a reasonable (near-certain) expectation of success.

2. Claim 3

166. Claim 3 depends on Claim 1, which Kimura teaches or implies as discussed

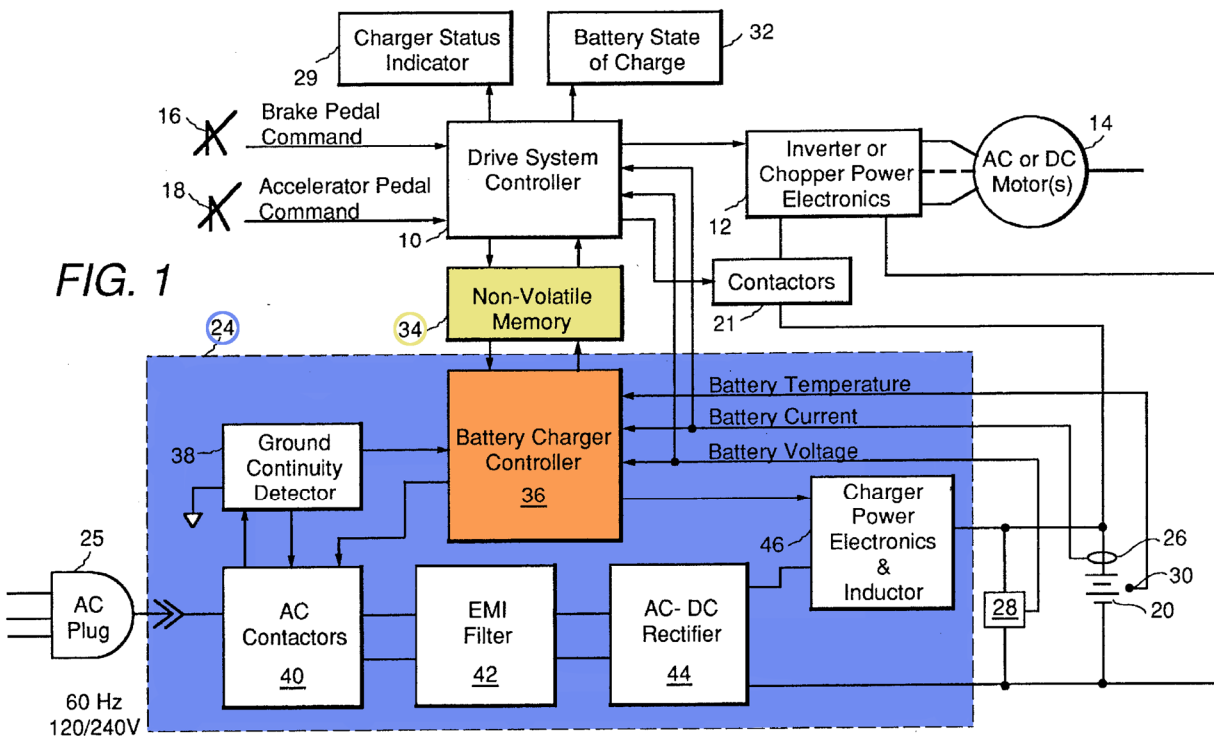
above, and Kimura-Hotta retains those aspects of Kimura relied on against Claim

1. Claim 3 adds *storing the set of operational parameters in a storage device*.

Despite the triviality of this feature, King discloses it.

167. King describes a charger 24 (purple) that operates according to various operational parameters, including “battery temperature profile, ampere-hours of charge, battery charge profile, charger status.” Ex-1004 at 5:49-51 and 4:66-5:1.

King teaches storing all of these operational parameters in a memory (yellow)—instructing that “[d]uring battery charging, memory 34 stores” the operational parameters. *Id.*, 4:66-5:1.



Ex-1004, Fig. 1.

168. As noted previously, there was ample motivation for a POSA to simply

replace Kimura's EEPROM with King's more generic, non-volatile memory 34 and to implement King's teachings related to using this memory to store the operational parameters during a charging process. So, Kimura-King would have included a non-volatile memory and would have stored Kimura's operational parameters.

169. Therefore, in my opinion, Kimura-King renders obvious *storing the set of operational parameters* (e.g., battery temperature profile, ampere-hours of charge, battery charge profile, charger status) *in a storage device* (i.e., the non-volatile memory 34).

3. Claims 10 and 17

170. Claims 10 and 17 are analogous to Claim 3. Therefore, in my opinion, Claims 10 and 17 are rendered obvious by Kimura-King for reasons discussed above with respect to Claim 3.

D. My Opinions as to the Anticipation of Claims 1, 2, 4-9, 11-16, and 18-20 in View of Keith

171. For the reasons discussed above, it is my opinion that Claims 1-20 are not novel in view of Kimura, Kimura combined with aspects of Hotta, and Kimura combined with aspects of King. And as I discuss below, this opinion is further supported by the fact that Keith separately shows that claims 1-20 are anticipated and/or rendered obvious.

1. Claim 1

172. In my opinion, Claim 1 is anticipated by Keith. Claim 1 of the '391 Patent includes the following features, each of which I address in my analysis below:

1[P] A computer implemented method of managing a charging process of an electric vehicle, the computer implemented method comprising:

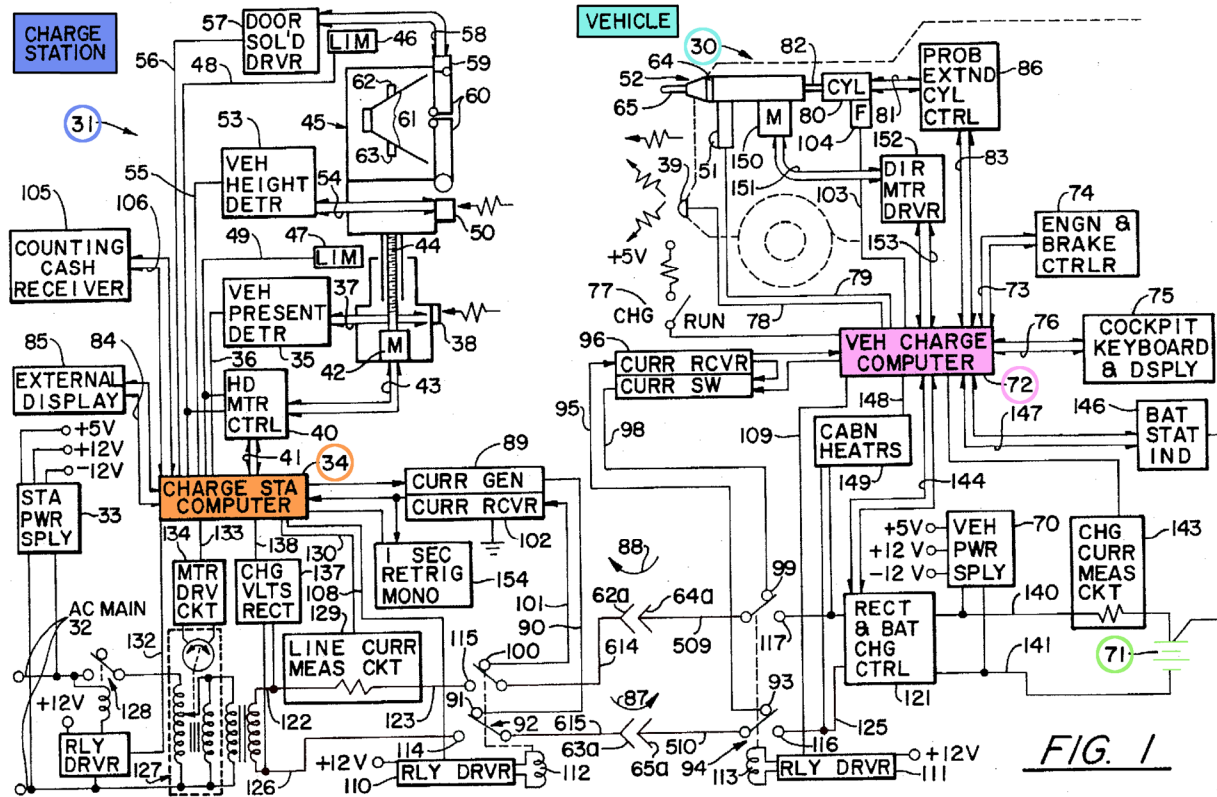
1[A] responsive to receiving, from an energy transaction execution engine, a request signaling a start of the charging process, monitoring a set of operational parameters of the charging process during the flow of electricity for one or more interruptions;

1[B] detecting the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions, 1[C] wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data services interruption; and

1[D] responsive to detecting the one or more interruptions, sending a response to the energy transaction execution engine to terminate the charging process.

a. 1[P]

173. If the preamble is limiting, I believe that Keith alone discloses it. Referring to Ex-1005, Figure 1 (copied below), the charging process of Keith involves a charge station 31 (purple) providing electricity to the battery 71 (green) of an electric vehicle 30 (turquoise). Ex-1005, 4:65-5:2; *see also id.*, Figs. 2-17. As Keith explains, this process is implemented by charge station computer 34 (orange) and vehicle charge computer 72 (pink). *Id.*, 7:32-40; *see also id.*, 9:6-9 (steps at charge station computer 34) and 9:53-56 (steps at vehicle charge computer 72).



Ex-1005, Fig. 1.

174. Keith executes subroutines at the charge station computer 34 (Figure 15) and the vehicle charge computer 72 (Figure 16). Ex-1005, 3:62-4:15.

175. Therefore, in my opinion, Keith discloses *a computer* (e.g., the charge station computer 34 and the vehicle charge computer 72) *implemented method of managing a charging process* (i.e., the charging process including the subroutines of Figures 15 and 16) *of an electric vehicle* (i.e., the vehicle 30).

b. 1[A]

176. Feature 1[A] recites, *responsive to receiving, from an energy transaction execution engine, a request signaling a start of the charging process, monitoring a*

set of operational parameters of the charging process during the flow of electricity for one or more interruptions. Keith discloses this.

177. In Keith, the charge station computer 34 sends a five-second warning to the vehicle charge computer 72 to signal that “the charge phase is going to begin.”

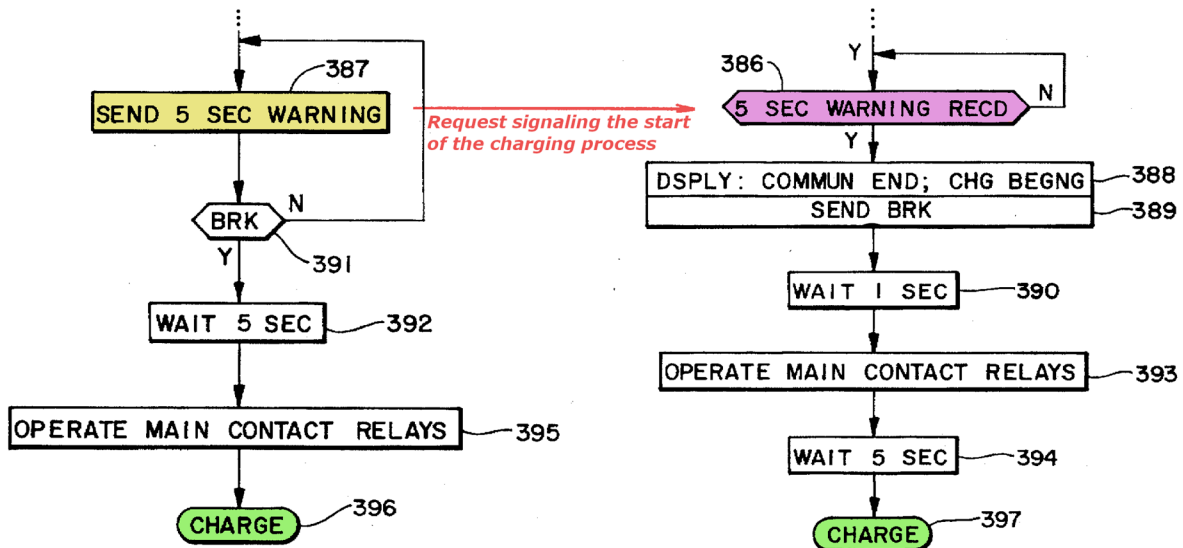
Ex-1005, 20:15-23. In my opinion, this five-second warning is a request signaling the start of the charging process, with the part of the charging station computer 34 that is responsible for transmitting the warning acting in the capacity of as the *energy transaction execution engine*.

178. As I noted above, the '391 Patent does not expressly indicate what is being requested by the *request signaling the start of the charging process*.

Notwithstanding, Keith describes a signals with a five-second warning that initiates vehicle-side charging operations, including the monitoring of operational parameters. Accordingly, in my opinion, its teachings are sufficient for any understanding of what is being requested.

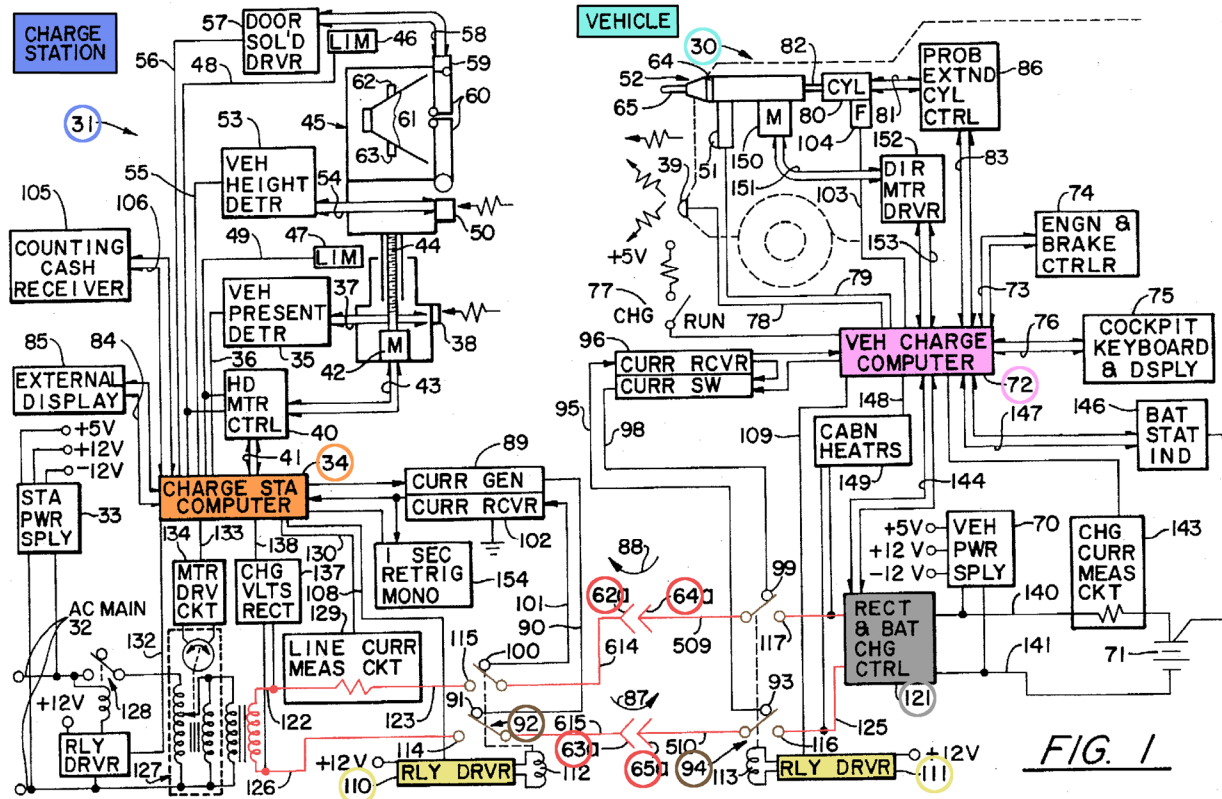
179. I also mention above that I have been informed that the term *energy transaction execution engine* could be in means-plus-function format and therefore limited to the corresponding structure in the specification and equivalents. That would be energy transaction execution engine 316 and any implementing algorithm. In my opinion, Keith teaches this structure with the part (e.g., hardware and/or software) of the charge station computer 34 configured to send the five-

second warning.



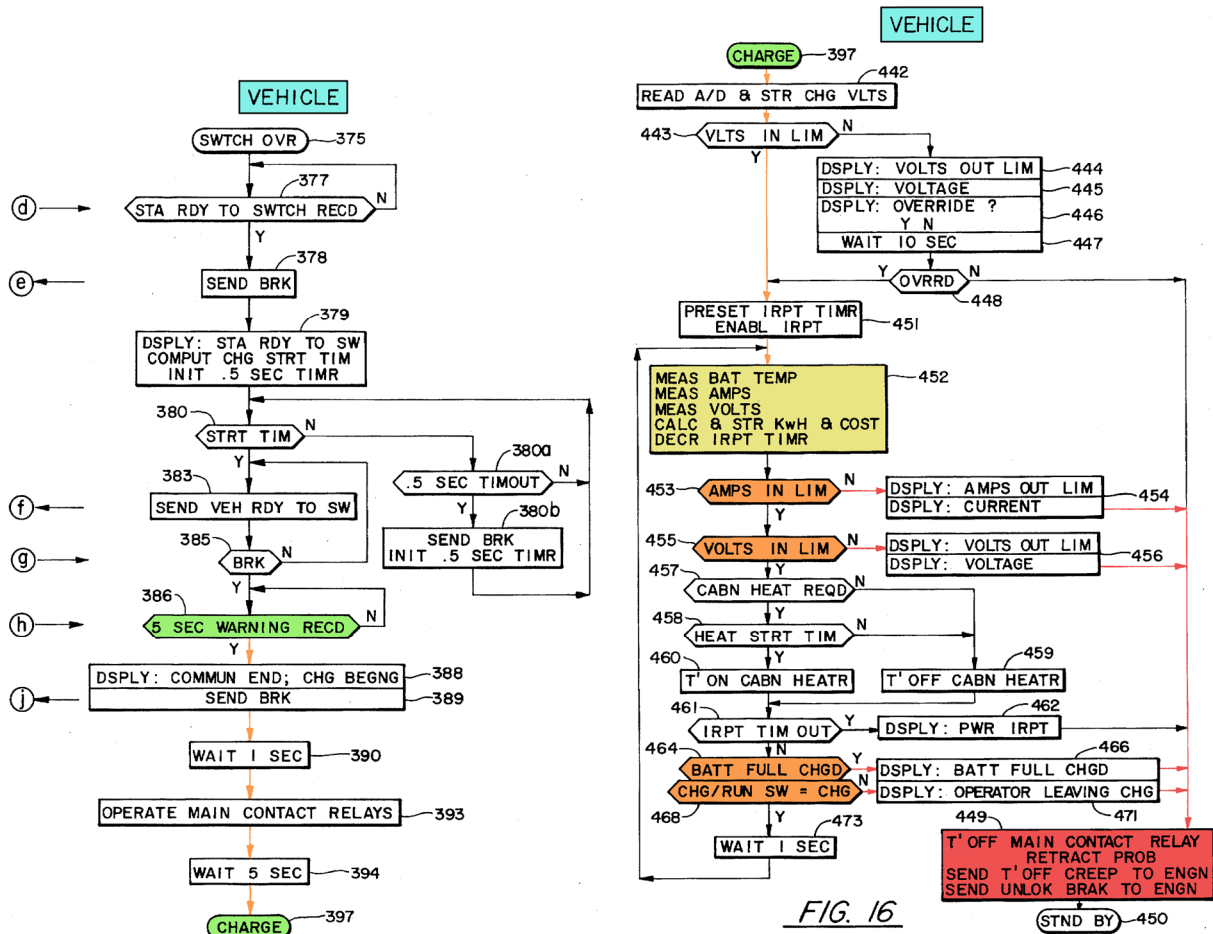
Ex-1005, Figs. 13-14 (excerpted).

180. After the five-second warning, the charge station computer 34 and the vehicle charge computer 72 operate respective relay drivers 110 and 111 (yellow), thereby closing relays 92 and 94 (brown) and completing the circuit between charge station 31 (purple) and vehicle 30 (turquoise). *Id.*, 7:36-43. Power then flows to the vehicle 30, “through the connections 62-65 (red) to the rectifier and battery charge control circuit 121 (gray).” *Id.*, 8:1-6.



Ex-1005, Fig. 1.

181. Based on Figures 14 and 16 (below), the five-second warning (386, green) causes the vehicle charge computer 72 to monitor operational parameters of the charging process (452, yellow; and 453, 455, 464, and 468, all orange), including battery temperature, current, voltage, the amount of energy transferred to the battery 71, and energy cost. *Id.*, 23:57-62 and Figs. 14 and 16 (step 386 leads to the subsequent monitoring of operational parameters, at 452, 453, 455, 464, and 468). Abnormal values of the monitored operational parameters in Keith can lead to interruptions, e.g., 453-N, 455-N, 464-Y, and 468-Y (red pathways), and then termination at 449 (red). *E.g.*, Ex-1005, 23:62-24:1, 24:1-7, and 24:24-28.



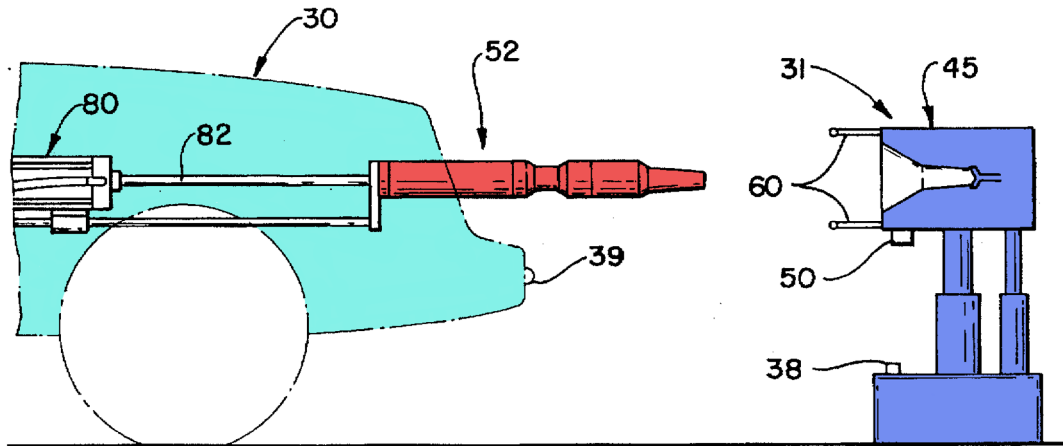
Ex-1005, Figs. 14 and 16.

182. In my opinion, this monitoring occurs *during the flow of electricity*. Keith's vehicle charge computer 72 operates its relay driver 111 at step 393 of Figure 14, and electricity flows to the vehicle 30 as of transfer point 397 in Figures 14 and 16. *Id.*, 20:25-32 and 20:41-47. Charging continues during monitoring until it is determined that the charging process should be terminated. *Id.*, 8:29-32 ("The charge will continue until something goes awry").

183. When termination step 449 is reached, the vehicle charge computer 72 de-

energizes vehicle contact relay 94 and retracts charging probe 52 (red) of vehicle 30 (turquoise) at step 449 of Figure 16. *Id.*, 23:29-41; *cf. id.*, Fig. 19.

When computer 34 of the charge station 31 (purple) determines that probe 52 (red) is released, termination occurs. *Id.*



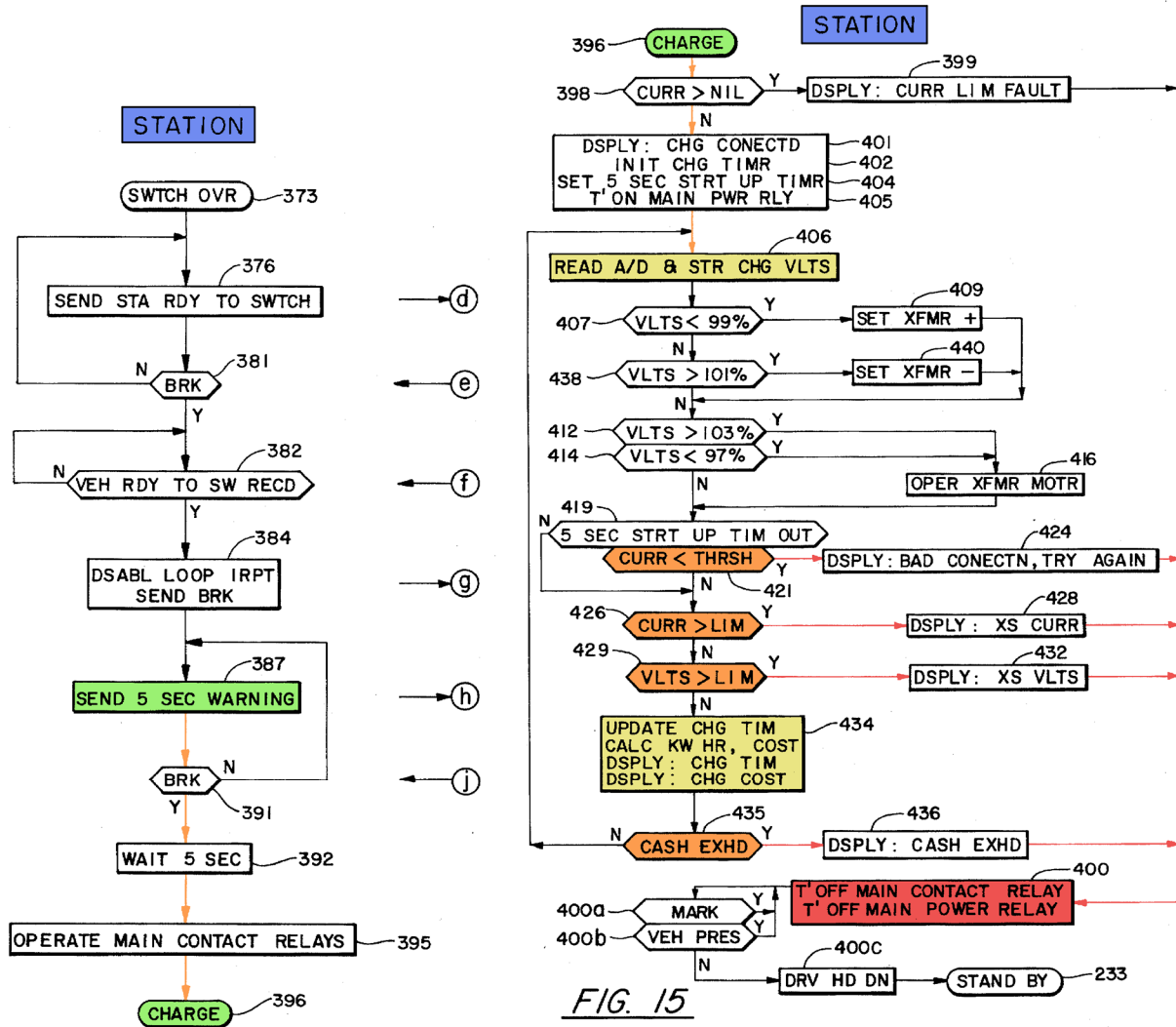
Ex-1005, Fig. 19.

184. Therefore, in my opinion, Keith discloses *responsive to receiving, from an energy transaction execution engine (i.e., part of the charge station computer 34), a request signaling a start of the charging process (i.e., signal with the five-second warning), monitoring (e.g., at the vehicle charge computer 72) a set of operational parameters (e.g., the battery temperature, the current, the voltage, the amount of energy transferred to the battery 71, and the cost of said energy) of the charging process during the flow of electricity for one or more interruptions (e.g., caused by the operating parameters measuring outside of their respective limits).*”

185. If the Patent Owner argues that monitoring and detecting interruptions must

also (or alternatively) occur on the charger side, Keith allows this interpretation.

Id., 21:66-22:30. As with the monitoring performed at the vehicle charge computer 72, this charger-side monitoring is responsive to receipt of a request, as the request is received from the *energy transaction execution engine* identified above, namely, the hardware and/or software responsible for transmitting the five-second warning to the vehicle charge computer 72. *See id.*, Fig. 13. The request on the charger side is signaled within the charge station computer 34, represented by operations leading from 387 of Figure 13 to 406 of Figure 15 (orange path).



Ex-1005, Figs. 13 and 15.

186. At the charge station computer 34, monitoring involves measuring and interpreting operational parameters at steps 406 and 434 (yellow) and determining whether the parameters are in acceptable bounds at steps 421, 426, 429, and 435 (orange). *Id.*, 21:29-31, 21:66-22:30. Moreover, Keith explains that if one of the parameters is detected as matching a predetermined interrupt condition (i.e., if the parameter is not “in limits”), the charging process is terminated. *Id.*, 22:4-16,

21:4-6, and Fig. 15 (termination at step 400).

c. 1[B]

187. Feature 1[B] recites *detecting the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions*. Keith discloses this.

188. Before the charge station 31 provides power to the vehicle 30, they communicate to define various limits. Ex-1005, 6:31-36, 11:54-58, and 18:17-24. As Keith explains, “[t]he vehicle [30] and station [31] communicate ... to establish battery type and voltage, method of payment and credit card number, as well as the cost basis for the power.” *Id.*, Abstract.

189. Detecting the predefined interrupt conditions in Keith involves comparing operational parameters against these predefined limits. In the vehicle charge computer 72, Keith describes determining whether “the current is within limits,” *id.*, 23:62-24:1; whether “the voltage is within limits,” *id.*, 24:1-7; whether “the battery is fully charged,” *id.*, 24:24-28; and whether “the charge/run switch [77] is closed,” *id.*, 24:28-34. Similarly, at the charge station computer 34, Keith describes determining whether “the current ... exceeds a current limit,” *id.*, 21:66-22:4; whether “the voltage is beyond limits,” *id.*, 22:9-12; and whether “the amount of cash which has been deposited is exhausted,” *id.*, 22:27-28.

190. Therefore, in my opinion, Keith discloses *detecting the one or more*

interruptions (e.g., caused by the voltage, the current, the battery charge level, the status of the charge/run switch 77, or the amount of cash spent not being within a predefined limit) *during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions* (e.g., the voltage, current, and charge level limits based on the type of the battery 71, the state of the charge/run switch 77, or the amount of cash to be spent).

d. 1[C]

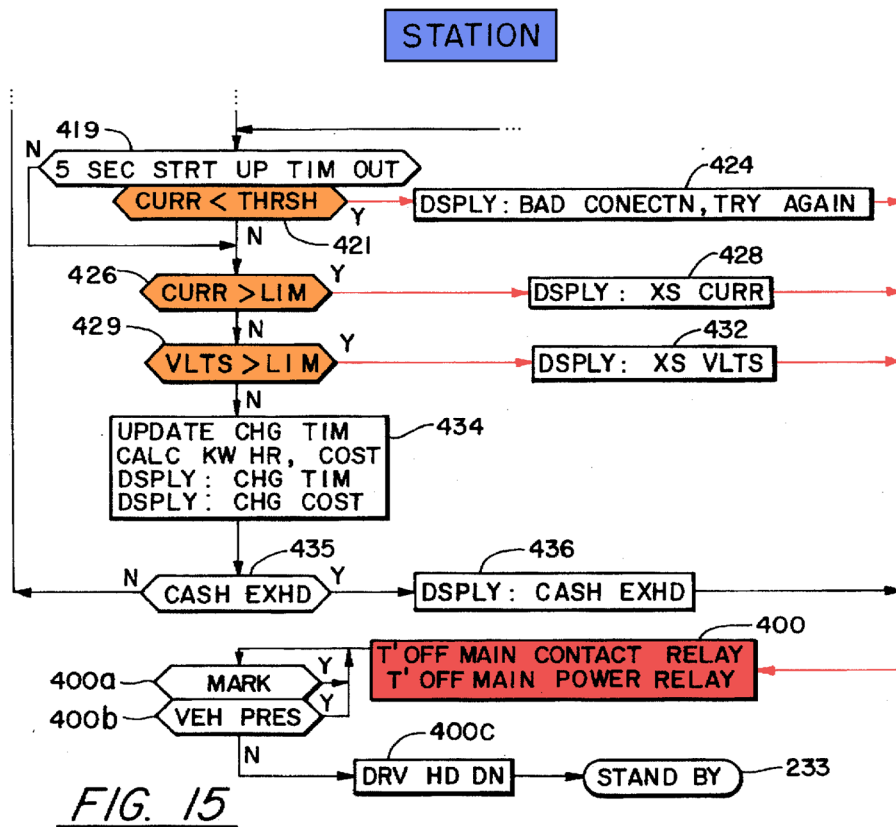
191. Feature 1[C] recites *wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data services interruption*. Keith discloses this.

192. While not required (Ex-1001, 10:38-48 (“at least one of” when used with a list of items means that ... only one of each item may be needed”)), Keith discloses all three types of interruptions, albeit by different names.

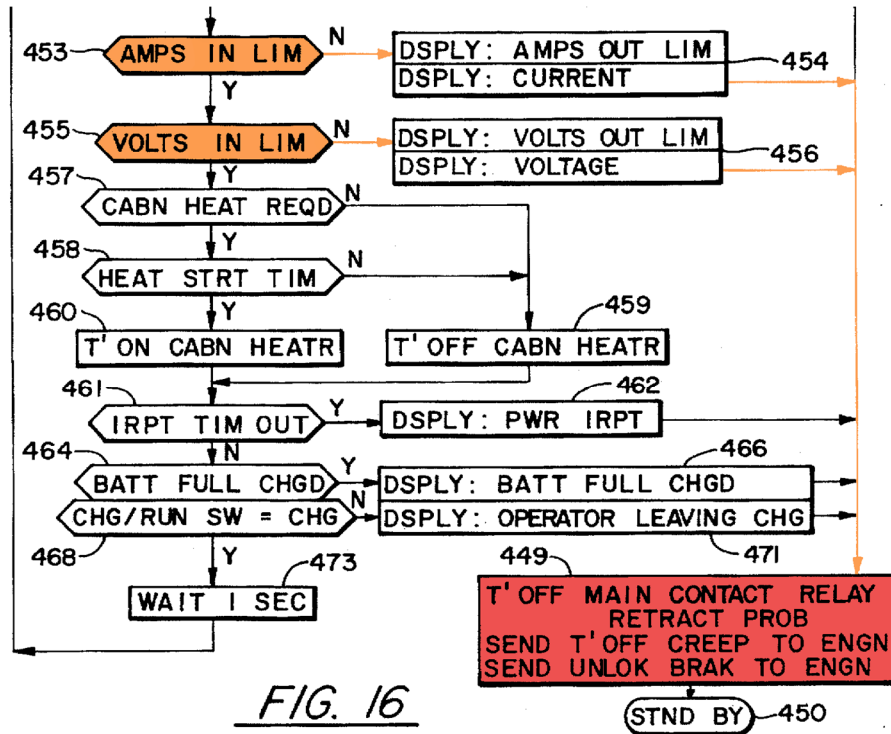
193. Regarding **device capabilities interruptions**, the ’391 Patent explains that they can be caused by “**transaction plan amperage** [i.e., current], ... stability of charging devices, or any other condition or status associated with components of an electric vehicle energy transaction infrastructure.” *Id.*, 13:15-20.

194. Keith explicitly describes interruptions caused by amperage and voltage measurements. Ex-1005, 23:62-24:7 and 21:66-22:12. As discussed above, these interruptions can be detected by the vehicle charge computer 72, (*id.*, 23:62-24:7),

as well as by the charge station computer 34 (id., 21:66-22:12).



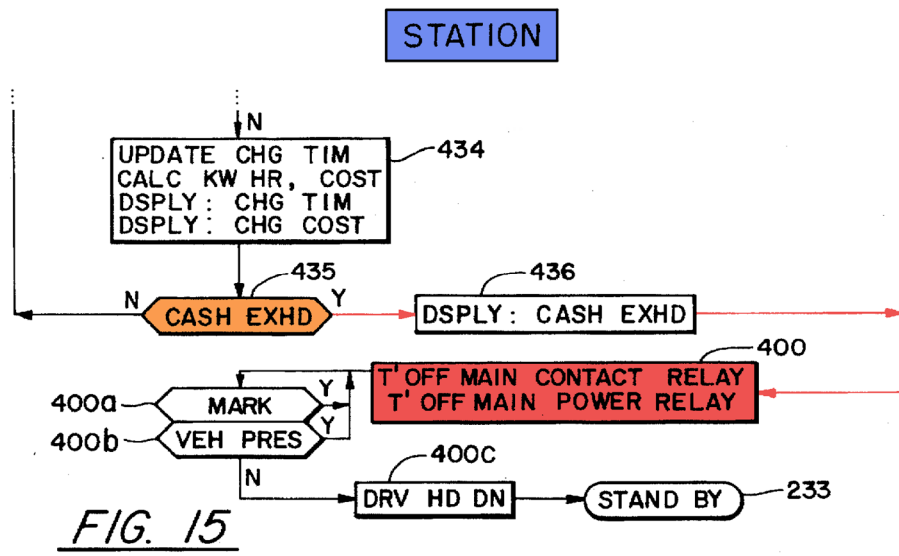
Ex-1005, Fig. 15 (excerpted).



Ex-1005, Fig. 16.

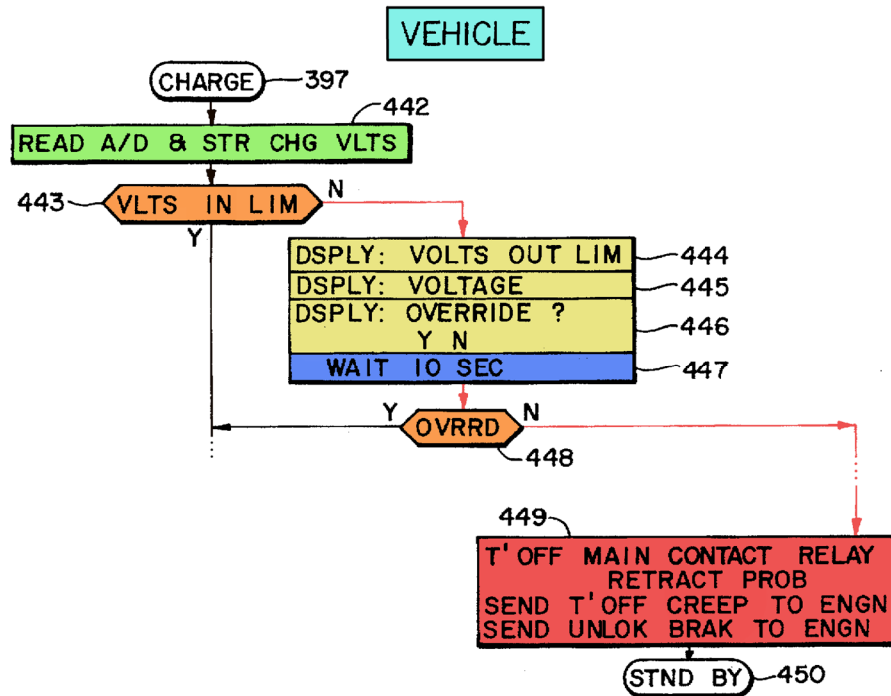
195. As for **preference interruptions**, the '391 Patent provides an example of “a preference for a **threshold cost** for charging an electric vehicle.” *Id.*, 13:26-28.

196. Keith describes this also. As Keith explains, at step 435 of the charging process (orange), the charge station computer 34 “determines if the amount of cash which has been deposited [i.e., a user-defined preference for charging cost] is exhausted.” Ex-1005, 22:27-28. If exhausted, then the charge control computer 34 informs the user and terminates charging at step 400 (red). *Id.*, 22:27-29.



Ex-1005, Fig. 15 (excerpted).

197. An example of a **data services interruption** in Keith occurs at steps 443-448 in Figure 16 during which voltage over a limit is detected, at 443 (orange), as electricity begins flowing to the vehicle 30, at 442 (green). After a sequence of display steps 444-446 (yellow) requesting data from a user (i.e., whether or not to override), a response-waiting period of ten seconds occurs at 447 (blue). If no response is received after ten seconds, (i.e., an interruption in data services from the user failing to provide data in time), the logic proceeds to 449 (red) for termination.



Ex-1005, Fig. 16 (excerpted).

198. Therefore, in my opinion, Keith discloses *wherein the one or more interruptions comprises at least one of a device capabilities interruption (e.g., caused by the current or the voltage not being within a respective limit), a preference interruption (e.g., caused by exhaustion of cash), and a data services interruption (e.g., caused by a user not providing requested data in time).*

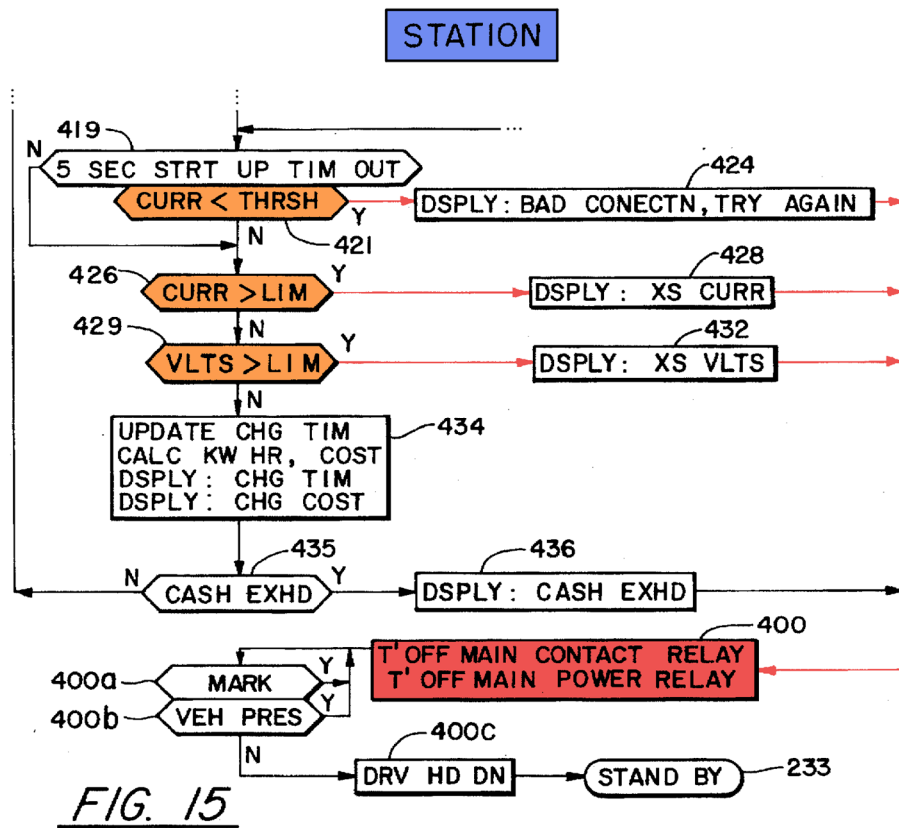
e. 1[D]

199. Feature 1[D] recites, *responsive to detecting the one or more interruptions, sending a response to the energy transaction execution engine to terminate the charging process.* Keith discloses this.

200. For controller 72, the response to terminate the charging process is signaled

by de-energizing the vehicle contact relay 94. Ex-1005, 23:29-35. As Keith illustrates, this occurs responsive to detecting an interruption at the vehicle charge controller 72. *See id.*, Fig. 16 (illustrating positive determinations at any of steps 453, 455, 464, and 468 and leading to de-energizing the vehicle contact relay, at step 449). This de-energizing of the vehicle contact relay 94 provides a response that causes the charge station computer 34 to terminate the charging process. *Id.*, 23:29-35.

201. At the charge station computer 34, hardware and/or software at the charge station 31 likewise sends a response to terminate the charging process responsive to detecting an interruption. This is signaled within the charge station computer 34 and is represented (expressly or, at a minimum, necessarily) by the arrows in Figure 15 pointing from the various steps at which interruptions can be detected to termination of the charging process. *See id.*, Fig. 15 (illustrating positive determinations at any of steps 421, 426, 429, 434, and 435 (orange) leading to termination at step 400, red).



Ex-1005, Fig. 15 (excerpted).

202. Therefore, in my opinion, Keith discloses *responsive to detecting the one or more interruptions* (e.g., caused by the current or the voltage not being within a respective limit, or caused by exhaustion of the cash deposited for the charging process), *sending a response* (e.g., the de-energizing of the main contact relay 94, or the signal represented by the operations leading from steps 421, 426, 429, and 435 to step 400 of Figure 15) *to the energy transaction execution engine* (e.g., portions of the charge station controller 34, including those implementing 387 and 400) *to terminate the charging process*.

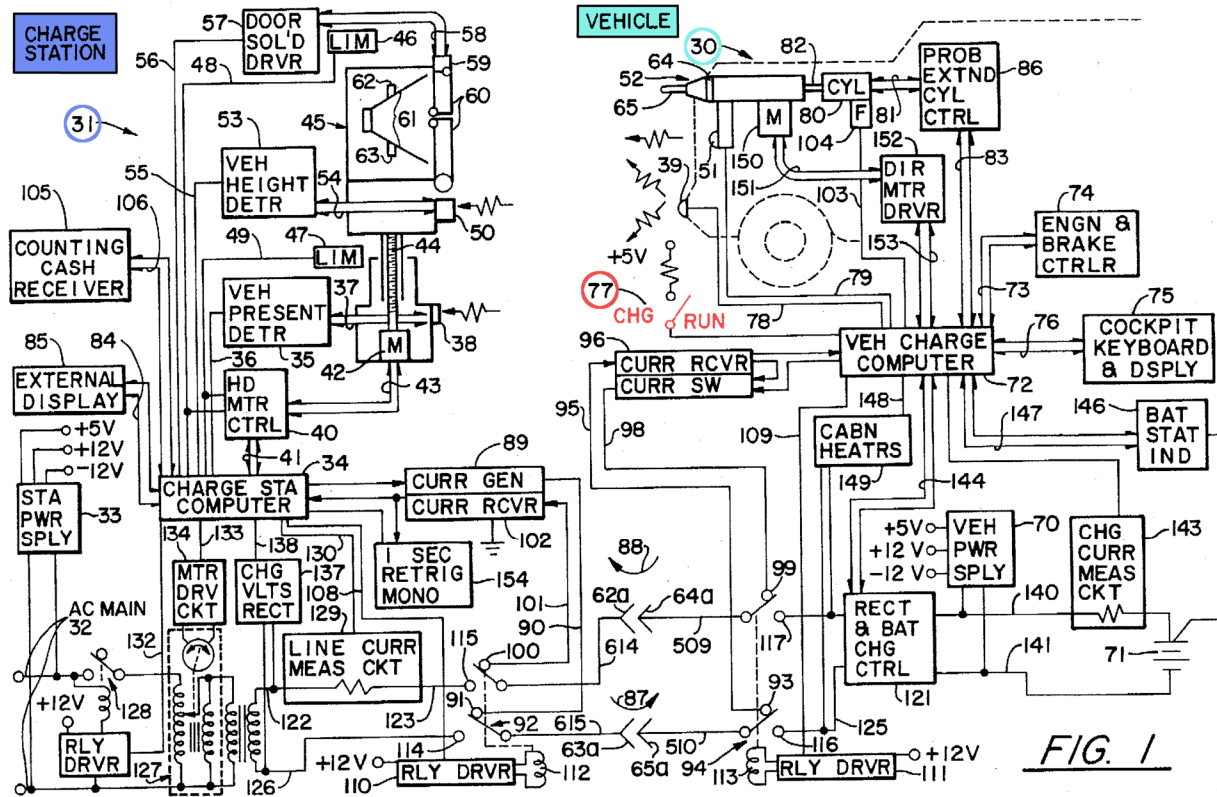
* * * *

203. As discussed above, Keith anticipates each and every limitation of Claim 1.

2. Claim 2

204. Claim 2 depends on Claim 1, which Keith discloses for reasons I discussed above. Claim 2 adds *wherein the one or more interruptions is a manual override interruption, and wherein the computer implemented method further comprises: responsive to receiving, from a user, the manual override interruption, terminating the charging process.* Keith discloses this.

205. In Keith, a manual override interruption occurs when “the operator moves a charge[/]run switch 77 into the open position.” Ex-1005, 8:29-32. As Keith explains, the charge/run switch 77 (red) allows the operator to manually terminate the charging process. *Id.*, 8:1-6 and 8:29-32.



Ex-1005, Fig. 1.

206. The operator is a user of the charging station. *See* Ex-1005, 2:10-15. As the operator moves charge/run switch 77 into open position, the charging station receives a manual interruption and terminates accordingly. *Id.*, 8:29-32.

207. Like the '391 Patent (Ex-1001, 12:26-31), Keith explains that its charge/run switch 77 can be part of a user interface. Ex-1005 at 6:6-8 (explaining that charge/run switch 77 “may be a discrete switch, or may simply be a suitable keyboard input through the cockpit keyboard and display system 75.”).

208. Therefore, in my opinion, Keith anticipates *wherein the one or more interruptions is a manual override interruption* (i.e., caused by opening of

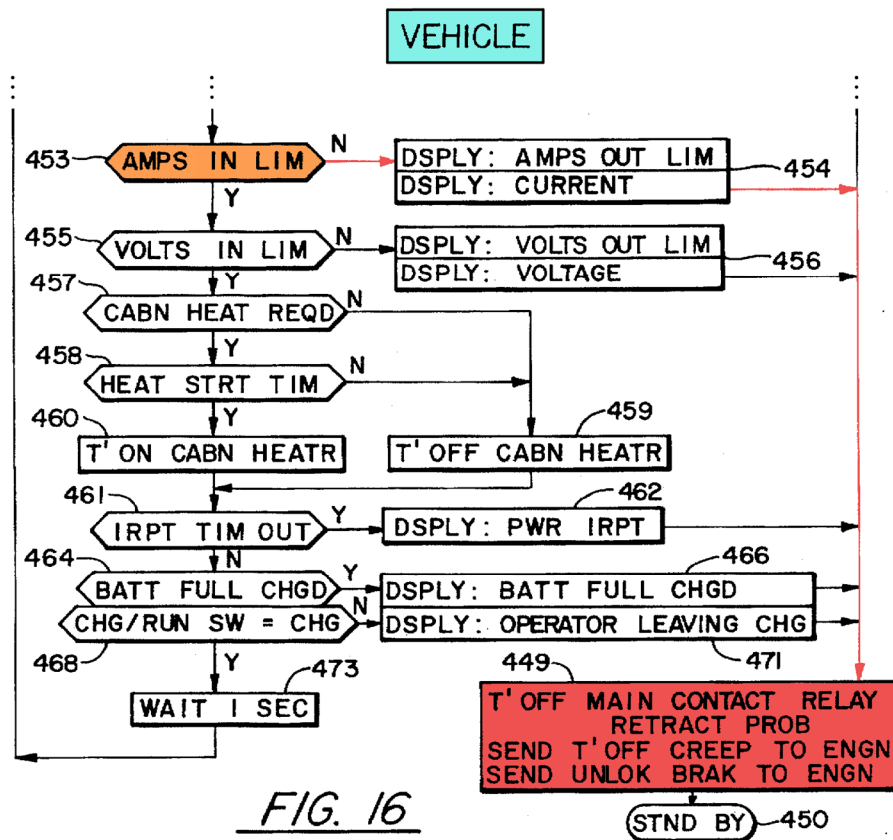
charge/run switch 77), and wherein the computer implemented method further comprises: responsive to receiving, from a user (e.g., vehicle owner/operator), the manual override interruption, terminating the charging process.

3. Claim 4

209. Claim 4 depends on Claim 1, which Keith anticipates as discussed above.

Claim 4 adds *wherein the one or more interruptions is the device capabilities interruption, and the device capabilities interruption originates from at least one component of an electric vehicle transaction infrastructure.* Among the several types of interruptions that Keith responds to, Keith discloses this.

210. One example in Keith is caused by “record[ing] the current measured by the charge current measuring circuit 143,” and then conducting a test 453 (orange) to “determine[] if the current is in limits.” Ex-1005, 23:57-63. This example device capabilities interruption occurs when the measured current is not within limits, which causes the “display to inform the operator that the current is out of limits” and leads to termination of the charging process at 449 (red).



Ex-1005, Fig. 16 (excerpted).

211. This interruption can also originate from a component of Keith’s electric vehicle transaction infrastructure, i.e., charge current measuring circuit 143 of the vehicle and the vehicle charge computer 72. Cf. Ex-1001, 7:32-34 (indicating that energy transaction infrastructure is “a charging infrastructure for managing all phases of an electric vehicle transaction”) and 9:64-67 (noting internal vehicle components as being part of the infrastructure).

212. Therefore, in my opinion, Keith discloses *wherein the one or more interruptions is the device capabilities interruption* (e.g., caused by current

exceeding a predefined limit), *and the device capabilities interruption originates from at least one component* (e.g., charge current measuring circuit 143 and vehicle charge computer 72) *of an electric vehicle transaction infrastructure* (e.g., including vehicle 30).

4. Claim 5

213. Claim 5 depends on Claim 1, which Keith anticipates for the reasons I discussed above. Claim 5 adds *wherein the one or more interruptions is the preference interruption, and the preference interruption is detected from a violation of a preference selected by a participant to the charging process*. Keith discloses this.

214. One preference interruption in Keith involves exhaustion of the cash deposited by the user for charging. Ex-1005, 22:27-28. This is a preference selected by a participant to the charging process. Referring to the payment technology of the time, Keith explains that “the operator [of the vehicle 30] ... deposit[s] cash into a counting cash receiver” and “[t]he charge ... continue[s] until ... the credit established by the counting cash receiver 105 is exhausted.” *Id.*, 7:24-26 and 8:29-31; *cf. id.*, 6:4.

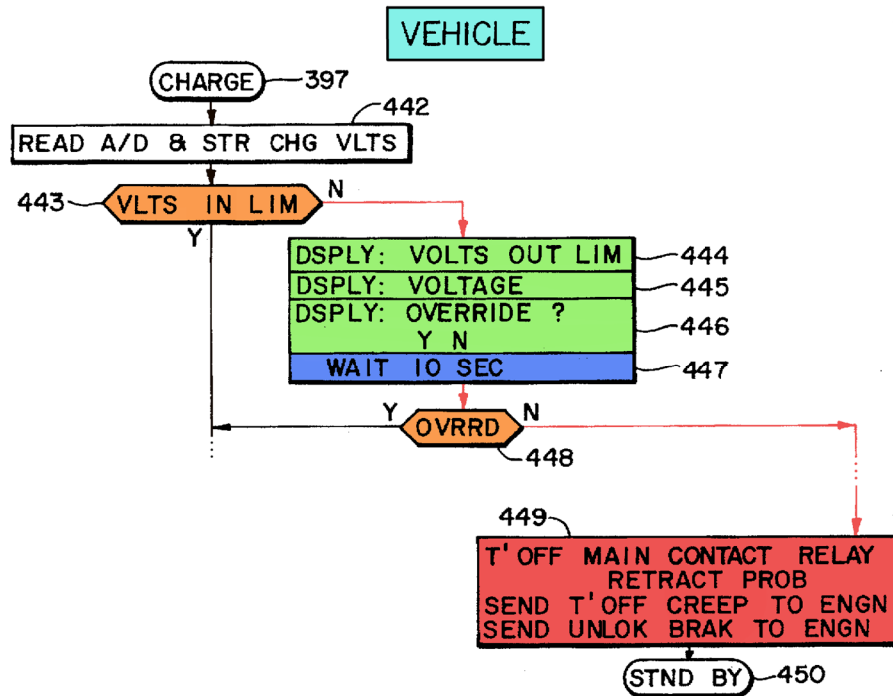
215. Therefore, in my opinion, Keith discloses *wherein the one or more interruptions is the preference interruption* (e.g., caused by exhaustion of cash deposited), *and the preference interruption is detected from a violation of a*

preference selected by a participant to the charging process (e.g., owner/operator of vehicle 30).

5. Claim 6

216. Claim 6 depends on Claim 1, which Keith anticipates for the reasons I discussed above. Claim 6 adds *wherein the one or more interruptions is the data services interruption, and the data services interruption originates from a failure in data transmission.* Keith discloses this.

217. One data services interruption in Keith occurs when voltage over a limit is detected as electricity begins to flow to the vehicle at 443 (orange), followed by a sequence of display steps 444-446 (green) at the vehicle leading to a request for data from a user (i.e., whether or not to override) and a response-waiting period of 10 seconds at step 447 (blue). Ex-1005, 23:16-39. If no response is received after 10 seconds (an interruption in data services from the user failing to respond in time), then the logic proceeds to 449 (red) and the charging process is terminated. *Id.*



Ex-1005, Fig. 16 (excerpted).

218. Therefore, in my opinion, Keith discloses *wherein the one or more interruptions is the data services interruption, and the data services interruption originates from a failure in data transmission* (e.g., caused by a user not providing data in time).

6. Claim 7

219. Claim 7 depends on Claim 1, which Keith anticipates for the reasons above. Claim 7 adds *wherein the one or more interruptions are detected by identifying an operational parameter from the set of operational parameters that conform to the set of predefined interrupt conditions*. Keith discloses this.

220. As one example, Keith describes “determin[ing] if the current provided by

the line current measuring circuit 129 ... exceeds a current limit which is established by manufacturer's data." Ex-1005, 21:66-22:4. The current is the *operational parameter from the set of operational parameters*. Other operational parameters in this set include those discussed above as to Claim 1.

221. Therefore, Keith discloses *wherein the one or more interruptions are detected by identifying an operational parameter (e.g., the current) from the set of operational parameters that conform to the set of predefined interrupt conditions (e.g., the current limit)*.

7. Claim 8

222. In my opinion, Claim 8 is not novel because it is anticipated by Keith.

Claim 8 of the '391 Patent includes the following features, each of which I address in my analysis below:

8[P] *A computer program product for managing a charging process of an electric vehicle, the computer program product comprising:*

8[A] *a tangible computer-recordable storage medium;*

8[B] *first program instructions to monitor a set of operational parameters of the charging process during the flow of electricity for one or more interruptions in response to receiving, from an energy transaction execution engine, a request signaling a start of the charging process;*

8[C] *second program instructions to detect the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions,*
8[D] *wherein the one or more interruptions comprise at least one of a*

device capabilities interruption, a preference interruption, and a data services interruption;

8[E] third program instructions to send a response to the energy transaction execution engine to terminate the charging process in response to detecting the one or more interruptions; and 8[F] wherein the first program instructions, the second program instructions, and the third program instructions are stored on the tangible computer-recordable storage medium.

a. 8[P]

223. If the preamble is limiting, it is my opinion that Keith discloses it. Keith describes “a background program [that] ... determines when charging should cease, either because the battery is full, a switch has been thrown, or there is excess voltage or current in the system.” Ex-1005, 3:47-51. Additionally, Keith illustrates various logic diagrams for managing a charging process, as well as computers 34 and 72 for executing that logic, as discussed in more detail above.

224. Therefore, in my opinion, Keith discloses *a computer program product* (e.g., the background program) *for managing a charging process* (e.g., the process of Figures 15 and 16) *of an electric vehicle* (e.g., the vehicle 30).

b. 8[A]

225. Feature 8[A] recites *a tangible computer-recordable storage medium*. Keith discloses this. Keith explains that the charge station computer 34 executes a “charge station computer program” and that the vehicle charge computer 72 executes a “vehicle charge computer program.” Ex-1005, 17:41-49, 18:45-47, and

18:45-47; *cf. id.*, Figs. 11 and 12 (illustrating portions of the charge station and vehicle charge computer programs, respectively).

226. Because these computers are able to run their respective programs, this means that those respective control programs are expressly, or at least necessarily, stored on one or more tangible, computer readable storage media. At a minimum, a POSA would have recognized that these respective control programs had to be stored in one or more tangible computer readable storage media.

227. Therefore, in my opinion, Keith discloses *a tangible computer-recordable storage medium* (e.g., tangible, computer-recordable media storing the charge station and vehicle charge computer programs).

c. 8[B]-[E]

228. Features 8[B]-[E] are substantively identical to 1[A]-[D], respectively, while adding *first, second, and third program instructions*. Keith discloses these additions.

229. That each of the operations is associated with program instructions is taught in Keith as the computer programs executed by its charge station computer 34 and vehicle charge computer 72. A program executed by a computer, as Keith's computer programs are, includes instructions for each of its operations, so each of the operations in Keith's computer programs also includes corresponding instructions within the control programs.

230. Therefore, in my opinion, Keith discloses the added features regarding *first ... , second ... , and third program instructions* (e.g., instructions that, when executed, cause performance of the charge station and vehicle charge computer programs).

d. 8[F]

231. Feature 8[F] recites *wherein the first program instructions, the second program instructions, and the third program instructions are stored on the tangible computer-recordable storage medium*. Keith discloses this feature, as discussed above with respect to Feature 8[A].

* * * *

232. As discussed above, Keith anticipates each and every limitation of Claim 8.

8. Claims 9 and 11-14

233. Claims 9 and 11-14 depend from Claim 8, which Keith anticipates for the reasons I discussed above. Claims 9 and 11-14 are analogous to Claims 2 and 4-7, respectively. Therefore, in my opinion, Keith anticipates Claims 9 and 11-14 for reasons analogous to those discussed above with respect to Claims 2 and 4-7.

9. Claim 15

234. In my opinion, Claim 15 is rendered obvious by Kimura. Claim 15 of the '391 Patent includes the following features, each of which I address in my analysis below:

15[P] *An apparatus comprising:*

15[A] *a bus system;*

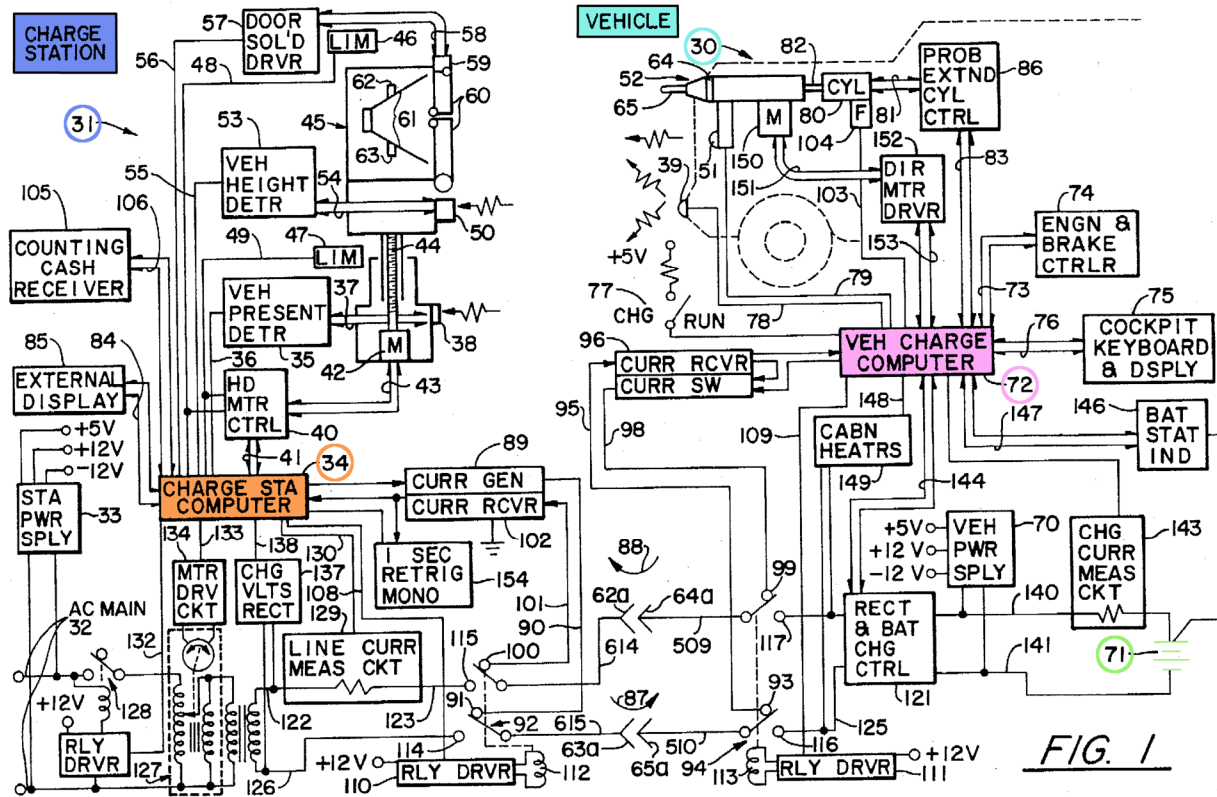
15[B] *a memory connected to the bus system, wherein the memory includes a computer usable program code; and*

15[C] *a processing unit connected to the bus system, wherein the processing unit executes the computer usable program code to*
15[D] *monitor a set of operational parameters of a charging process during the flow of electricity for one or more interruptions in response to receiving, from an energy transaction execution engine, a request signaling a start of the charging process; 15[E] detect the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions,*
15[F] *wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data services interruption; and 15[G] send a response to the energy transaction execution engine to terminate the charging process in response to detecting the one or more interruptions.*

a. 15[P]

235. If the preamble is limiting, it is my opinion that Keith discloses it. Keith illustrates a “schematic block diagram of [an] **apparatus**.” Ex-1005, 3:60-61.

This apparatus includes a charge station 31 (purple) with a charge station computer 34 (orange) for charging the battery 71 (green) of an electric vehicle 30 (turquoise) with a vehicle charge computer 72 (pink). *Id.*, 4:65-5:10.



Ex-1005, Fig. 1.

236. Therefore, in my opinion, Keith discloses *an apparatus* (e.g., the apparatus including the charge station 31).

b. 15[A]-[C]

237. Features 15[A]-[C] recite *a bus system; a memory connected to the bus system, wherein the memory includes a computer usable program code; and a processing unit connected to the bus system*. Aside from the fact that limitations [A]-[C] simply include well-known components of a computer, Keith discloses this.

238. The '391 Patent states that its bus system “may be implemented using any

suitable type of architecture that provides for a transfer of data between different components or devices attached to the bus system.” Ex-1001, 6:51-54. Keith includes architecture that provides for data transfers between charge station computer 34 and vehicle charge computer 72 using an RS232 UART (Universal Asynchronous Receiver/Transmitter) circuit that involves contacts 62-65. Ex-1005, 6:31-36. Moreover, Keith indicates that the controllers 14 and 24 execute computer usable program code stored in a memory, as discussed for Claim 8. Further, the computers in Keith form a processing unit (or one or more processing units) as those computers execute (process instructions for) respective computer programs on the vehicle or charger side of Keith’s apparatus. *See id.*

239. Therefore, in my opinion, Keith discloses *a bus system* (e.g., the RS232 UART system and the contacts 62-65); *a memory connected to the bus system, wherein the memory includes a computer usable program code; and a processing unit* (e.g., the charge station and vehicle charge computers 34 and 71) *connected to the bus system, wherein the processing unit executes the computer usable program code.*

c. 15[D]-[G]

240. In my opinion, Features 15[D]-[G] are substantively identical to 1[A]-[D], respectively, so these claims are disclosed by Keith for analogous reasons to those discussed above with respect to 1[A]-[D].

* * * *

241. As discussed above, Keith anticipates each and every limitation of Claim 15.

10. Claims 16 and 18-19

242. Claims 16 and 18-19 depend from Claim 15, which Keith anticipates for the reasons I discussed above. Claims 16 and 18-19 are analogous to Claims 2, 4, and 7, respectively. Therefore, in my opinion, Keith anticipates Claims 16-19 for reasons analogous to those discussed above with respect to Claims 2, 4, and 7.

11. Claim 20

243. In my opinion, Claim 20 is rendered obvious by Kimura. Claim 20 of the '391 Patent includes the following features, each of which I address in my analysis below:

20[P] *A system for managing a charging process of an electric vehicle, the system comprising:*

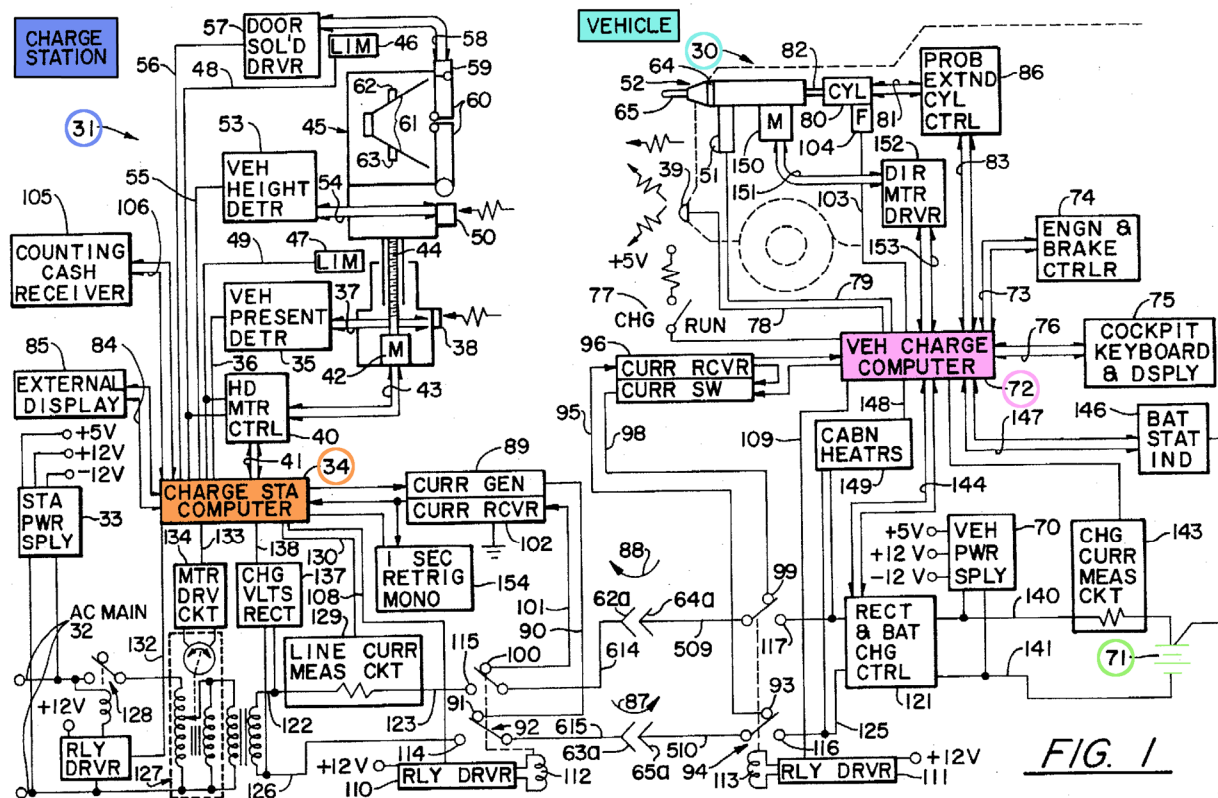
20[A] *an energy transaction execution engine, wherein the energy transaction execution engine executes the charging process;*

20[B] *an energy transaction interrupt monitor, 20[C] wherein the energy transaction interrupt monitor monitors a set of operational parameters of the charging process during the flow of electricity for one or more interruptions in response to receiving, from the energy transaction execution engine, a request signaling a start of the charging process; 20[D] detects the one or more interruptions during the flow of electricity from the set of operational parameters which conform to a set of predefined interrupt conditions, 20[E] wherein the one or more interruptions comprise at least one of a device capabilities interruption, a preference interruption, and a data services interruption; and 20[F] sends a response to the energy*

transaction execution engine to terminate the charging process in response to detecting the one or more interruptions.

a. 20[P]

244. If the preamble is limiting, it is my opinion that Keith discloses it. Keith's apparatus includes components associated with the vehicle 30 (turquoise) and with the charge station 31 (purple), and the components of either side of the system (e.g., the respective computers 72 and 34) are collectively used to manage Keith's charging process.



Ex-1005, Fig. 1.

245. Therefore, in my opinion, Keith discloses *a system* (e.g., including the vehicle 30 and its vehicle charge computer 72, as well as the charge station 31 and

its charge station computer 34) *for managing a charging process of an electric vehicle* (e.g., the vehicle 30).

b. 20[A]

246. Feature 20[A] recites *an energy transaction execution engine, wherein the energy transaction execution engine executes the charging process*. As explained above, Keith's *energy transaction execution engine* is the charge station computer 34 (or parts thereof) or the electric vehicle computer program (or parts thereof).

c. 20[B]-[F]

247. Features 20[B]-[F] recite *an energy transaction interrupt monitor, wherein the energy transaction interrupt monitor ... performs the operations of 1[A]-[D]*. Keith discloses an energy transaction interrupt monitor in its vehicle charge computer 72 and its charge station computer (or portions of either of the computers 34 and 72), both of which monitor Keith's charging process for interruptions, as explained above.

248. Therefore, in my opinion, Keith discloses *an energy transaction interrupt monitor* (e.g., parts of the vehicle charge computer 72 or parts of the charge station computer 34).

* * * *

249. As discussed above, Keith anticipates each and every limitation of Claim 20.

E. My Opinions as to the Obviousness of Claims 3 and 8-19 in View of Keith Alone

1. Claim 3

250. Claim 3 depends on Claim 1, which Keith anticipates for the reasons discussed above. Claim 3 adds *storing the set of operational parameters in a storage device*. Despite the trivial detail of this claim, Keith teaches or implies this.

251. Keith describes monitoring various operational parameters at both the vehicle charge computer 72, as well as at the charge station computer 34, as I discussed above. For instance, Keith notes that the vehicle charge computer 72 measures parameters including battery temperature, current, voltage, the amount of energy transferred to the battery 71, and the cost of said energy. Ex-1005, 23:57-62. With regard to the latter two parameters, Keith explicitly states that the vehicle charge computer 72 “stores the kilowatt hours [i.e., energy] and cost.” *Id.*, 23:57-62.

252. Although Keith does not appear to disclose using these two parameters at the vehicle charge computer 72 for interruption detection, Keith does describe detecting interrupts at the charge station computer 34 based on the cost of the charge. *Id.*, 22:27-29, 21:4-6. In the event the Board determines that anticipation of Claim 3 requires *storing the set of operational parameters in a storage device* of the same device performing the monitoring and detection operations, it is my

opinion that it would have been obvious to perform Keith's storing the cost of the charging process and detecting an interruption with respect to the cost of the charging process at the same device (e.g., at the vehicle charge computer 72 or the charge station computer 34).

253. Additionally, Keith describes displaying the current or the voltage via a display 75 on the vehicle 30 if they ever are out of bounds, thereby informing the operator of the issue as well as the value of the current or the voltage. *Id.*, 23:63-65 and 24:1-7. A POSA would have understood displaying these operational parameters as requiring the storage thereof, or would have obviously implemented such a technique.

254. Therefore, in my opinion, Keith teaches or implies *storing the set of operational parameters* [e.g., the amount of energy transferred to the battery, the cost of the energy, the current, or the voltage] *in a storage device* [e.g., memory of the vehicle charge computer 72].

2. Claim 8

255. Features 8[A] and 8[F] recite a *storage medium* that stores instructions for operations described in 8[B]-[E]. For the reasons discussed above, I maintain that Keith discloses these features. Notwithstanding, it is my opinion that the former features are rendered obvious by Keith alone, which teaches computers 34 and 72 that execute, respectively, a “charge station computer program” and a “vehicle

charge computer program.” Ex-1005, 17:41-49, 18:45-47, and 18:45-47; *cf. id.*, Figs. 11 and 12 (illustrating portions of the charge station and vehicle charge computer programs, respectively).

256. I believe that, to a POSA, the execution Keith’s program instructions would have required their storage by some mechanism as a necessary prerequisite.

257. Moreover, as noted above with respect to Kimura, the conclusions regarding the added features of Claim 8, discussed above are entirely consistent with the ’391 Patent itself, which indicates that these aspects are left to the common knowledge of a POSA and are not at all inventive (in fact, they are completely routine and conventional). Ex-1001, 3:33-37 and 15:66-16:3.

3. Claims 9-14

258. Claims 9-14 depend from Claim 8, which Keith anticipates or at least renders obvious as discussed above. Claims 9-14 are analogous to Claims 2-7, respectively. Therefore, in my opinion, Keith renders Claims 9-14 obvious for the reasons discussed above with respect to Claims 2-7.

4. Claim 15

259. Features 15[A]-[C] recite a bus system, a memory including computer usable program code, and a processing unit. These common features of a computer are disclosed in full detail and rendered obvious by Keith alone. Keith describes an RS232 UART system that includes contacts 62-65 (Ex-1005, 6:31-36), a

memory for storing instructions associated with the aforementioned computer programs, and computers 34 and 72 configured to execute control programs with functionality corresponding to Features [D]-[G] (*see id.*).

260. A POSA would have been motivated by these teachings to recognize contacts 62-65 as a type of bus or components of a bus system, the memory as a memory including computer usable program code, and the computers as a processing unit. This is consistent with the '391 Patent, which states that its bus system “may be implemented using any suitable type of architecture that provides for a transfer of data between different components or devices attached to the bus system.” Ex-1001, 6:51-54. This is consistent with common knowledge in the art, where computer programs were stored in memory and executed by processing units such as the computers of Keith.

261. Moreover, as noted above with respect to Kimura, the conclusions regarding the added features of Claim 15, discussed above, are entirely consistent with the '391 Patent itself, which indicates that these aspects are left to the common knowledge of a POSA and are not at all inventive (in fact, they are completely routine and conventional). Ex-1001, 3:33-37 and 15:66-16:3.

5. Claims 16-19

262. Claims 16-19 depend from Claim 15, which Keith renders obvious for the reasons I discussed above. Claims 16-19 are analogous to Claims 2-4 and 7,

respectively. Therefore, in my opinion, Keith renders Claims 16-19 obvious for the reasons I discussed above with respect to Claims 2-4 and 7.

F. My Opinions as to the Obviousness of Claims 6 and 13 in View of Keith and Nor

1. Motivation to Combine Keith and Nor

263. As a threshold matter, Keith and Nor qualify as analogous art to the '391 Patent because they share the same field of endeavor with the '391 Patent, namely the field of charging processes for electric vehicles. Ex-1001, 1:8-14 (mentioning “managing electric vehicle charging transactions”); Ex-1005, 1:8-11 (mentioning “electric vehicles which are operated with a battery and charging stations”); Ex-1006, 1:7-14 (mentioning “apparatus[es] and methods for providing fast recharging of electric vehicle batteries”).

264. It is my opinion that Keith and Nor are reasonably pertinent to at least one problem allegedly solved by the '391 Patent. The '391 Patent, Keith, and Nor are each concerned with ensuring that an electric vehicle charging process is executed safely and accountably. Ex-1001, 9:8-21 (describing an energy transaction execution engine “monitor[ing] and log[ging] the health and safety of charging process 318”); Ex-1005, 2:10-35 (indicating the invention is directed to “safety for operators” and describing “isolat[ing] the battery ... if the voltage is excessive”); Ex-1006, 9:29-61 (describing various determinations for terminating the charging process following events that could render it unsafe).

265. Additionally, for at least the two reasons detailed below, there was ample motivation for a POSA to modify Keith based on Nor's teachings.

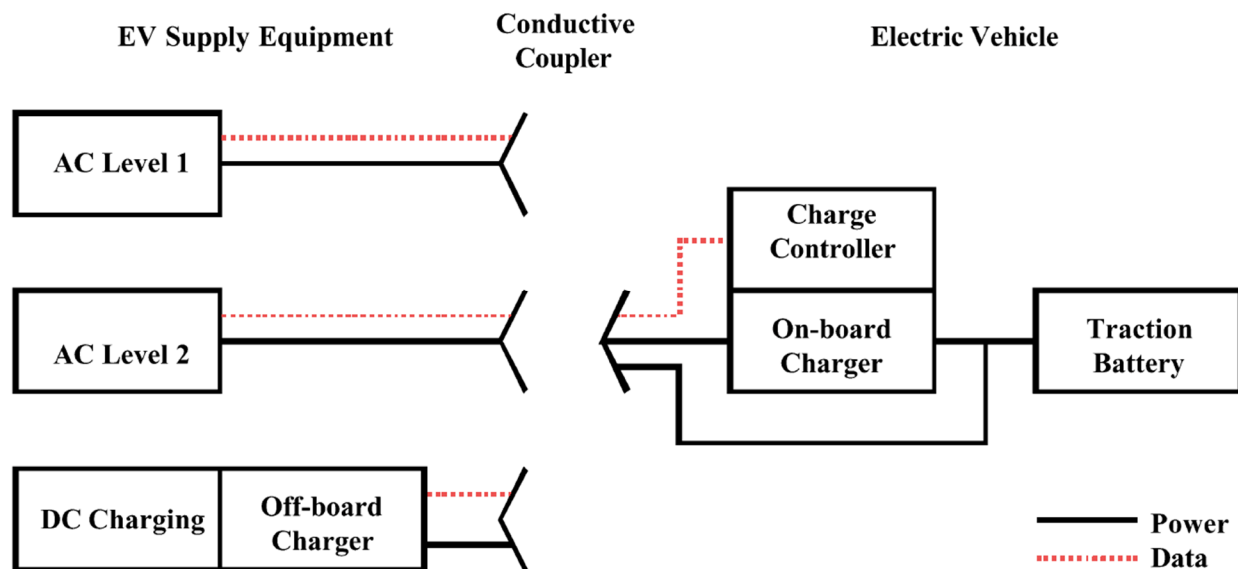
266. First, Keith describes various other implementation possibilities for its "communications and exchanges," and specifically indicates that "the communications may be had via a media different from the charging power transfer (current) medium (herein, both media are the probe-receptable connection)." Ex-1005 at 20:49-56. Therefore, in my opinion, while Keith's primary embodiment discusses an arrangement in which a communication transaction occurs before charging is initiated, Keith expressly motivates a POSA to explore different options.

267. This express motivation would have naturally led a POSA to consult analogous references (like Nor) to learn more about other ways to implement Keith's communications and exchanges. In Nor, a POSA would have found that it prescribes "a pair of wires 90" for carrying charging current and also a separate "data communication means 92." Ex-1006 at 10:1-13. Synergies between Keith's express instructions and Nor's teachings would have immediately been recognized as the data communication link types taught in Nor align with the other communication media mentioned by Keith. *Compare* Ex-1005 at 20:49-53 and Ex-1006 at 10:6-11. This express motivation and the immediately-apparent synergies would have led a POSA to integrate Nor's separate communication

means with Keith's system.

268. Second, modifying Keith to include a separate data communication means would have been obvious to try (utilizing the same or a different medium for power and data exchanges), and/or was a simple substitution of one known technique (use of same media for power and data exchanges, as in Keith) for another technique (separate to use different media, as in Nor) to achieve predictable results (exchanging power and data between two sides of a charging system).

269. Well-known published standards that long predated the '391 Patent filing (e.g., SAE J1772) also prescribed the use of a separate data/communication pathway (diagram from the SAE specification shown below with red dotted lines).



Ex-1011, Fig. 1.

270. This confirms the existence of the motivations discussed above as remaining

standards compliant also would have guided a POSA to the use of a separate data/communication pathway in Keith, as taught by Nor. And, given the inclusion of this in J1772, a POSA reasonably would have expected to be able to build a working system with a separate communication pathway. *See, e.g.*, EX-1011, 5 and 11.

271. Nor shows in its figures various means to create separate data communication means, so following this and applying ordinary skills, a POSA would have reasonably expected to succeed in adding a separate data communication means to Keith.

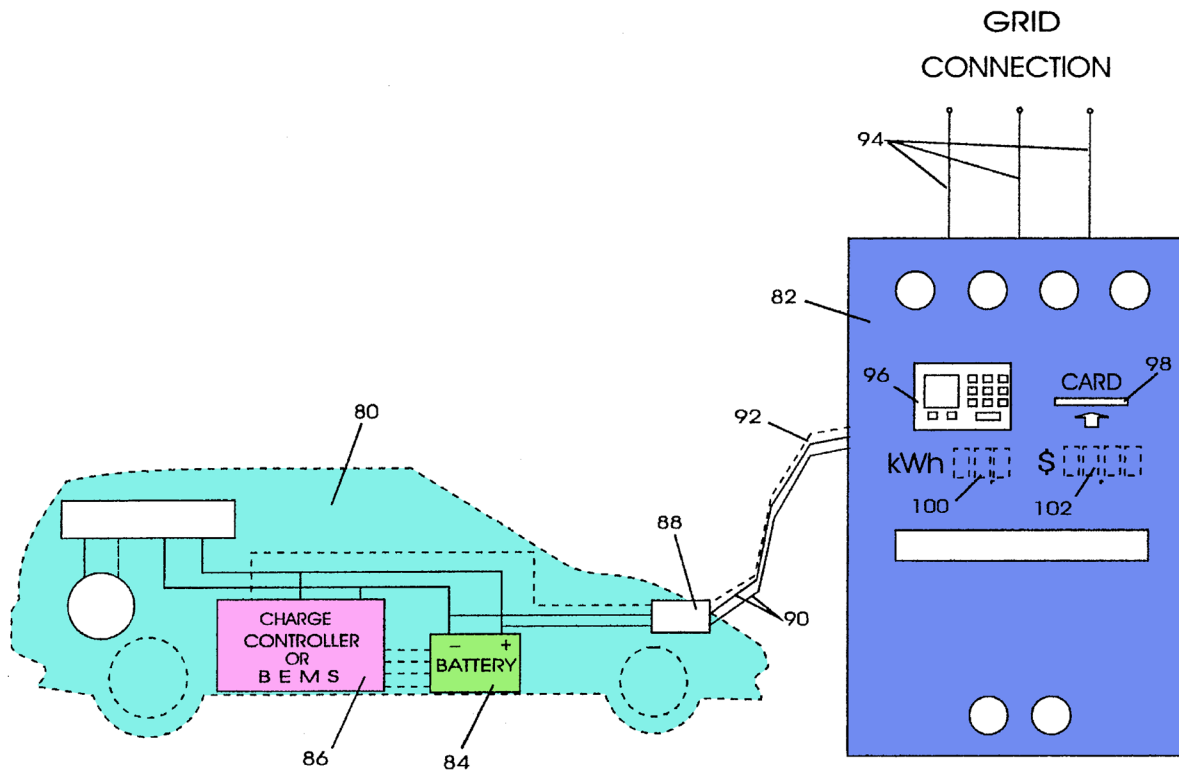
2. Claim 6

272. Claim 6 depends on Claim 1, which Keith anticipates as discussed above, and Keith-Nor retains those aspects of Keith relied on against Claim 1. Claim 6 adds *wherein the one or more interruptions is the data services interruption, and the data services interruption originates from a failure in data transmission*. Nor discloses this.

273. In Nor, it is my opinion that a data services interruption occurs when the battery charge controller 86 (pink) of the electric vehicle 80 (turquoise) fails to communicate with the charging station 82 (purple). Ex-1006, 4:52-63. Nor explains that the charging operation is terminated if the battery charge controller 86 and the power station 82 fail to communicate for a certain amount of time (e.g.,

4-6 seconds). *Id.*, 4:57-63.

274. This clearly constitutes a data services interruption because it causes termination of the charging process based on the inability of the charging station 82 to exchange data with the charge controller 86 of the vehicle 80. *Id.*



Ex-1006, Fig. 2.

275. In adding the separate data communication means of Nor to Keith, a POSA also would have followed Nor's teachings and used that separate data communication means to convey Keith's operational parameters using Nor's separate data communication means (and the timeout periods taught by Nor).

276. Therefore, in my opinion, Keith in view of Nor render obvious *wherein the*

one or more interruptions is the data services interruption, and the data services interruption originates from a failure in data transmission (i.e., the failure of the battery charge controller to communicate with the power station 82).

3. Claim 13

277. Claim 13 depends on Claim 8, which Keith anticipates as discussed above, and Keith-Nor retains those aspects of Keith relied upon for Claim 8. In my opinion, Claim 13 is analogous to Claim 6 and thus is rendered obvious by Keith-Nor for the reasons I discussed above with respect to Claim 6.

XII. CONCLUDING STATEMENTS

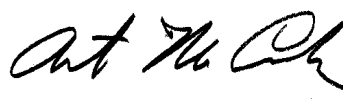
278. In my opinion, (1) Claims 1, 4-8, 11-15, and 18-20 are rendered obvious by Kimura alone; (2) Claims 2, 5, 9, 12, 16 are rendered obvious by Kimura in view of Hotta; (3) Claims 3, 10, and 17 are rendered obvious by Kimura in view of King; (4) Claims 1, 2, 4-9, 11-16, and 18-20 are anticipated by Keith; (5) Claims 3 and 8-19 are rendered obvious by Keith alone; and (6) Claims 6 and 13 are rendered obvious by Keith in view of Nor.

279. I hereby declare that all statements made herein of my own knowledge are true and that all statements made based upon information and provided by counsel are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code

and that such willful false statements may jeopardize the results of these proceedings.

Dated: January 31, 2024

Respectfully submitted,

A handwritten signature in black ink, appearing to read "C. Arthur MacCarley". The signature is fluid and cursive, with a prominent "C" and "A".

C. Arthur MacCarley, Ph.D., P.E.