

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner

v.

CHARGELOGIC LLC,
Patent Owner

Inter Partes Review Case No. IPR2026-00379
U.S. Patent No. 11,508,996

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,508,996**

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
II.	THE '996 PATENT.....	1
A.	SUMMARY.....	1
B.	PRIORITY.....	2
C.	LEVEL OF SKILL	2
III.	REQUIREMENTS UNDER 37 C.F.R. §42.104	2
A.	GROUND FOR STANDING UNDER 37 C.F.R. §42.104(A)	2
B.	IDENTIFICATION OF CHALLENGE UNDER 37 C.F.R. §42.104(B)	2
C.	CLAIM CONSTRUCTION UNDER 37 C.F.R. §42.104(B)(3).....	3
IV.	SHOWING OF ANALOGOUS ART	4
V.	GROUND 1: CLAIM 1 IS OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, AND YOKOTA	6
A.	OVERVIEW OF THE COMBINATION.....	6
B.	CLAIM 1	7
1.	<i>Claim 1[Pre]: “A vehicle alignment system for an inductive vehicular battery charger having a first core movable with respect to a second core to charge a battery of a vehicle, the vehicle alignment system comprising:”</i>	<i>7</i>
2.	<i>Claim 1[a]: “a controller; and”</i>	<i>11</i>
a)	Izuno’s Controller	11
3.	<i>Claim 1[b]: “a display mounted within the vehicle, oriented for view by a user seated in the vehicle, and coupled to the controller;”</i>	<i>13</i>
a)	'996 Patent’s Display	13
b)	Izuno’s Display	13
c)	Canedy’s Display	15
d)	Motivation to Combine Izuno and Canedy	16
4.	<i>Claim 1[c]: “wherein the controller is configured to:”</i>	<i>18</i>

5.	<i>Claim 1[c][i]: “detect a first positional relationship between the first core and the second core at a first time,”</i>	18
a)	Overview of Izuno-Minoshima	19
b)	Minoshima’s First Positional Relationship	20
c)	Motivation to Combine Izuno and Minoshima	24
d)	Canedy’s Microprocessor and Sensors	28
e)	Motivation to Modify Izuno-Minoshima-Canedy	31
6.	<i>Claim 1[c][ii]: “detect a misalignment of the first core with respect to the second core based at least in part on the first positional relationship between the fir[st] core and the second core,”</i>	33
a)	Minoshima’s Detecting Misalignment	34
b)	Motivation to Combine Izuno and Minoshima	36
7.	<i>Claim 1[c][iii]: “in response to detecting the misalignment, disable at least one user control on the display usable to control the inductive charging of the battery,”</i>	38
a)	Minoshima’s Detecting Misalignment	40
b)	Yokota’s Disabling User Control on a Display	40
c)	Motivation to Combine Izuno-Minoshima-Canedy-Yokota	41
8.	<i>Claim 1[c][iv]: “detect a second positional relationship between the first core and the second core at a second time occurring after movement of the vehicle,”</i>	43
a)	Minoshima’s Second Positional Relationship	44
b)	Motivation to Combine Izuno-Minoshima	47
c)	Canedy’s Microprocessor and Sensors	48
d)	Motivation to Combine Izuno-Minoshima-Canedy	48
9.	<i>Claim 1[c][v]: “detect an alignment of the first core with respect to the second core within a threshold based at least in part on the second positional relationship between the first core and the second core,”</i>	48

a)	'996 Patent's Threshold	49
b)	Minoshima's Detecting Alignment Within a Threshold.....	49
c)	Motivation to Combine Izuno-Minoshima-Canedy	51
10.	<i>Claim 1[c][vi]: "in response to detecting the alignment, enable the user control on the display, and"</i>	52
a)	Yokota's Enabling User Control on a Display	53
b)	Motivation to Combine Izuno-Minoshima-Canedy-Yokota	56
11.	<i>Claim 1[c][vii]: "in response to receiving a selection of the user control, initiate inductive charging via the first core and the second core."</i>	58
VI.	GROUND 2: CLAIMS 7, 12-20 ARE OBVIOUS OVER IZUNO, MINOSHIMA, AND YOKOTA	59
A.	CLAIM 7	59
1.	<i>Claim 7[Pre]: "A method of charging a battery of a vehicle, the method comprising:"</i>	59
2.	<i>Claim 7[a]: "detecting a positional relationship between a first core on the vehicle and a second core in a location exterior to the vehicle, the first and second cores enabling induction charging of the battery when sufficiently aligned with respect to one another;"</i>	60
3.	<i>Claim 7[b]: "detecting a misalignment of the first core with respect to the second core based at least in part on the positional relationship between the first core and the second core; and"</i>	60
4.	<i>Claim 7[c]: "in response detecting the misalignment of the first core with respect to the second core, disabling a user control displayed on a display for controlling the induction charging of the battery."</i>	60
B.	CLAIM 12	60
1.	<i>Claim 12[Pre]: "The method of claim 7, wherein the positional relationship is a first positional relationship and further comprising:"</i>	60

2.	<i>Claim 12[a]: “detecting a second positional relationship between the first core on the vehicle and the second core after detecting the first positional relationship,”</i>	60
3.	<i>Claim 12[b]: “detecting an alignment of the first core with respect to the second core based within a predetermined threshold at least in part on the second positional relationship, and”</i>	61
4.	<i>Claim 12[c]: “in response detecting the alignment misalignment of the first core with respect to the second core, enabling the user control.”</i>	61
C.	CLAIM 13: “THE METHOD OF CLAIM 12, FURTHER COMPRISING, IN RESPONSE TO RECEIVING A SELECTION OF THE USER CONTROL, INITIATING INDUCTION CHARGING VIA THE FIRST CORE AND THE SECOND CORE.”	61
D.	CLAIM 14: “THE METHOD OF CLAIM 7, WHEREIN THE DISPLAY IS MOUNTED WITHIN THE VEHICLE.”	61
E.	CLAIM 15	61
1.	<i>Claim 15[Pre]: “A method of charging a battery of a vehicle, the method comprising:”</i>	61
2.	<i>Claim 15[a]: “detecting a positional relationship between a first core on the vehicle and a second core in a location exterior to the vehicle, the first and second cores enabling induction charging of the battery when sufficiently aligned with respect to one another;”</i>	62
3.	<i>Claim 15[b]: “detecting an alignment of the first core with respect to the second core within a predetermined threshold based at least in part on the positional relationship between the first core and the second core; and”</i>	62
4.	<i>Claim 15[c]: “in response detecting the alignment of the first core with respect to the second core, enabling a user control displayed on a display for controlling the induction charging of the battery.”</i>	62
F.	CLAIM 16	62

1.	<i>Claim 16[Pre]: “The method of claim 15, wherein the positional relationship is a first positional relationship and further comprising:”</i>	62
2.	<i>Claim 16[a]: “detecting a second positional relationship between the first core on the vehicle and the second core before detecting the second positional relationship;”</i>	62
3.	<i>Claim 16[b]: “detecting a misalignment of the first core with respect to the second core based at least in part on the second positional relationship between the first core and the second core; and”</i>	63
4.	<i>Claim 16[c]: “in response detecting the misalignment of the first core with respect to the second core, disabling the user control displayed on a display for controlling the induction charging of the battery.”</i>	63
G.	CLAIM 17: “THE METHOD OF CLAIM 16, FURTHER COMPRISING PROVIDING INFORMATION INDICATIVE OF THE SECOND POSITIONAL RELATIONSHIP TO A USER SEATED WITHIN THE VEHICLE.”	63
H.	CLAIM 18: “THE METHOD OF CLAIM 16, FURTHER COMPRISING PROVIDING INFORMATION INDICATIVE OF THE MISALIGNMENT TO A USER SEATED WITHIN THE VEHICLE.”	63
I.	CLAIM 19: “THE METHOD OF CLAIM 16, FURTHER COMPRISING PROVIDING INFORMATION INDICATIVE OF CHANGES OF POSITION OF THE VEHICLE WITH RESPECT TO THE SECOND CORE TO A USER SEATED WITHIN THE VEHICLE.”	63
J.	CLAIM 20: “THE METHOD OF CLAIM 15, FURTHER COMPRISING INITIATING INDUCTION CHARGING VIA THE FIRST CORE AND THE SECOND CORE IN RESPONSE TO RECEIVING A SELECTION OF THE USER CONTROL.”	64
VII.	GROUND 3: CLAIM 2 IS OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, YOKOTA, AND ROSS	64
A.	CLAIM 2: “THE VEHICLE ALIGNMENT SYSTEM OF CLAIM 1, WHEREIN THE SECOND CORE IS PART OF A PAD OVER WHICH THE FIRST CORE IS MOVABLE.”	64
1.	<i>’996 Patent’s Charging Pad</i>	64
2.	<i>Izuno’s Charging Pad</i>	64

3.	<i>Ross's Charging Pad</i>	65
4.	<i>Motivation to Combine Izuno-Minoshima-Canedy-Yokota-Ross</i>	67

VIII. GROUND 4: CLAIM 3 IS OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, YOKOTA, AND KUKI.....68

A.	CLAIM 3: THE VEHICLE ALIGNMENT SYSTEM OF CLAIM 1, WHEREIN THE CONTROLLER IS CONFIGURED TO DETECT THE FIRST POSITIONAL RELATIONSHIP BETWEEN THE FIRST CORE AND THE SECOND CORE BASED AT LEAST IN PART ON DETECTION OF A MAGNETIC FIELD.	68
1.	<i>Kuki's Magnetic Sensors</i>	69
2.	<i>Motivation to Combine Izuno-Minoshima-Canedy-Yokota-Kuki</i>	71

IX. GROUND 5: CLAIMS 4-6 ARE OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, YOKOTA, AND SHIMIZU.....73

A.	CLAIM 4: THE VEHICLE ALIGNMENT SYSTEM OF CLAIM 1, WHEREIN THE CONTROLLER IS FURTHER CONFIGURED TO, IN RESPONSE TO DETECTING THE MISALIGNMENT, GENERATE AN INDICATOR FOR DISPLAY ON THE DISPLAY, THE INDICATOR INDICATING A DIRECTION OF MOVEMENT OF THE VEHICLE FOR IMPROVED ALIGNMENT OF THE FIRST CORE WITH RESPECT TO THE SECOND CORE.....	73
1.	<i>Minoshima's Indicator Generation</i>	73
2.	<i>Shimizu's Indicator Generation</i>	73
3.	<i>Motivation to Combine Izuno-Minoshima-Canedy-Yokota-Shimizu</i>	75
B.	CLAIM 5: THE VEHICLE ALIGNMENT SYSTEM OF CLAIM 4, WHEREIN THE INDICATOR COMPRISES AN ARROW INDICATING THE DIRECTION OF MOVEMENT.	78
C.	CLAIM 6: THE VEHICLE ALIGNMENT SYSTEM OF CLAIM 4, WHEREIN THE CONTROLLER IS CONFIGURED TO GENERATE THE INDICATOR IN A POSITION RELATIVE TO A GRAPHICAL REPRESENTATION OF AT LEAST PART OF THE VEHICLE DISPLAYED ON THE DISPLAY.	78

X.	GROUND 6: CLAIMS 8-10 ARE OBVIOUS OVER IZUNO, MINOSHIMA, YOKOTA, AND SHIMIZU	78
A.	CLAIM 8: “THE METHOD OF CLAIM 7, FURTHER COMPRISING, IN RESPONSE TO DETECTING THE MISALIGNMENT OF THE FIRST CORE WITH RESPECT TO THE SECOND CORE, GENERATING AN INDICATOR FOR DISPLAY ON THE DISPLAY, THE INDICATOR INDICATING A DIRECTION OF MOVEMENT OF THE VEHICLE FOR IMPROVED ALIGNMENT OF THE FIRST CORE WITH RESPECT TO THE SECOND CORE.”	78
B.	CLAIM 9: “THE METHOD OF CLAIM 8, WHEREIN THE INDICATOR COMPRISES AN ARROW INDICATING THE DIRECTION OF MOVEMENT.”	78
C.	CLAIM 10: “THE METHOD OF CLAIM 8, WHEREIN THE INDICATOR IS DISPLAYED IN A POSITION RELATIVE TO A GRAPHICAL REPRESENTATION OF AT LEAST PART OF THE VEHICLE DISPLAYED ON THE DISPLAY.”	78
XI.	GROUND 7: CLAIM 11 IS OBVIOUS OVER IZUNO, MINOSHIMA, YOKOTA, AND ROSS	79
A.	CLAIM 11: “THE METHOD OF CLAIM 7, WHEREIN THE SECOND CORE IS PART OF A PAD OVER WHICH THE FIRST CORE IS MOVABLE.”	79
XII.	CONCLUSION.....	79
XIII.	MANDATORY NOTICES UNDER 37 C.F.R. §42.8(A)(1)	80
A.	REAL PARTY-IN-INTEREST	80
B.	RELATED MATTERS	80
C.	LEAD AND BACK-UP COUNSEL	80
D.	37 C.F.R. § 42.8(B)(4) – SERVICE INFORMATION	81

TABLE OF AUTHORITIES

Cases

<i>Phillips v. AWH Corp.</i> , 415 F.3d 1303 (Fed. Cir. 2005) (<i>en banc</i>).....	3
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Regulations

37 C.F.R. § 42.100(b).....	3
37 C.F.R. § 42.104.....	2
37 C.F.R. § 42.104(a)	2
37 C.F.R. § 42.104(b).....	2
37 C.F.R. § 42.104(b)(3)	3
37 C.F.R. § 42.105.....	91
37 C.F.R. § 42.105(b).....	91
37 C.F.R. § 42.24.....	90
37 C.F.R. § 42.6(e)	91
37 C.F.R. § 42.8.....	90
37 C.F.R. § 42.8(a)(1)	80
37 C.F.R. § 42.8(b)(1)	80
37 C.F.R. § 42.8(b)(3)	80
37 C.F.R. § 42.8(b)(4)	80, 81

I. INTRODUCTION

Petitioner Tesla, Inc. (“Petitioner”) requests *inter partes* review (“IPR”) of Claims 1-20 (collectively, “Challenged Claims”) of U.S. Patent No. 11,508,996 (“the ’996 Patent”). The Challenged Claims broadly encompass well-known features for managing an electric vehicle’s battery charging. EX1001, Claims 1, 7, 15. Despite the breadth of the Challenged Claims, the application that issued as the ’996 Patent received a first action notice of allowance where the Examiner repeated claim language as the reason for allowance. EX1002, 309-311.

However, the claimed features are plainly encompassed by the prior art, and the Challenged Claims should be found obvious and unpatentable.

II. THE ’996 PATENT

A. Summary

The ’996 Patent is directed to an electrical charging system for charging electric vehicles, including performing alignment of cores (one in a vehicle, another in a charger) for inductively charging the vehicle’s battery. EX1001, generally 33:19-34:63. The vehicle includes a display and a controller that detects a positional relationship between the two cores including detecting misalignment/alignment of the cores. EX1001, 34:43-63. When core alignment is detected, the controller enables a user control on the display to charge the vehicle upon user selection. *Id.*

B. Priority

The '996 Patent claims priority to provisional application 61/189,353 filed August 18, 2008. EX1001, (63), (60). For purposes of this Petition only, Petitioner applies August 18, 2008 as the priority date for the Challenged Claims.

C. Level of Skill

A POSITA at the time of the '996 Patent would have had at least a bachelor's degree in electrical or mechanical engineering (or an equivalent field) and at least two years of work experience involving automotive systems, including electric vehicle battery charging systems. EX1003-Dec., ¶¶28-30. Additional industry experience or technical training may offset less formal education, while advanced degrees or additional formal education may offset lesser levels of industry experience. *Id.*

III. REQUIREMENTS UNDER 37 C.F.R. §42.104

A. Grounds for Standing Under 37 C.F.R. §42.104(a)

Petitioner certifies the '996 Patent is eligible for IPR.

B. Identification of Challenge Under 37 C.F.R. §42.104(b)

Petitioner requests the Challenged Claims be found unpatentable on the following grounds.

Proposed Grounds of Unpatentability of the '996 Patent	Exhibits
<u>Ground 1:</u> Claim 1 is obvious under §103(a) over Izuno, Minoshima, Canedy, and Yokota	EX1004-Izuno EX1005-Minoshima EX1006-Canedy EX1007-Yokota
<u>Ground 2:</u> Claims 7, 12-20 are obvious under §103(a) over Izuno, Minoshima, and Yokota	EX1004-Izuno EX1005-Minoshima EX1007-Yokota
<u>Ground 3:</u> Claim 2 is obvious under §103(a) in view of Izuno, Minoshima, Canedy, Yokota, and Ross	EX1004-Izuno EX1005-Minoshima EX1006-Canedy EX1007-Yokota EX1008-Ross
<u>Ground 4:</u> Claim 3 is obvious under §103(a) in view of Izuno, Minoshima, Canedy, Yokota, and Kuki	EX1004-Izuno EX1005-Minoshima EX1006-Canedy EX1007-Yokota EX1009-Kuki
<u>Ground 5:</u> Claims 4-6 are obvious under §103(a) in view of Izuno, Minoshima, Canedy, Yokota, and Shimizu	EX1004-Izuno EX1005-Minoshima EX1006-Canedy EX1007-Yokota EX1010-Shimizu
<u>Ground 6:</u> Claims 8-10 are obvious under §103(a) in view of Izuno, Minoshima, Yokota, and Shimizu	EX1004-Izuno EX1005-Minoshima EX1007-Yokota EX1010-Shimizu
<u>Ground 7:</u> Claim 11 is obvious under §103(a) in view of Izuno, Minoshima, Yokota, and Ross	EX1004-Izuno EX1005-Minoshima EX1007-Yokota EX1008-Ross

C. Claim Construction Under 37 C.F.R. §42.104(b)(3)

In this proceeding, claims are interpreted under the same standard applied by Article III courts. 37 C.F.R. §42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312

(Fed. Cir. 2005) (*en banc*). Petitioner applies the ordinary and customary meaning of all claim terms.

IV. SHOWING OF ANALOGOUS ART

The prior art is analogous to the claimed invention of the '996 Patent.

The prior art is from the same field of endeavor of the '996 Patent, namely electric vehicle battery charging systems. EX1001, Title, Abstract, 33:19-42; EX1004-Izuno, Title, Abstract, [0001], [0008]-[0012], [0018]-[0020], [0027]-[0039], Figs. 1-5; EX1005-Minoshima, Title, Abstract, [0001]-0008], [0016]-[0046], Figs. 1-5, 8; EX1008-Ross, Abstract, 1:5-12; 2:4-53; 3:31-51; 4:37-47; 13:47-14:21; 16:23-63; 17:13-18:27; Figs. 1-2, 4-7; EX1009-Kuki, Title, Abstract, 1:7-11; 1:44-6:44, 8:41-52, 11:29-49; 12:60-13:10; 15:42-16:40; 17:10-26; 23:14-25:22, Figs 1-47, 54-56; EX1003-Dec., ¶¶32-34.

The prior art is also reasonably pertinent to at least one problem facing the '996 Patent's inventors, namely at least one of:

(A) assisting a driver in parking a vehicle at a particular position, optionally including repositioning a vehicle. EX1001, 34:20-35:3; EX1004-Izuno, [0020], [0030], [0039]; EX1005-Minoshima, [0009], [0022], [0059], [0065], Figs. 1-3; EX1008-Ross, 6:12-23, 9:44-10:5, 12:33-62, 13:5-14, 15:56-16:12, 20:17-28, Fig. 7; EX1009-Kuki, Abstract, 4:24-61, 5:4-7, 8:64-9:3, 9:24-39, 10:49-60, 11:41-12:3, 13:3-10, 15:44-16:12, 16:41-57, 17:27-18:50, Figs. 1, 37-38, 49-51; EX1010-

Shimizu, Title, Abstract, 1:6-8, 1:36-4:23, 5:13-7:8, 9:34-13:43, Figs. 1, 5-21; EX1003-Dec., ¶36;

(B) using a controller/processor in a vehicle to perform processing operations. EX1001, 34:20-63; EX1004-Izuno, [0015], [0018], [0022], Fig. 2; EX1006-Canedy, 3:66-4:16, 4:34-51, 5:7-23 Fig. 2; EX1007-Yokota, [0060], [0069], [0072], [0075], [0083], Fig. 2; EX1008-Ross, Abstract, 11:50-12:32, 13:27-31, 14:22-40, Fig. 2; EX1010-Shimizu, 5:6-12, Fig. 1; EX1003-Dec., ¶37;

(C) enabling and disabling functions on a display based on various conditions. EX1001, 34:59-63; EX1007-Yokota, [0030], [0032]-[0034], [0052], [0063], [0071], [0084]-[0085]; EX1003-Dec., ¶38;

(D) notifying a user about information related to the vehicle using a vehicle display. EX1001, 34:20-63; EX1004-Izuno, [0014], [0025]; EX1005-Minoshima, [0053]-[0054], Fig. 7; EX1006-Canedy, 3:65-4:23, Fig. 2; EX1007-Yokota, [0030], [0032]-[0034], [0052], [0063], [0071], [0084]-[0085]; EX1008-Ross, 12:1-9, Fig. 2; EX1010-Shimizu, Abstract, 1:46-2:49, 3:45-59, 4:1-36, Figs. 1-2, 7-19; EX1003-Dec., ¶39;

(E) using a particular charging device such as a charging pad to charge an electric vehicle. EX1001, 33:19-34:19, 34:64-35:3; EX1008-Ross, 17:7-13, 17:40-51, 18:1-10; EX1003-Dec., ¶40; and/or

(F) using sensors to assist a user in parking a vehicle at a particular position.

EX1001, 33:48-34:28, 34:64-35:3; EX1005-Minoshima, Abstract, [0022], [0047], [0059], [0065], Figs. 1-3; EX1006-Canedy, 3:8-34, 4:34-5:6, Fig. 1; EX1009-Kuki, 10:19-34, 10:65-11:24, 12:39-51, Figs. 17, 21; EX1010-Shimizu, 5:6-140, 6:35-40, 7:10-14, 7:48-8:23, Figs. 1-2; EX1003-Dec., ¶41.

V. GROUND 1: CLAIM 1 IS OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, AND YOKOTA

A. Overview of the Combination

Izuno alone teaches an electric vehicle, aligning charging coils (one in the vehicle and another connected to a charging station) to charge the vehicle's battery, and a user initiating charging by selecting a user control on a vehicle display. Izuno teaches allowing charging when the cores are aligned and disallowing charging when the cores are misaligned.

As to the additional recited limitations, such concepts were well known in the prior art, and it would have been obvious to incorporate these implementation details in Izuno, as detailed in the Grounds below. For example, Minoshima teaches using proximity sensors in an electric vehicle to detect alignment/misalignment based on a threshold and, if misaligned, providing feedback to a driver on a display for the driver to reposition the vehicle to enable inductive charging. Canedy teaches a vehicle with a microprocessor, display, and proximity sensors connected via a bus, where the microprocessor in the vehicle performs processing related to the proximity

sensors and display. And Yokota teaches a vehicle where certain functionalities are disabled and cannot be selected on a display (or executed) when certain conditions are not met. Conversely, when the conditions are met, the functionalities are enabled/selectable for a user on the display. This concept was simply an application of human-computer interaction/context-based menu programming principles that were well known in the prior art.

Thus, Minoshima, Canedy, and Yokota are merely included to provide well-known implementation details not expressly described in Izuno. Together, the Izuno-Minoshima-Canedy-Yokota combination renders Claim 1 obvious.

B. Claim 1

1. *Claim 1[Pre]: “A vehicle alignment system for an inductive vehicular battery charger having a first core movable with respect to a second core to charge a battery of a vehicle, the vehicle alignment system comprising:”*

To the extent the preamble is limiting, Izuno teaches an electric vehicle battery charging system comprising contactless charging using electromagnetic induction where two couplers (*first and second cores*)¹ are aligned to charge a vehicle’s

¹ Claim language provided in italics. All drawing annotations and emphases added unless otherwise noted. Citations to a claim limitation (e.g., Claim 1[a]) and/or section number are to the limitations mapping such claim limitation in this Petition

battery. Izuno's system and method includes vehicle system 10 of the electric vehicle including a *first core*, charging station 60 including a *second core* located in a parking space for transferring energy to the *first core* in the vehicle, and service system server 100 for performing scheduling and other operations, all of which are coupled via a communication network. EX1004-Izuno, [0012], [0014], [0021]. Collectively, vehicle system 10, charging station 60, and service system server 100 are *an inductive vehicular battery charger*. EX1003-Dec., ¶112

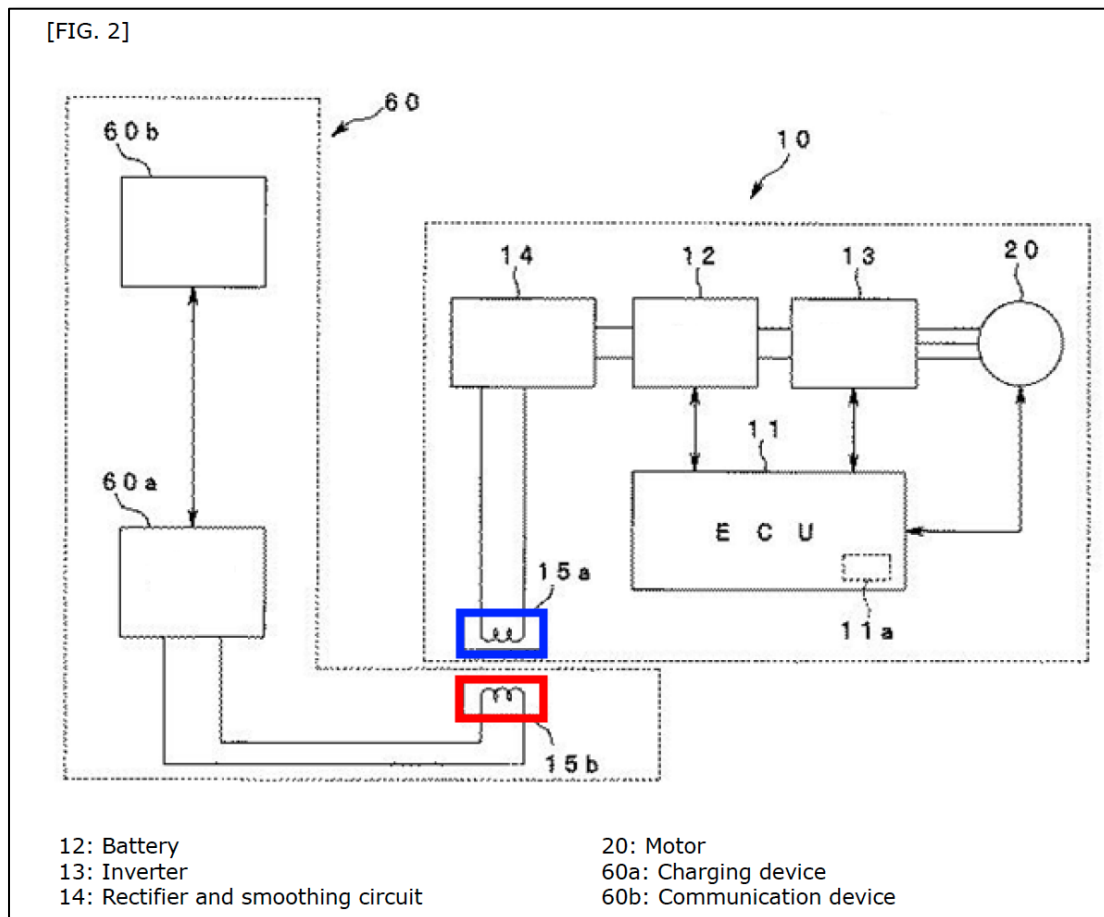
Izuno teaches vehicle system 10 includes charging coupler 15a (*first core*) arranged on the underside of a vehicle and coupler 15b (*second core*) installed in a parking space of charging station 60. EX1004-Izuno, [0015] (“charging coupler 15b in the charging station 60”), [0019]-[0020] (“Charging unit 60a first converts the commercial AC power...into DC power, then...converts it into high-frequency AC power to charge the vehicle battery 12 via the charging coupler 15b ... and the vehicle charging coupler 15a.”), [0037] (“charging of the vehicle battery 12 begins by contact-free electromagnetic induction via the charging coupler 15b ... and the vehicle charging coupler 15a.”).

and are incorporated by reference, including the motivations to combine (MTC) and showing of reasonable expectation of success (REOS) provided in the cross-referenced section. All REOS include the benefits described for the respective MTC.

Izuno teaches inductive charging of the vehicle battery is enabled only after the vehicle is parked in a predetermined position in a charging space and charging coupler 15a of vehicle 1 is “positioned opposite” charging coupler 15b. EX1004-Izuno, [0019]-[0020] (“When a vehicle with a charging coupler 15a mounted on its underside is parked in a predetermined charging parking space at a charging station 60, the vehicle charging coupler 15a and the charging coupler 15b located in the charging parking space are positioned opposite each other, enabling contact-free charging of the battery 12 via electromagnetic induction.”), [0037] (“[T]he system checks whether the vehicle has been parked at the predetermined position in the charging parking space[.]”).

Because Izuno’s charging coupler 15a is installed on the vehicle while charging coupler 15b is in the parking space at charging station 60, charging coupler 15a (*first core*) is *movable with respect to* charging coupler 15b (*second core*) to facilitate charging when the vehicle is parked in a predetermined position (i.e., when the couplers are aligned). EX1004-Izuno, [0019]-[0020], [0012], [0030]. Conversely, Izuno teaches charging is not enabled “[i]f the vehicle is not parked in the predetermined position.” EX1004-Izuno, [0030]. Thus, Izuno teaches a *vehicle alignment system for an inductive vehicular battery charger*. EX1003-Dec., ¶¶115-117.

Fig. 2 below depicts **charging coupler 15a** (*first core*) arranged on the underside of a vehicle and **coupler 15b** (*second core*) installed in a parking space of charging station 60:



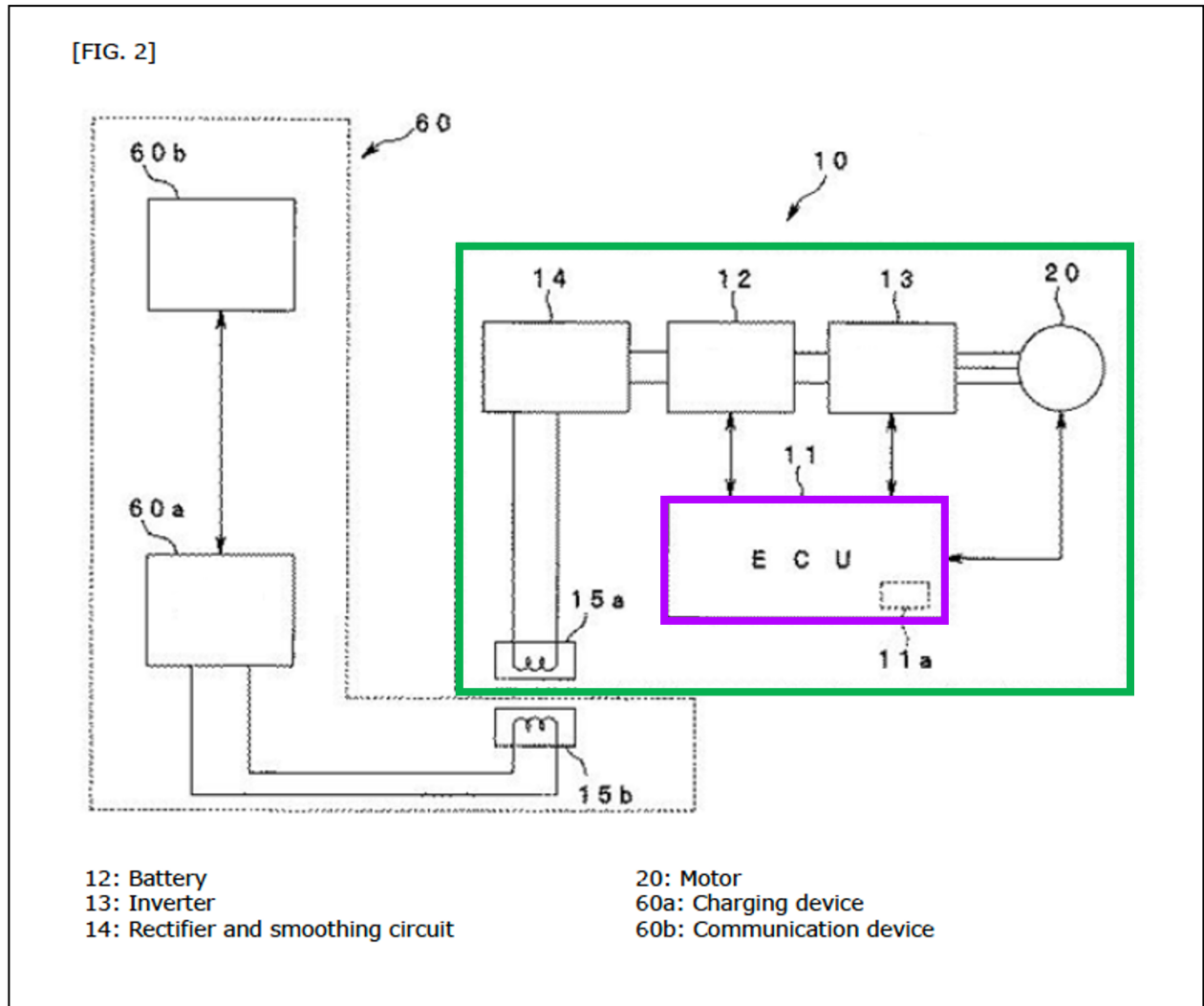
EX1004-Izuno, Fig. 2.

As described below, a POSITA would have found it obvious and been motivated to modify Izuno to utilize Minoshima's vehicle alignment technique including using proximity sensors to detect when a vehicle is parked correctly, thus ensuring Izuno's couplers 15a and 15b are properly aligned before initiating charging. EX1003-Dec., ¶117. See Claims 1(c)(i)-(ii), and (iv)-(v).

2. Claim 1[a]: “a controller; and”

a) Izuno’s Controller

Izuno teaches *a controller*. Izuno’s vehicle system 10 includes electronic control unit (ECU) 11 “which includes a microcomputer.” EX1004-Izuno, [0015]. ECU 11 “is a control device that primarily controls the motor 20 via the inverter 13 and manages the battery 12.” EX1004-Izuno, [0016]. Izuno teaches ECU 11 “oversees the entire system” and may be a single unit or multiple units “connected via a communication line, such as a CAN (Controller Area Network), to enable bidirectional communication, thereby allowing the units to exchange control information and sensing data related to the operational status of the controlled objects.” EX1004-Izuno, [0016]. Fig. 2 depicts ECU 11 of vehicle system 10 of the vehicle:



EX1004-Izuno, Fig. 2. A vehicular Electronic Control Unit (ECU) is a *controller* at least because the ECU controls various operations of the vehicle. EX1003-Dec., ¶118.

As mapped below, Izuno's ECU (*controller*) alone or as modified by Minoshima, Canedy, and/or Yokota is configured to perform the claimed functions. See Claim 1(c)(i)-1(c)(vii).

3. ***Claim 1[b]: “a display mounted within the vehicle, oriented for view by a user seated in the vehicle, and coupled to the controller;”***

a) ’996 Patent’s Display

The ’996 Patent describes a *display* as “an LCD display 32, although any other type of display can be used as desired.” EX1001, 8:18-20, 34:29-37 (describing a touchscreen or another display in a vehicle console).

b) Izuno’s Display

Izuno’s vehicle includes a *display mounted within the vehicle*. Izuno teaches communication terminal 50 may be “a display device or audio device installed in the vehicle system 10 of the user’s vehicle...allowing information from the service system server 100 to be automatically confirmed via display or audio.” EX1004-Izuno, [0014]. Communication terminal 50 installed in vehicle system 10 of vehicle is mapped as a *display* below. Izuno teaches “in this battery charging system, the vehicle system 10, the communication terminal 50, and the charging station 60 are all connected to the service system server 100 via a communication network.” EX1004-Izuno, [0012]. Further, Izuno teaches the user selects charging modes using communication terminal 50. EX1004-Izuno, [0027], [0014]. Thus, communication terminal 50 is a *display*. EX1003-Dec., ¶121.

Izuno’s display is *oriented for view by a user seated in the vehicle* including because communication terminal 50 (*display*) provides specific information to “users of electric vehicles[.]” EX1005-Izuno, [0005]. Examples of information

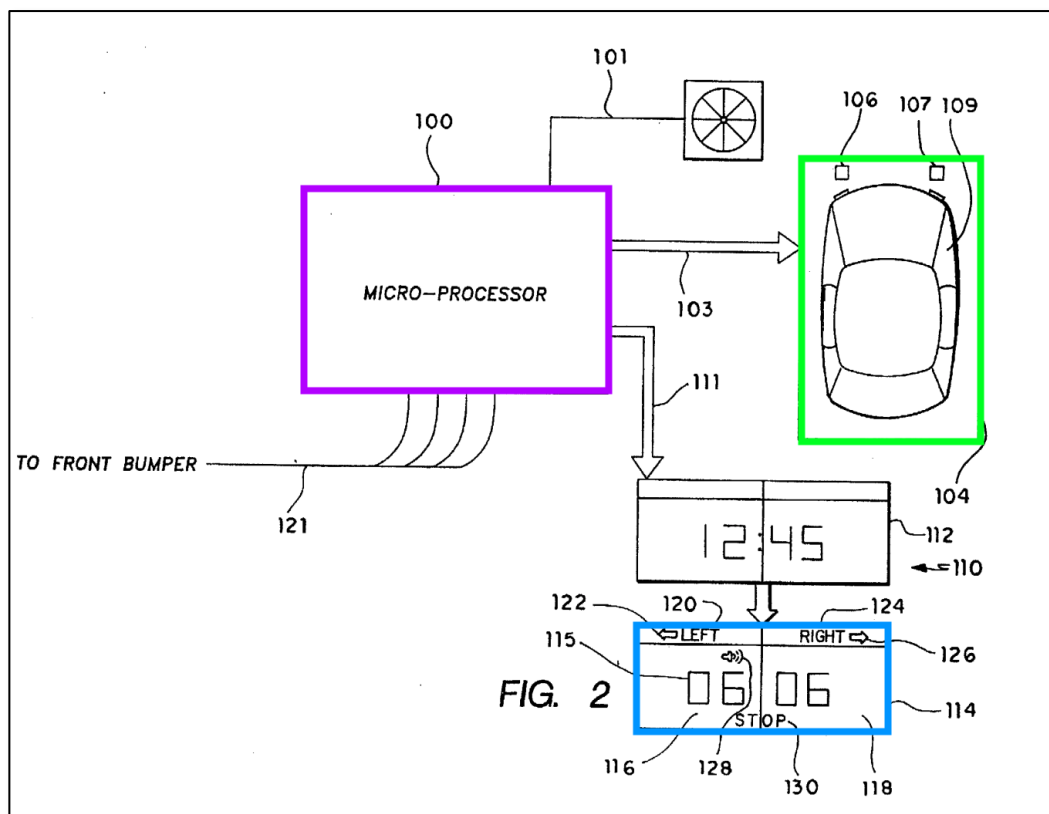
provided to a user via communication terminal 50 (*display*) include “battery charge level, charge status, time remaining until full charge, remaining capacity, and estimated driving range, and to confirm this information via display or audio output.” EX1004-Izuno, [0013]; EX1003-Dec., ¶122. Izuno’s information is *oriented for view by a user seated in the vehicle* because Izuno’s display is part of the vehicle and this information (e.g., driving range remaining, battery charge level) is pertinent to a user, particularly a driver, within the vehicle for viewing. EX1003-Dec., ¶122.

Izuno teaches the display is *coupled to the controller*. ECU 11 and communication terminal 50 are both part of vehicle system 10 of the user’s vehicle. EX1004-Izuno, [0014]-[0015]. ECU 11 may be “a single unit that oversees the entire system” of vehicle 1, including the vehicle display. EX1004-Izuno, [0017]; EX1003-Dec., ¶123. ECU 11 (*controller*) provides information to service system server 100 via communication module 11a in the vehicle including “battery status.” EX1004-Izuno, [0022], [0018] (“transmits battery information, such as the voltage and remaining capacity of the battery 12...to the service system server 100.”). Service system server 100 “calculates the amount of charge required to reach full charge, the charging time, and the estimated driving range both currently and after charging, and transmits this charging information to the user’s communication terminal 50 or the vehicle system 10.” EX1004-Izuno, [0022]. Thus, Izuno’s ECU 11 and display are

coupled such that the display presents information originally provided by ECU 11 via service system server 100. EX1003-Dec., ¶¶123-124.

c) Canedy's Display

To the extent it is argued Izuno's display is not explicitly *coupled to the controller* and/or not *oriented for view by a user seated in the vehicle*, Canedy teaches this. Canedy teaches "electronic circuitry" for a vehicle including microprocessor 100 and displays 104 and 112/114, which are electronically coupled via buses 103 and 111, respectively:



EX1006-Canedy, Fig. 2, 3:66-4:33, 2:63-65 ("FIG. 2 is a block diagram of the electronic circuitry of the present invention."). Display 104 includes lights 106/107

related to proximity sensors at the front of the vehicle that detect an object's proximity to the vehicle's front. EX1006-Canedy, 3:66-4:16. The sensor information is provided to the display from proximity sensors via microprocessor 100 and buses 121, 103, 111. EX1006-Canedy, 3:66-4:16, Fig. 2. Microprocessor 100 also controls display 114, which displays a distance to the detected object in inches based on data from proximity sensors. EX1006-Canedy, 4:24-33. Thus, the display is *coupled to* the microprocessor (*controller*). EX1003-Dec., ¶125.

Canedy's information on proximity of objects detected in front of a vehicle is presented to a user to aid the user when parking a vehicle. EX1006-Canedy, 2:15-31, 2:39-50, 3:66-4:33, 5:26-30. Thus, Canedy's display is *oriented for view by a user seated in the vehicle*. EX1003-Dec., ¶126.

d) Motivation to Combine Izuno and Canedy

A POSITA would have been motivated and found it obvious to modify Izuno's display to be coupled to ECU 11 to output information to the display to a user seated in the vehicle. EX1003-Dec., ¶¶127-129. This use of a known technique would have improved Izuno's vehicle in the same way as Canedy's vehicle. EX1003-Dec., ¶¶127-129. Canedy provides implementation details such as a bus coupling the display and controller, which a POSITA would have looked to when modifying Izuno. EX1003-Dec., ¶¶127-129. Coupling a controller such as Izuno's ECU to a display would have advantageously allowed the ECU to output information

for viewing by the user (e.g., related to charging, sensor data, proximity). EX1003-Dec., ¶¶127-129. Presenting such information to the user while seated in the vehicle would have assisted the user in parking the vehicle, thereby improving accuracy and efficiency of parking in a predetermined position. EX1003-Dec., ¶¶127-129. Combining these prior art elements according to known methods would have yielded the predictable results of a controller coupled to a display and a display oriented for view by a user seated in the vehicle. EX1003-Dec., ¶¶127-129.

A POSITA would have had a reasonable expectation of success when modifying Izuno. EX1003-Dec., ¶130. Connecting components in vehicles, such as a controller and display, via buses was well known in the prior art. EX1003-Dec., ¶130. To the extent a hardware modification would have been required, a POSITA would have known how to locate off-the-shelf vehicle components and would have known either how to install such components or locate a technician to perform the installation. EX1003-Dec., ¶130. Additionally, or alternatively, a POSITA would have simply selected from known, commercially available products, including circuitry such as Canedy's. EX1003-Dec., ¶130.

A POSITA would have had a reasonable expectation of success because orienting the display for a user seated in the vehicle was also known. EX1003-Dec., ¶131. Izuno already teaches a display. EX1003-Dec., ¶131. A POSITA looking to Canedy would have positioned the display in a manner visible to the user while

seated to advantageously provide information to the user to aid in positioning the vehicle correctly, allowing inductive charging. EX1003-Dec., ¶131.

4. Claim 1[c]: “wherein the controller is configured to:”

As mapped below, Izuno’s controller alone or as modified by Minoshima, Canedy, and/or Yokota is configured to perform the claimed functions. *See* Claims 1(c)(i)-1(c)(vii).

5. Claim 1[c][i]: “detect a first positional relationship between the first core and the second core at a first time,”

The ’996 Patent describes detecting the distance between vehicle sensors 1154 and reference points (sensed elements 1156) on the charging pad (or having known positions with respect to the charging pad) using methods “well-known to those skilled in the art.” EX1001, 34:1-9, 34:64-35:1, Fig. 18. As mapped below, Petitioner’s combination teaches *detecting a first positional relationship*.

Izuno teaches an ECU (*controller*) controls the charging of the battery in a contactless vehicle charging system. *See* Claim 1(a). Izuno teaches enabling charging when a vehicle is parked in a “predetermined position” in a parking space, such that the vehicle and charging couplers are “positioned opposite each other.” EX1004-Izuno, [0020], [0030], Fig. 2. Izuno-Minoshima teaches *detecting a first positional relationship between the first core and the second core at a first time*.

a) Overview of Izuno-Minoshima

Izuno teaches a stationary power transfer core located in a parking space. EX1004-Izuno, [0020], Fig. 2. Minoshima teaches a movable power transmitting coupler, attached to a ground-side charging device, that extends underneath the vehicle to enable contactless charging. EX1005-Minoshima, [0016], [0018], Figs. 1-2. Minoshima further teaches detecting a positional relationship between the vehicle-side coupler and ground-side coupler. EX1005-Minoshima, [0055]-[0057]. In the Izuno-Minoshima combination, the power transfer core is stationary as in Izuno's native arrangement, but Minoshima's teaching of using proximity detection sensors would have applied to Izuno for determining alignment of the first and second cores.

While Minoshima's setup allows more flexibility in the allowable position for "correctly" parking the vehicle compared to Izuno's native system, Izuno's setup is simpler, less expensive, and requires fewer moving parts to implement. EX1003-Dec., ¶¶137-138. Thus, Petitioner's combination implements Izuno's stationary power transfer core in the parking space but modifies Izuno's vehicle and method to include proximity sensors to assist the user in determining when the vehicle is correctly parked and assist in adjusting vehicle position when incorrectly parked (which inhibits or prevents charging), as taught by Minoshima. A POSITA would have recognized the combination would have been a tradeoff by choosing amongst

various advantages (e.g., Izuno's simplicity vs Minoshima's flexibility) and would have been simply a design choice. EX1003-Dec., ¶¶137-138.

b) Minoshima's First Positional Relationship

Minoshima teaches a contactless vehicle charging system comprises a power receiving coupler 3 provided on the front bottom surface of the electric vehicle 1 and a ground-level charging device 9 configured "so that a power transmitting coupler 10, which transmits power to a power receiving coupler 3, is mounted at the end of a support arm 11." EX1005-Minoshima, [0016], [0018], [0041]-[0044], [0061].

Minoshima teaches using proximity sensors to detect a position of the vehicle to determine if the parking orientation is correct to allow for charging to begin. EX1005-Minoshima, [0047]. Minoshima teaches two embodiments regarding the location of proximity sensors: one where proximity sensors are in ground-level charging device 9, and another where proximity sensors are on electric vehicle 1. EX1005-Minoshima, [0059] (teaching proximity sensors 17 ("detectors") are in the electric vehicle and detected component 16 is in ground-level charging station 9); EX1003-Dec., ¶¶140-143. Petitioner relies on Minoshima's embodiment where the proximity sensors are located within the electric vehicle, and the detected component is located in the ground-level charging station. EX1003-Dec., ¶¶140-143. In this manner, the Izuno-Canedy-Minoshima vehicle's *controller* (e.g., ECU 11) performs processing for positional relationships based on sensor data from proximity sensors

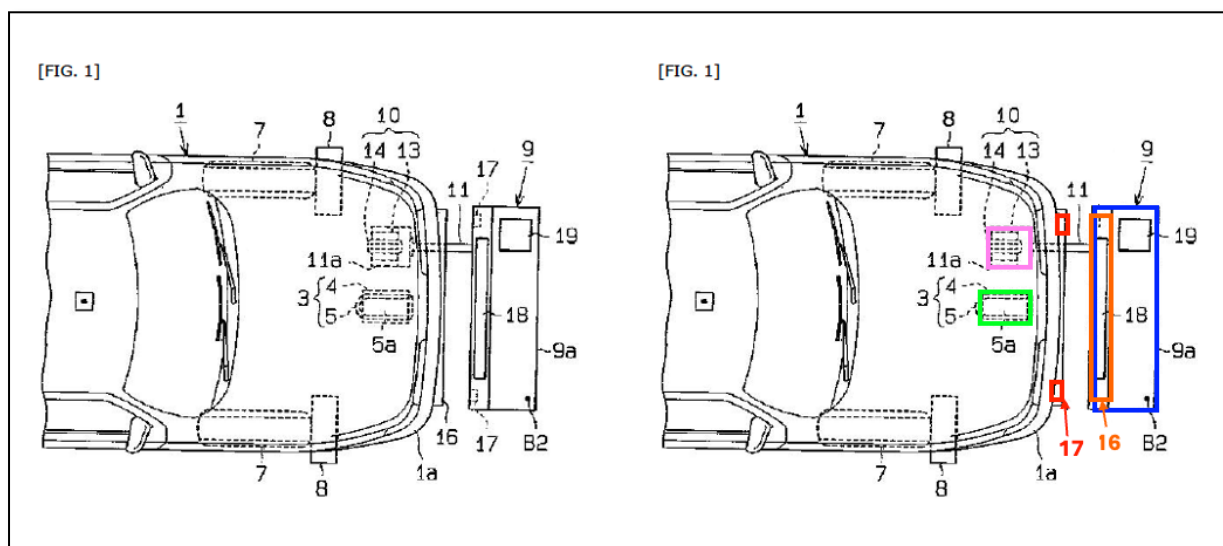
installed on the vehicle and provides feedback to the driver via a display, such as Izuno's display 50 and/or Minoshima's display 34, located within the Izuno-Canedy-Minoshima vehicle. EX1003-Dec., ¶¶140-143.

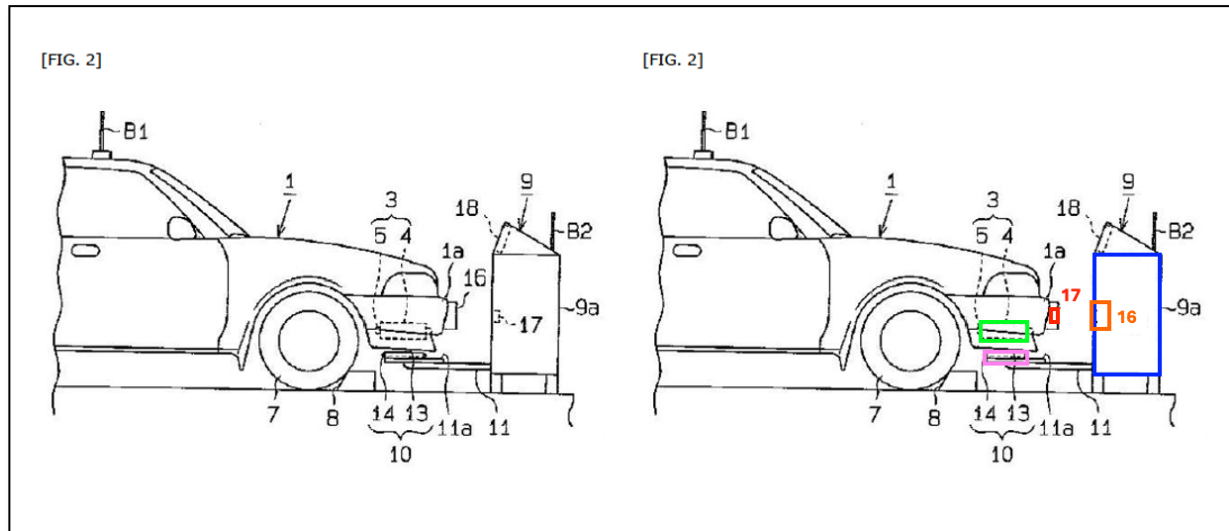
Minoshima teaches vehicle proximity sensors 17 detect the vehicle's deviation in the width and longitudinal directions relative to a predetermined distance from the ground-level charging device (*positional relationship*). EX1005-Minoshima, [0009], [0021]-[0024], [0039], [0047]-[0049], [0058] (“three or more detectors, such as proximity sensors, may be provided”), [0065] (“[T]he widthwise misalignment detecting means comprises at least two proximity sensors that detect when the vehicle has approached within a predetermined distance of a predetermined reference position, using two different locations on the vehicle as detection targets. As a result, the system can detect not only widthwise misalignment but also improper angled parking.”). The proximity sensors 17 may consist of optical, magnetic or ultrasonic sensors. EX1005-Minoshima, [0059].

If the proximity sensors determine the vehicle is not parked in a predetermined position to allow charging, the driver is notified to reposition the vehicle before charging is enabled. EX1005-Minoshima, Abstract (“Parking Position NG”), [0011] (“[I]f the parking orientation of the vehicle is unsuitable for charging, information indicating that the parking orientation is unsuitable is provided to the driver via the notifying means, prompting the driver to reposition the vehicle.”), [0039], [0048],

[0063]. Thus, the proximity sensors detect a *first positional relationship* between the vehicle-side power-receiving coupler (*first core*) and ground-level (charging station) coupler (*second core*) at a *first time* by detecting the vehicle position (e.g., the bumper) relative to the ground-level charging device at a first point in time. EX1003-Dec., ¶¶145-146. This determination of the *positional relationship at a first time* is compared with the known spatial relationship between the vehicle sensors, charging coils, and ground-side/charging station detected components that corresponds to a “correct” parking position. *Id.* See Claim 1(c)(ii) below mapping when the positional relationship is determined to be *misalignment*.

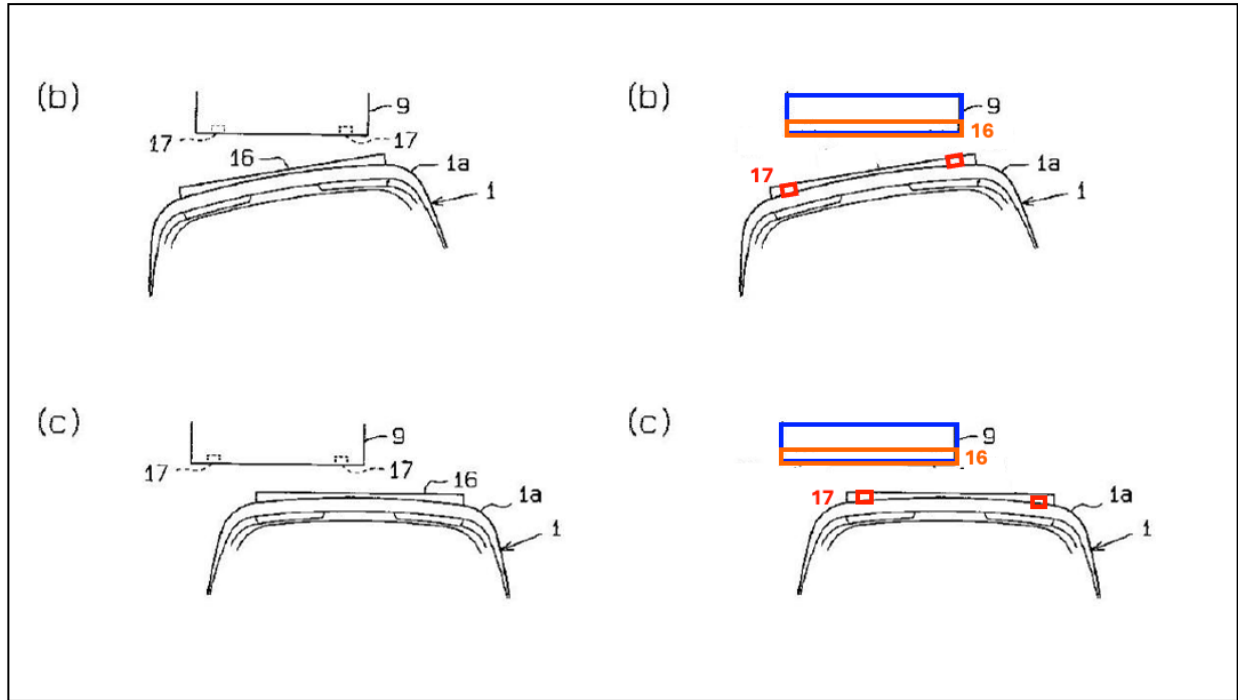
Minoshima’s general layout of electric vehicle 1 and ground-level charging device 9 is depicted below, including power receiving coupler 3, detected component 16, power transmitting coupler 10, proximity sensors 17, and ground-level charging device 9:





EX1005-Minoshima, Figs. 1 and 2 (left, original; right, depicting Minoshima's embodiment with **proximity sensors 17** located on the vehicle and **detected component 16** on **ground-level charging device 9**).

Minoshima depicts parking scenarios including misalignment (Figs. 3B-3C) of proximity sensors 17 of ground-level charging device 9 and detected component 16 of electric vehicle 1. Minoshima's embodiment where **proximity sensors 17** are within the electric vehicle and the **detected component 16** is within the **ground-level charging device 9** are depicted below (right) as compared to proximity sensors 17 in the ground-level charging device 9 (left):



EX1005-Minoshima, Figs. 3B-3C, [0021]-[0023], [0033], [0036]-[0037]; EX1003-Dec., ¶148.

c) Motivation to Combine Izuno and Minoshima

A POSITA would have been motivated and found it obvious to modify Izuno per Minoshima's known technique of determining a positional relationship between the coil in a vehicle and charging coil at a charging station by utilizing proximity sensors installed in a vehicle and a detected component installed in the charging station. EX1003-Dec., ¶¶149-150. A POSITA would have been motivated to modify Izuno's method of controlling a contactless vehicle charging system using an ECU with Minoshima's method of detecting vehicle proximity to the charging device to improve operational reliability and efficiency. EX1003-Dec., ¶¶149-150.

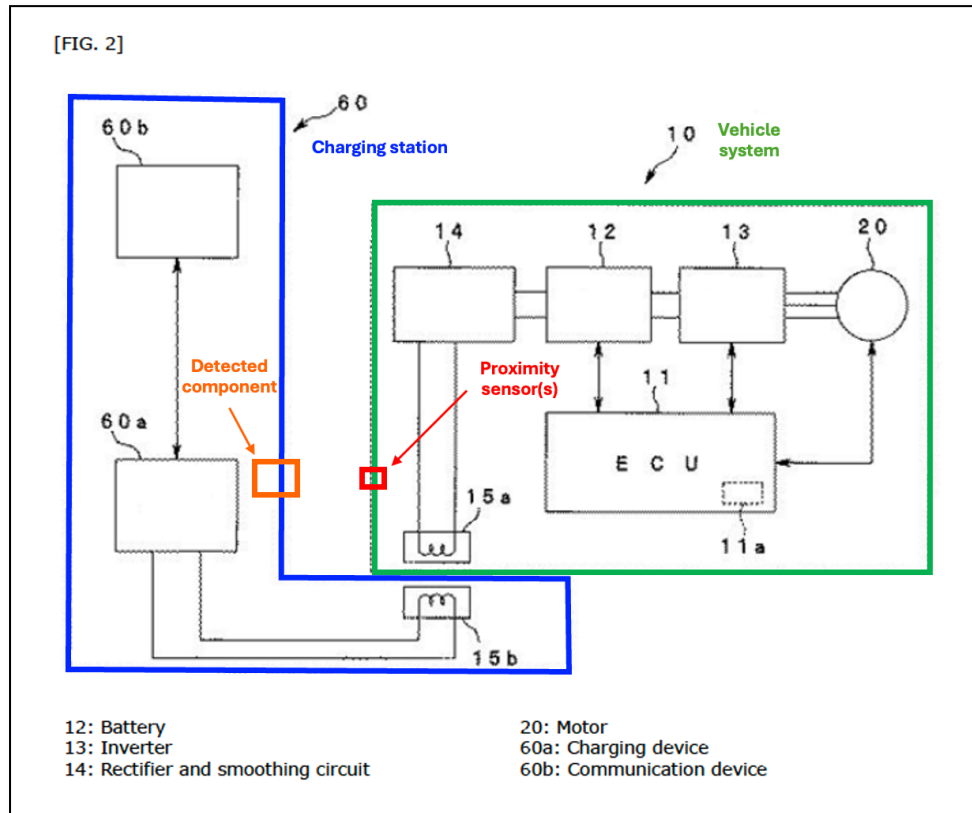
Izuno teaches the ECU sends start and stop charging signals via wireless communication to the contactless charger only when the vehicle is parked in a “predetermined position.” *See* Claim 1(a); EX1004-Izuno, [0030]. ECUs conventionally receive sensor inputs and initiate control decisions. EX1003-Dec., ¶¶151-152. Therefore, a POSITA would have been motivated and found it obvious to extend the ECU’s wireless control to include Minoshima’s proximity detection to allow the system to more effectively detect and confirm the required positional relationship (e.g., within the predetermined distance) is satisfied before issuing start charging signals. EX1003-Dec., ¶¶151-152. The ECU would stop charging if that condition is no longer detected (e.g., user repositions the vehicle, causing coil misalignment). EX1003-Dec., ¶¶151-152.

Such a combination would prevent inefficient charging conditions, while providing a centralized control system for the user. EX1003-Dec., ¶153. Because Izuno teaches the vehicle must be positioned within a predetermined position (e.g., couplers are positioned opposite each other) in the parking space to enable charging, a POSITA would have looked to Minoshima for a method of detecting a “correct” position for the vehicle to achieve alignment between the vehicle’s receiving coil and the ground-level (charging station’s) power transmission coil. EX1003-Dec., ¶153. This would have ensured the required positional condition is satisfied prior to charging to improve the efficiency and reliability of the charging system and prevent

a vehicle from being uncharged due to being improperly parked, as taught by Minoshima. EX1003-Dec., ¶153. Thus, combining prior art elements such as Izuno's vehicle and Minoshima's proximity sensors (or similar proximity sensors) according to Minoshima's known method would have yielded predictable results. EX1003-Dec., ¶153.

Further, a POSITA would have been motivated to utilize Minoshima's technique to ensure proper alignment between the coils to allow for more reliable, efficient, and faster inductive charging. EX1003-Dec., ¶154. Additionally, using Minoshima's technique advantageously avoids the situation of a car being parked in a position in which it will not be charged. EX1003-Dec., ¶154. This modification would have been use of Minoshima's known technique involving proximity sensors in a vehicle to improve Izuno's similar electric vehicle in the same way. EX1003-Dec., ¶154.

The proximity sensors in the Izuno combination vehicle detect the location of a detected component in the charging station, as taught by Minoshima. *See* EX1005-Minoshima, Figs. 1-2, 3B-3C *above*. As illustrated below in Izuno's Fig. 2, detection of the charging station provides a reference location from which the positions of the charging station coupler and vehicle-side coupler are known based on their fixed spatial relationships with the charging station detected component and vehicle sensors, respectively. EX1003-Dec., ¶155.



EX1004-Izuno, Fig. 2.

A POSITA would have had a reasonable expectation of success when modifying Izuno per Minoshima. EX1003-Dec., ¶156. Izuno already teaches an electric vehicle and inductive charging system and method requiring the vehicle to be in a particular position to enable charging. EX1003-Dec., ¶156. Minoshima provides implementation details for achieving proper alignment, including by utilizing proximity sensors in a vehicle and a detected component in the charging station. EX1003-Dec., ¶156. Thus, modifying Izuno per Minoshima would have been simply a matter of including proximity sensors and detected component (either in the vehicle and/or charging station) and related programming instructions to

provide positional relationship information to help the user properly align the couplers to achieve efficient charging. EX1003-Dec., ¶156.

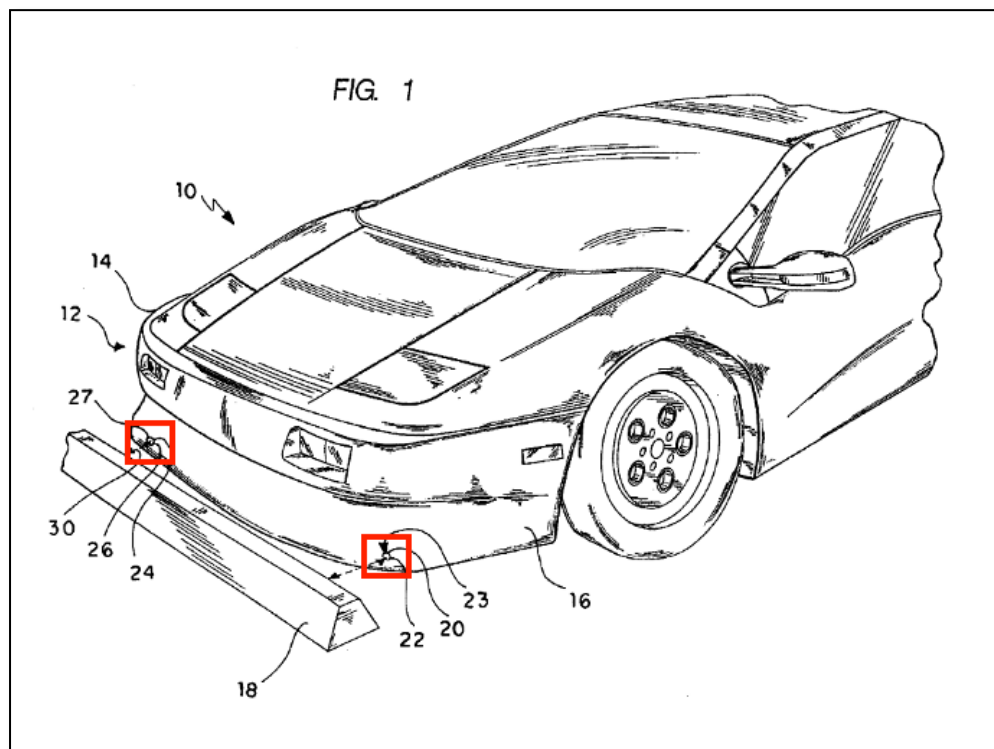
For example, Minoshima teaches presenting positioning information to a driver via display 34 in vehicle 1 and/or display 18 in the charging station. EX1003-Dec., ¶157. Thus, when modifying Izuno, positional information would also have been provided to the driver on a display to help correctly position the vehicle to enable inductive charging. EX1003-Dec., ¶157. Further, because this positional information would have been provided to the vehicle and/or charging system, the inductive charging system also would have known when the vehicle was properly aligned for efficient charging. EX1003-Dec., ¶157.

d) Canedy's Microprocessor and Sensors

To the extent it is argued Izuno-Minoshima is insufficient to teach a *controller configured to detect a positional relationship*, Canedy teaches this. Specifically, Canedy teaches vehicle microprocessor 100 and proximity sensors, comprising two pairs of optical sensors (optical transmitters/detectors 20/22 and 24/26 on the left and ride side, respectively, of vehicle spoiler 16), communicating via bus 121. EX1006-Canedy, 3:58-65 (“A microprocessor 100 is used to control the detection

process. Bus [121]² are used to control the two pairs of optical sensor units.”), 3:7-47 (generally teaching each pair of optical sensors), Fig. 2. Microprocessor 100 processes data from the proximity sensors regarding the proximity of an object in front of a vehicle when being parked. EX1006-Canedy, 3:58-4:51. Canedy also teaches outputting information to a driver on vehicle display 18 including distance from the sensor to the object. EX1006-Canedy, 3:66-4:33, 4:53-5:6, 5:24-43.

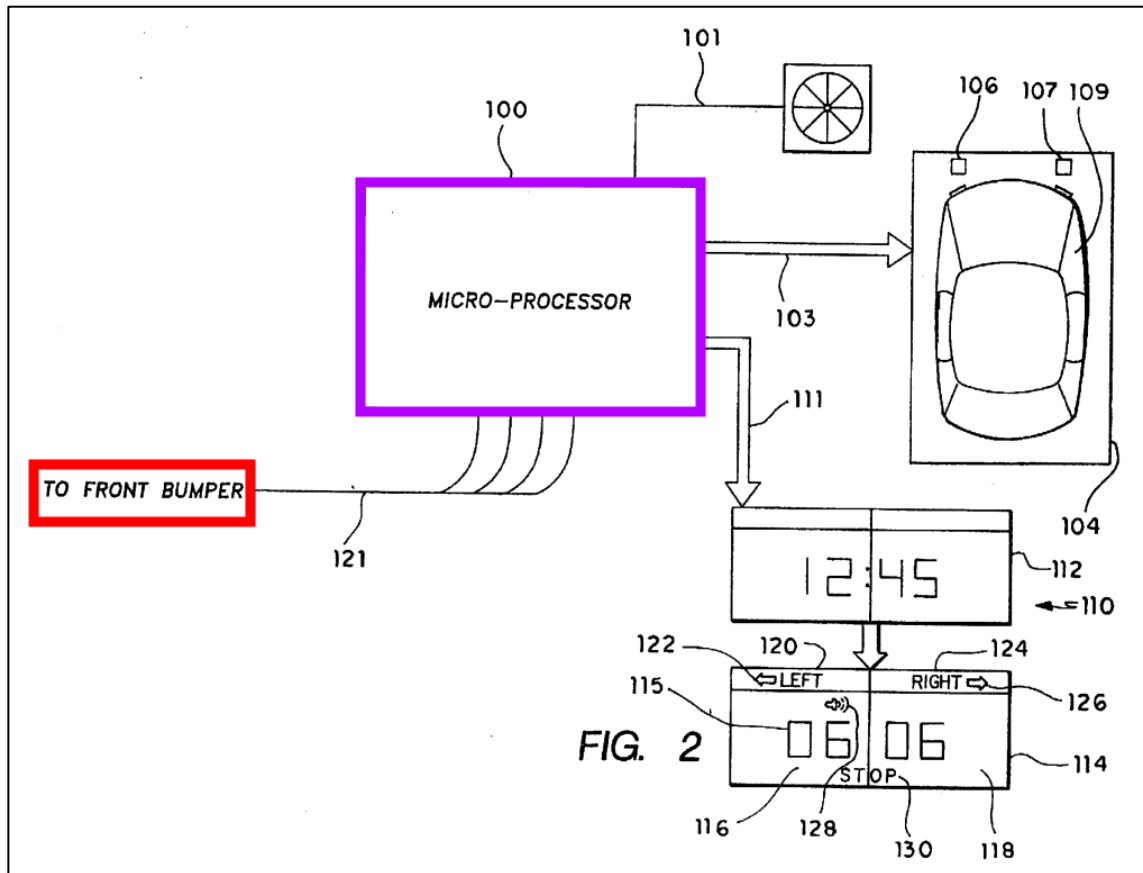
Fig. 1 depicts the optical sensor pairs 20, 22 and 24, 26 (proximity sensors):



² Canedy has a typographical error where “bus 120” should be “bus 121,” as depicted in Fig. 2 “bus 121.” EX1006-Canedy, 3:58-62, 4:19-21, Fig. 2. Element 120 properly refers to “LEFT indicator 120” of display 114. *Id.*

EX1006-Canedy, Fig. 1.

Fig. 2 depicts electronic circuitry, including microprocessor 100 and bus 121
“to front bumper,” housing optical/proximity sensors:



EX1006-Canedy, Fig. 2, 3:66-4:33. Display 104 includes lights 106/107 corresponding to the proximity sensors that detect when an object is close to the vehicle's front. EX1006-Canedy, 3:66-4:16. Microprocessor 100 also controls display 114, which displays a distance to the detected object. EX1006-Canedy, 4:24-33. Thus, the display and proximity sensors are coupled to the microprocessor (*controller*), which processes information received from the proximity sensors to

detect a positional relationship between the front bumper and an object and outputs the result to the display. *See* Claims 1(b), 1(c). Therefore, Izuno-Minoshima-Canedy's *controller is configured to detect a positional relationship*.

e) Motivation to Modify Izuno-Minoshima-Canedy

Canedy provides implementation details regarding a processor, communication bus, and proximity sensors in a vehicle that Minoshima does not expressly disclose. EX1003-Dec., ¶¶161-162. A POSITA would have been motivated and found it obvious to modify Izuno-Minoshima to utilize Canedy's well-known circuitry arrangement where a vehicle microprocessor is coupled to vehicle proximity sensors and display via buses. EX1003-Dec., ¶¶161-162. This modification would have used Canedy's known technique of coupling a vehicle processor, bus, and proximity sensors that would have improved the similar Izuno-Minoshima vehicle in the same way as Canedy's vehicle. EX1003-Dec., ¶¶161-162. Further, this modification would have combined prior art elements (e.g., vehicle, microprocessor, sensors) according to known methods to yield Canedy's predictable result of a functional proximity sensor system in a vehicle where the vehicle's processor processes sensor data to determine proximity of the vehicle to an object. EX1003-Dec., ¶¶161-162.

A POSITA would have been motivated to utilize a circuit setup like Canedy's as this was a known solution for including and allowing vehicle components to

communicate with one another and perform processing within the vehicle. EX1003-Dec., ¶163. Indeed, Canedy's setup would have allowed the Izuno-Minoshima vehicle to process proximity information for aligning the cores for inductive charging at the vehicle itself instead of relying on a charging station's processor, for example. EX1003-Dec., ¶163.

A POSITA would have had a reasonable expectation of success when modifying Izuno-Minoshima because a setup such as Canedy's was known in the prior art and would have been a straightforward, off-the-shelf solution. EX1003-Dec., ¶164. Further, Minoshima and Canedy teach placing proximity sensors in the same location on a vehicle (e.g., front bumper/spoiler area), thus not requiring reconfiguring the sensor location, leading to a reasonable expectation of success. EX1006-Canedy, 3:7-33, Fig. 1; EX1005-Minoshima, [0021], [0059], Figs. 1-3; EX1003-Dec., 164.

Minoshima lacks implementation details for how sensor data is processed for its embodiment where proximity sensors are located in/on the vehicle. EX1003-Dec., ¶¶165-166. Canedy provides these details, including teaching a microprocessor and communication bus within a vehicle for processing sensor data. EX1003-Dec., ¶¶165-166. Izuno's vehicle already includes an ECU (processor/controller) but does not expressly disclose proximity sensors. EX1003-Dec., ¶¶165-166. Applying Canedy's teachings to Izuno-Minoshima would have

required merely straightforward and routine changes to programming instructions and known, off-the-shelf solutions for implementing proximity sensors and a processor/controller in a vehicle, resulting in a reasonable expectation of success. EX1003-Dec., ¶¶165-166.

6. ***Claim 1(c)(ii): “detect a misalignment of the first core with respect to the second core based at least in part on the first positional relationship between the fir[st] core and the second core,”***

Izuno-Minoshima-Canedy teaches Claim 1(c)(ii). Izuno teaches a vehicle with coupler 15a and charging station coupler 15b (*first core* and *second core*, respectively). *See* Claim 1(Pre). Izuno’s vehicle must be parked in a predetermined position in the parking space to enable charging. EX1004-Izuno, [0019]-[0020], [0030] (“If the vehicle is not parked in the predetermined position, the processing ends. If the vehicle is parked in the predetermined position, the processing proceeds to step S22.”); *see* Claim 1(c)(i). As discussed below, a POSITA would have been motivated and found it obvious to modify Izuno’s charging process to advantageously detect misalignment and provide feedback to a driver to reposition the vehicle to enable charging, per Minoshima, instead of simply “ending” processing, as done in Izuno. EX1003-Dec., ¶¶167-168. *See* § V.B.6.b) below.

Further, to the extent it is argued Izuno-Minoshima does not expressly disclose a *controller configured to detect misalignment* of the charging cores, Canedy provides these implementation details, as mapped above. *See* Claim 1(c)(i).

Thus, in the Izuno-Minoshima-Canedy combination, a processor/controller such as Izuno's ECU is configured to process information from proximity sensors to detect alignment/misalignment of the couplers based on the positional relationship, per Minoshima and Canedy.

a) Minoshima's Detecting Misalignment

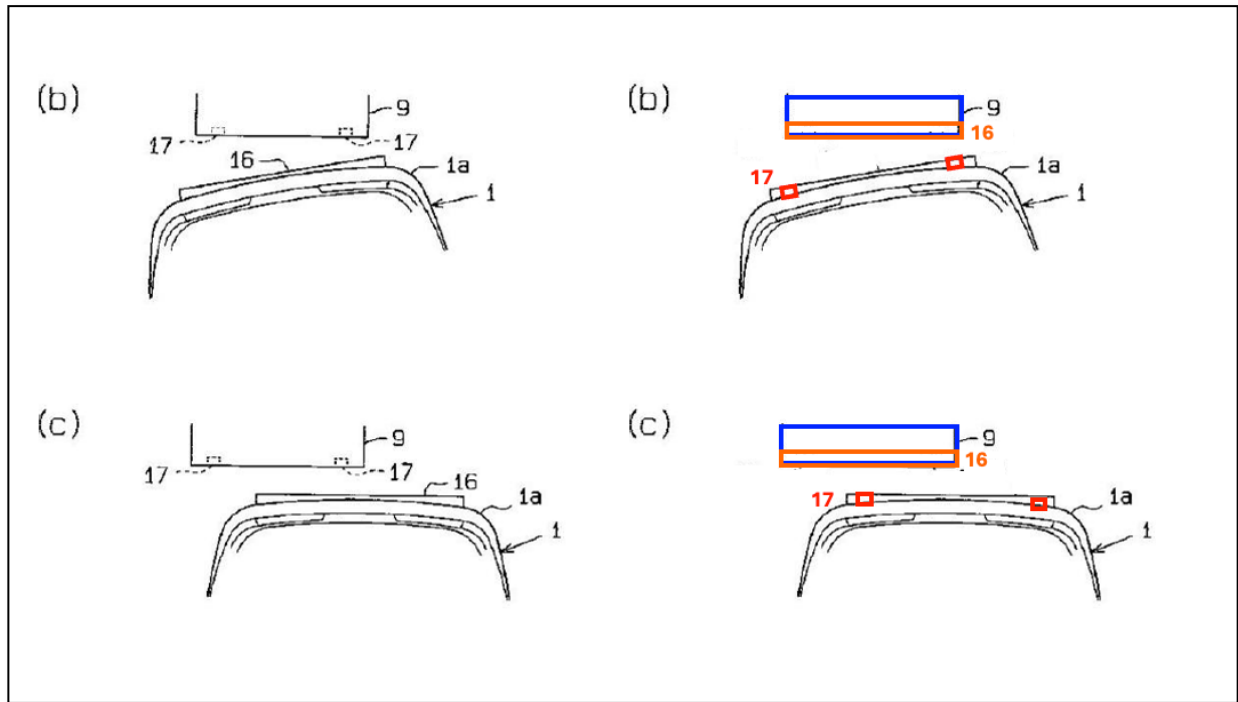
As discussed in Claim 1(c)(i), Minoshima teaches proximity sensors 17 detecting vehicle position with respect to ground-level charging device 9 (*positional relationship*), and that an electromagnetic induction voltage can be generated in the vehicle-side coil when the vehicle is correctly parked within a predetermined distance. EX1005-Minoshima, [0065], [0012]-[0013], [0022], [0034], [0037], [0039]. However, if the proximity sensors determine the vehicle's position is unsuitable (*detect a misalignment*), the driver is notified to reposition the vehicle. EX1005-Minoshima, [0011] ("if the parking orientation of the vehicle is unsuitable for charging, information indicating that the parking orientation is unsuitable is provided to the driver via the notifying means, prompting the driver to reposition the vehicle."). This notification is provided via vehicle display 34, indicating parking position quality. EX1005-Minoshima, [0053], [0011], [0025], [0035], [0039], [0047], [0052].

As noted, Petitioner's mapping relies on Minoshima's embodiment where proximity sensors 17 are located within electric vehicle 1 and detected component

16 is in the charging station for simplicity. EX1003-Dec., ¶171; EX1005-Minoshima, [0059]. Thus, proximity sensors and a processor within the Izuno-Canedy-Minoshima vehicle perform alignment/misalignment detection. EX1003-Dec., ¶171. *See* Claim 1(c)(i).

In the Izuno-Canedy-Minoshima vehicle, the proximity sensors *detect a misalignment* between the vehicle-side coupler (*first core*) and the charging station coupler (*second core*) by detecting the position of the vehicle (e.g., the bumper) relative to the charging station. EX1005-Minoshima, [0021]-[0023] (teaching detected component 16 and proximity sensors 17), [0033], [0039], [0048], [0053], [0059]. This determination is made in view of the known spatial relationships between the vehicle sensors, charging coils, and charging station detected component(s). EX1005-Minoshima, [0021]-[0023], [0033], [0039], [0047]-[0048], [0053], [0059]; EX1003-Dec., ¶172. *See* Claim 1(c)(i).

Figs. 3B-3C below depict examples of width/side-to-side and angle misalignment:



EX1005-Minoshima, [0021]-[0023], [0033], [0036]-[0037], Figs. 3B-3C (depicting Minoshima's embodiments where the proximity sensors 17 are located within the charging device 9 (left), and within the vehicle (annotated, right)). Thus, *detecting a misalignment* is based at least in part on the *first positional relationship*.

b) Motivation to Combine Izuno and Minoshima

See motivation to combine Izuno-Minoshima and Izuno-Minoshima-Canedy in Claim 1(c)(i).

A POSITA would have been motivated and found it obvious to modify Izuno's charging process to configure the controller to advantageously detect misalignment and provide feedback to a driver to reposition the vehicle to be able to perform charging, per Minoshima and Canedy, instead of simply "ending"

processing, as done in Izuno. EX1003-Dec., ¶¶175-176. This use of a known technique would have improved Izuno's similar vehicle and charging method in the same way as Minoshima's vehicle and charging method. EX1003-Dec., ¶¶175-176.

A POSITA would have been motivated and found it obvious to modify Izuno's method of controlling contactless vehicle charging with Minoshima's method of detecting misalignment between the vehicle's coil and the charging station's coil to improve charging efficiency. EX1003-Dec., ¶¶177-178. Proper alignment between the coils is critical for inductive charging, as misalignment reduces magnetic coupling, decreases power transfer efficiency, and can lead to increased energy loss or heat generation. EX1003-Dec., ¶¶177-178; EX1001, 33:43-46. Accordingly, a POSITA would have recognized the importance of detecting misalignment in the Izuno-Canedy-Minoshima vehicle to ensure charging occurs only under optimal conditions to prevent inefficient operation from insufficiently aligned coils. EX1003-Dec., ¶¶177-178. Because Izuno teaches charging is enabled only when the vehicle is parked in a specified position in the parking space, a POSITA would have looked to Minoshima's known technique of detecting misalignment to improve the efficiency and reliability of Izuno's similar contactless charging system in the same way as Minoshima's inductive charging system. EX1003-Dec., ¶¶177-178.

A POSITA would have had a reasonable expectation of success when modifying Izuno per Minoshima. EX1003-Dec., ¶179. Izuno already teaches electric vehicle inductive charging where the vehicle must be in a particular position to enable charging. Minoshima provides implementation details for achieving this alignment or detecting misalignment. EX1003-Dec., ¶179.

Thus, modifying Izuno per Minoshima would have been simply a matter of including proximity sensors in the vehicle and related programming instructions to detect and provide positional relationship information (including misalignment information) to help the user properly align the couplers to achieve efficient charging. EX1003-Dec., ¶¶180-181. For example, Minoshima teaches detecting and presenting positioning information to a driver via vehicle display 34 and/or charging station display 18. EX1003-Dec., ¶¶180-181. Thus, when modifying Izuno, detected positional information regarding misalignment would have been provided to the driver to help correctly position the vehicle to enable inductive charging. EX1003-Dec., ¶¶180-181.

7. Claim 1[c][iii]: “in response to detecting the misalignment, disable at least one user control on the display usable to control the inductive charging of the battery,”

Izuno-Minoshima-Canedy and further in view of Yokota teaches Claim 1(c)(iii). Izuno teaches a vehicle with a *controller* (see Claim 1(a)) and *display* (see Claim 1(b)). Izuno teaches that charging begins after a command to start charging is

issued by the user (*user control usable to control the inductive charging of the battery*) after a vehicle is correctly positioned. EX1004-Izuno, [0034] (“Next, in step S28, the system checks whether a charging start instruction has been received from the user...If a charging start instruction from the user is received within the threshold value time, the system...transmits a charging start signal to the charging station 60, and initiates charging.”), [0022] (“Then, depending on what the user selects—automatic charging, start charging, or stop charging—it transmits a charging instruction to the charging station 60.”), [0014], [0018]. The user can select to start charging via communication terminal 50 or input device in vehicle system 10, which may be a vehicle *display*. EX1004-Izuno, [0027], [0031].

As discussed above, Izuno-Minoshima-Canedy teaches a controller configured to perform detecting misalignment of a *first core* and *second core* and controlling a display. EX1003-Dec., ¶¶183-184. *See also* Claim 1(b), (c)(i)-(ii).

Further, Yokota teaches a system and method for determining whether a function associated with a menu item on a display can be executed and, if not, disabling the corresponding menu item to prevent selection. In the Izuno-Minoshima-Canedy-Yokota combination, the user-selectable control for initiating charging is disabled when the vehicle-side core and the charging station core are misaligned per Minoshima’s detection determination. *See* Claim 1(c)(iii). Yokota

teaches a central processing unit CPU 17 (*controller*) and memory for controlling device functions, such as enabling/disabling controls on the display.

a) Minoshima's Detecting Misalignment

Izuno-Minoshima-Canedy teaches detecting misalignment and notifying a driver via a display to reposition the vehicle. *See* Claim 1(c)(i)-(ii).

b) Yokota's Disabling User Control on a Display

Yokota teaches a system and method for executing a function corresponding to a selected menu item displayed on a screen, e.g., a navigation device in a vehicle. EX1007-Yokota, [0004], [0014], [0058]-[0059]. Yokota also includes a central processing unit CPU 17 (*controller*) and memory for enabling/disabling controls on the display. EX1007-Yokota, [0060], [0069], [0072], [0075]-[0077], [0083]-[0084] (“when a desired menu item is selected (step 306), the CPU 17 executes the function corresponding to the selected menu item (step 307).”).

Specifically, Yokota teaches determining whether a function corresponding to a menu item displayed on the screen can be executed, and when it is determined the function cannot be executed, disabling the menu item corresponding to that function (*disabling at least one user control on the display*). EX1007-Yokota, [0030] (“The menu item displaying method includes...determining whether a function corresponding to a menu item displayed on the screen can be executed, and when it is determined that the function cannot be executed in the determining step, disabling

the menu item corresponding to the function from being selected.”). For example, the menu item associated with that function is shaded (e.g., grayed out) to indicate to a user the function is disabled, and a user cannot select the disabled function. EX1007-Yokota, [0052], [0063]. If the menu item is not selectable, the menu skips over the disabled option. EX1007-Yokota, [0071] (“When the user attempts to select the shaded menu item 51 by causing the menu bar to move thereto, since the menu bar skips over it, the menu item 51 cannot be selected (step 105).”), [0032]-[0034], [0084]-[0085]. Additionally, Yokota teaches displaying a reason for why the menu item is disabled. EX1007-Yokota, [0030], [0052]-[0053], [0063], [0084]-[0088].

c) Motivation to Combine Izuno-Minoshima-Canedy-Yokota

A POSITA would have been motivated and found it obvious to modify Izuno-Minoshima-Canedy’s method of detecting misalignment between the vehicle and charging station cores with Yokota’s method of disabling a menu item if the associated function cannot be executed to advantageously prevent user initiation of charging under improper conditions. EX1003-Dec., ¶¶189-190. A POSITA would have recognized that when the coils are misaligned, inductive charging cannot be efficiently performed, or cannot be performed at all, and thus it would be advantageous to disable the user’s menu item to prevent initiating charging while the coils are misaligned. EX1003-Dec., ¶¶189-190. Incorporating Yokota’s method into Izuno-Minoshima-Canedy’s charging system would allow the system to disable

the user control for initiating charging when misalignment is detected. EX1003-Dec., ¶¶189-190.

This modification would have provided clear feedback and control to the user and prevented inefficient operation of the contactless charger. EX1003-Dec., ¶¶191-193. It would have also prevented a user thinking it started charging, but did not because the coils are not properly aligned. EX1003-Dec., ¶¶191-193. Indeed, Minoshima already describes that when a vehicle is not properly aligned, the vehicle will receive a message “stop position NG” to inform the driver that the stop position is “not appropriate,” and the vehicle will not charge. EX1005-Minoshima, [0011], [0012], [0039]. Izuno further teaches a vehicle having a display to inform the user of the vehicle charging status and that charging is initiated in response to a user-issued command. EX1004-Izuno, [0014], [0018], [0037]; EX1003-Dec., ¶¶191-193. Therefore, a POSITA would have been motivated to use Yokota’s known technique in Izuno-Minoshima-Canedy’s system to configure the controller to disable a “start charging” command on the vehicle display when misalignment is detected to improve the similar devices in the same way. EX1003-Dec., ¶¶191-193. Disabling the user control in this manner would have been a straightforward method for informing a user in the vehicle that misalignment of the couplers has been detected and need to be correctly aligned before charging can be initiated. EX1003-Dec., ¶¶191-193.

A POSITA would have had a reasonable expectation of success when modifying Izuno-Minoshima-Canedy per Yokota. EX1003-Dec., ¶¶194-195. “[G]raying out” or otherwise disabling menu options was a known technique in human-machine interfaces. EX1003-Dec., ¶¶194-195. This would have required only straightforward and routine changes to programming instructions, which would have been well-within the skillset of a POSITA. EX1003-Dec., ¶¶194-195. Further, context-based/context-aware menu design was known in the prior art, such that a POSITA would have been aware of techniques for modifying menus to restrict or disable items for selection/execution. EX1003-Dec., ¶¶194-195. Additionally, devices such as Yokota’s were known to be mounted in vehicles and controlled by a processor, which the Izuno-Minoshima-Canedy vehicle already includes. EX1003-Dec., ¶¶194-195. Thus, a POSITA would have had a reasonable expectation of success when modifying Izuno-Minoshima-Canedy’s vehicle per Yokota’s teachings. EX1003-Dec., ¶¶194-195.

8. Claim 1[c][iv]: “detect a second positional relationship between the first core and the second core at a second time occurring after movement of the vehicle,”

Izuno-Minoshima-Canedy teaches Claim 1(c)(iv). As discussed above, Izuno-Minoshima-Canedy teaches using sensors and a *controller configured to detect* a first positional relationship, e.g., first and second cores are misaligned. *See* Claim 1(c)(i)-(ii). In the combination, a processor/controller such as Izuno’s ECU is

configured to process information from sensors regarding alignment/misalignment, per Minoshima and Canedy.

In Claim 1(c)(iv)-(v), Izuno-Minoshima-Canedy teaches detecting a second positional relationship, where the first and second cores are aligned. As mapped below, this *second positional relationship* occurs at a *second time occurring after* a user has repositioned the vehicle (*after movement of the vehicle*). In particular, Izuno's vehicle and vehicle coupler 15a moves relative to coupler 15b because coupler 15a is attached to the vehicle and coupler 15b is stationary. EX1003-Dec., ¶197.

a) Minoshima's Second Positional Relationship

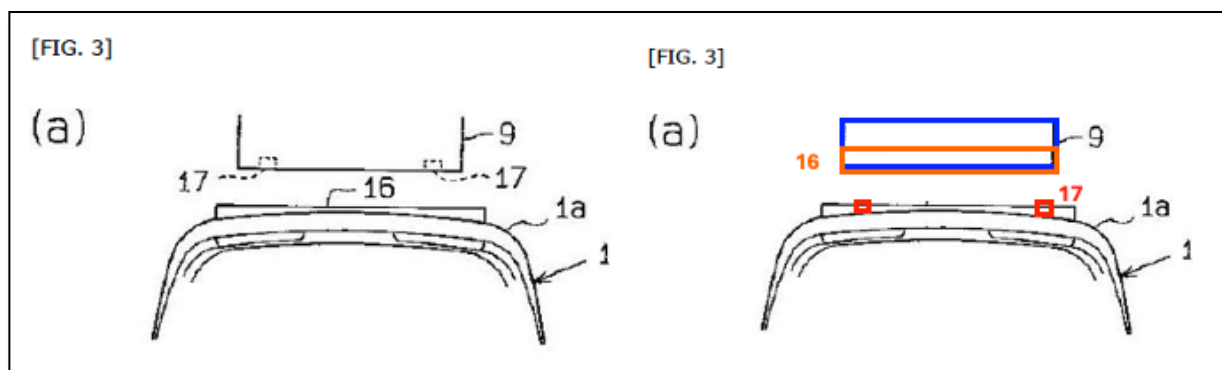
Minoshima teaches that if the proximity sensors detect an unsuitable vehicle position (i.e., the first positional relationship discussed in Claim 1(c)(i)-(ii)), vehicle display 34 notifies the driver to reposition the vehicle before charging can be enabled. EX1005-Minoshima, [0053] (“[A] display 34 may be provided in the cabin of the vehicle, and the driver may be notified whether the parking position and orientation are correct by displaying a message on the display 34.”), [0011], [0025], [0035], [0047], [0052].

In response, a user repositions the vehicle. EX1005-Minoshima, [0039] (“Thus, if either of the two proximity sensors 17 does not activate, the message ‘Parking Position NG’ will appear on the display 18 when the gearshift is moved to

P. Once this message is seen, the driver will realize that the parking position is inappropriate and will reposition the vehicle.”), [0048] (“the driver can promptly reposition the vehicle after viewing the message displayed on the display 18.”). In the Izuno-Minoshima-Canedy combination, when parking is performed correctly (i.e., detected to be in a second positional relationship), the cores are aligned and charging can begin when a user initiates charging. EX1005-Minoshima, Abstract, [0011], [0040]-[0041]; EX1004-Izuno, [0022], [0034], [0037].

As noted above, in the Izuno combination, coupler 15a moves with the vehicle and coupler 15b is stationary. *See* Claim 1(Pre). Thus, after the vehicle is repositioned (*after movement of the vehicle*), the proximity sensors detect the vehicle’s position relative to the charging station core (*detect a second positional relationship*). EX1005-Minoshima, [0035], [0039], [0048], [0053].

Minoshima depicts proper alignment (*second positional relationship*) for charging the battery below including proximity sensors 17 of electric vehicle 1 and detected component 16 of charging device 9:



EX1005-Minoshima, Fig. 3A (depicting Minoshima's embodiments where the proximity sensors 17 are located in the charging device 9 (left), and within the vehicle (annotated, right)). As discussed in Claim 1(c)(i)-(ii), Petitioner relies on Minoshima's embodiment where proximity sensors are in the vehicle and the detected component is in the charging station.

Thus, in the Izuno-Minoshima-Canedy combination, the proximity sensors *detect a second positional relationship between vehicle-side coupler (first core) and charging station coupler (second core) by detecting the position of the vehicle (e.g., the bumper) relative to the charging station to be in an appropriate position for charging.* EX1003-Dec., ¶¶203-205; *see also* EX1005-Minoshima, [0022], [0024], [0033], [0035], Fig. 3A Fig. 3A. This determination is made in view of the known spatial relationship between the vehicle, charging coils, and charging station detected component. EX1003-Dec., ¶¶203-205; *see also* EX1005-Minoshima, Abstract, [0022], [0024], [0033], [0035], Fig. 3A; Claim 1(c)(v). The *second positional relationship* is detected *at a second time* after the driver repositions the vehicle for optimal alignment. EX1003-Dec., ¶¶203-205; *see also* EX1005-Minoshima, [0035], [0039], [0048], [0053], Fig. 3A. This process is essentially the same as that mapped in Claim 1(c)(i)-(ii) except that the driver repositions the vehicle based on feedback with the result being *alignment (second positional*

relationship) of the cores instead of *misalignment* (*first positional relationship*). See Claim 1(c)(i)-(ii). EX1003-Dec., ¶¶203-205.

b) Motivation to Combine Izuno-Minoshima

See motivation to combine Izuno and Minoshima in Claim 1(c)(i).

Modifying Izuno per Minoshima's repositioning technique would have been use of a known technique that would have improved similar devices in the same way to achieve the benefits of ensuring alignment between coils. EX1003-Dec., ¶207. A POSITA would have been motivated to utilize Minoshima's technique to ensure proper alignment between the coils to allow for more efficient and faster inductive charging. EX1003-Dec., ¶207 (coil placement affects inductive charging efficiency and speed). Indeed, providing more efficient charging would also have reduced charging costs to a user by wasting less energy with proper alignment. EX1003-Dec., ¶207. Further, this combination of prior art elements (e.g., vehicle, proximity sensors) according to Minoshima's known method would have yielded the predictable result of detecting a positional relationship between Izuno's first and second cores. EX1003-Dec., ¶207.

A POSITA would have had a reasonable expectation of success for the same reasons discussed in Claim 1(c)(i).

c) Canedy's Microprocessor and Sensors

Izuno-Minoshima-Canedy teaches using a microprocessor and proximity sensors configured to detect a *first positional relationship*. See Claim 1(c)(i). For the reasons discussed above, Izuno-Minoshima-Canedy teaches using a microprocessor and proximity sensors configured to detect a *second positional relationship after movement of the vehicle*. See Claim 1(c)(i).

d) Motivation to Combine Izuno-Minoshima-Canedy

See motivation to combine Izuno, Minoshima, and Canedy in Claim 1(c)(i).

9. ***Claim 1[c]/[v]: “detect an alignment of the first core with respect to the second core within a threshold based at least in part on the second positional relationship between the first core and the second core,”***

Izuno-Minoshima-Canedy teaches *a controller configured to detect a second positional relationship*, where the first and second cores are aligned *within a threshold based at least in part on the second positional relationship*. See Claim 1(c)(iv)-(v). As mapped above, this *second positional relationship* occurs at a *second time occurring after* a user has repositioned the vehicle (*after movement of the vehicle*).

As mapped above, Canedy provides implementation details for a *controller configured to detect* sensor data, such as an alignment. See Claim 1(c)(i)-(ii). Thus, in the Izuno-Minoshima-Canedy combination, a processor/controller such as Izuno's

ECU is configured to process information from sensors regarding alignment/misalignment, per Minoshima and Canedy.

a) '996 Patent's Threshold

Claim 1(c)(v) recites: “detect an alignment of the first core with respect to the second core within a threshold based at least in part on the second positional relationship between the first core and the second core.” EX1001, Claim 1(c)(v); *see also id.*, Claims 12(b), 15(b). The '996 Patent specification describes “proper alignment” by detecting a relationship between sensors and sensed elements using conventional algorithms, but no numerical range for a threshold is described. EX1001, *generally* 33:43-35:11. The '996 Patent only describes “alignment within a predetermined acceptable error calculated by the controller.” EX1001, 34:54-59.

b) Minoshima's Detecting Alignment Within a Threshold

Similar to the '996 Patent's description of “predetermined acceptable error,” Minoshima teaches a “permissible alignment range” for charging. EX1001, 34:54-59; EX1005-Minoshima, [0035] (“When the P range signal is received and both proximity sensors 17 are activated, the controller 20 determines that the electric vehicle 1 has been parked in the parking space with the vehicle body positioned within the **permissible misalignment range for charging** and displays the message ‘Parking Position OK’ on the display 18. In this way, the driver recognizes that the vehicle has been parked correctly and is ready for charging.”). In response to

receiving messaging regarding misalignment of the cores, a user repositions the vehicle. EX1005-Minoshima, [0039], [0048]. Minoshima also teaches displaying parking position messages on vehicle display 34. EX1005-Minoshima, [0053].

In the Izuno-Minoshima-Canedy combination, when parking is performed correctly, the cores are aligned *within a* predetermined distance (*threshold*) and charging can begin when a user initiates charging. EX1004-Izuno, [0022], [0033]-[0034], [0035], [0037]; EX1005-Minoshima, Abstract, [0008], [0011], [0041], [0065] (“the widthwise misalignment detecting means comprises at least two proximity sensors that detect when the vehicle has approached within a predetermined distance of a predetermined reference position, using two different locations on the vehicle as detection targets. As a result, the system can detect not only widthwise misalignment but also improper angled parking.”), [0009], [0013].

Thus, if the vehicle was not initially aligned properly, then after the vehicle is repositioned (*after movement of the vehicle*), the proximity sensors detect the vehicle’s position relative to the charging station core (*detect a second positional relationship*) “within a predetermined distance of a predetermined reference position” (*within a threshold*). EX1005-Minoshima, [0039], [0048], [0053], [0065], [0008]-[0009], [0013]; *see also* Claim 1(c)(iv).

Therefore, the proximity sensors *detect a second positional relationship between* the vehicle-side coupler (*first core*) and the charging station’s coupler

(*second core*) by detecting the position of vehicle sensors (e.g., in the bumper) relative to the charging station within a predetermined threshold. EX1003-Dec., ¶¶218-219. This determination is made in view of the known spatial relationships between the vehicle, charging coils, and charging station's detected component. EX1003-Dec., ¶¶218-219. The *second positional relationship* is detected *at a second time* after the driver repositions the vehicle for optimal alignment. EX1003-Dec., ¶¶218-219. This process is essentially the same as that mapped above except the driver repositions the car based on feedback with the result being *alignment* of the cores *within a threshold*. See Claims 1(c)(i)-(ii). EX1003-Dec., ¶¶218-219.

c) Motivation to Combine Izuno-Minoshima-Canedy

See motivations to combine discussed in Claims 1(c)(i)-(ii), 1(c)(iv).

The claims and specification do not recite a specific numerical value or range for the *threshold*. However, to the extent PO argues a specific numerical value or range is required, a POSITA would have selected a suitable value for a *threshold* for alignment as a design choice to achieve efficient charging in the Izuno combination based on the specifics of the charging system design. EX1003-Dec., ¶¶221-222. This use of Minoshima's known technique of using a threshold would have improved the similar Izuno system and method in the same way as Minoshima's. EX1003-Dec., ¶¶221-222. A POSITA would have had a reasonable expectation of success because this modification would have required only straightforward and routine changes to

programming instructions for what constitutes “alignment” vs “misalignment” in relation to Izuno-Minoshima-Canedy’s proximity sensors. EX1003-Dec., ¶¶221-222.

10. Claim 1(c)[vi]: “in response to detecting the alignment, enable the user control on the display, and”

Izuno-Minoshima-Canedy-Yokota teaches Claim 1(c)(vi). As discussed above, Izuno-Minoshima-Canedy teaches a *controller configured to detect* alignment of a *first core* and *second core*. See Claim 1(c)(v). Also discussed above, Izuno-Minoshima-Canedy teaches a *controller configured to detect* and display sensor data, such as an alignment. See Claim 1(c)(i). In the Izuno-Minoshima-Canedy combination, a processor/controller, such as Izuno’s ECU, is configured to control a display via a communication bus. See Claim 1(b).

In the Izuno-Minoshima-Canedy-Yokota combination, the user-selectable control for initiating charging is disabled when the charging cores are misaligned. See Claim 1(c)(iii). The Izuno-Minoshima-Canedy-Yokota user control for initiating charging would be *enabled* per Yokota only after repositioning the vehicle and detecting proper alignment between the vehicle-side and charging station cores (per Minoshima and Canedy). EX1003-Dec., ¶¶224. That is, in the Izuno-Minoshima-Canedy-Yokota combination, the user control on the display is *disabled* when misalignment is detected and *enabled* if properly aligned. EX1003-Dec., ¶224.

a) Yokota's Enabling User Control on a Display

Yokota performs a determination step that results in disabling or enabling a menu item. EX1003-Dec., ¶¶225-226. Specifically, Yokota teaches determining whether a function corresponding to a menu item can be executed. EX1007-Yokota, [0030]-[0031], [0052], [0069], [0075], [0076], [0083]. If the determination is the function can be executed, the menu item is enabled. EX1003-Dec., ¶¶225-226.

In more detail, Yokota teaches a system and method for executing a function corresponding to a selected menu item displayed on a screen. EX1007-Yokota, [0004], [0014], [0058]-[0059]. When it is determined the function cannot be executed, the menu item for that function is disabled (*disabling at least one user control on the display*). See Claim 1(c)(iii).

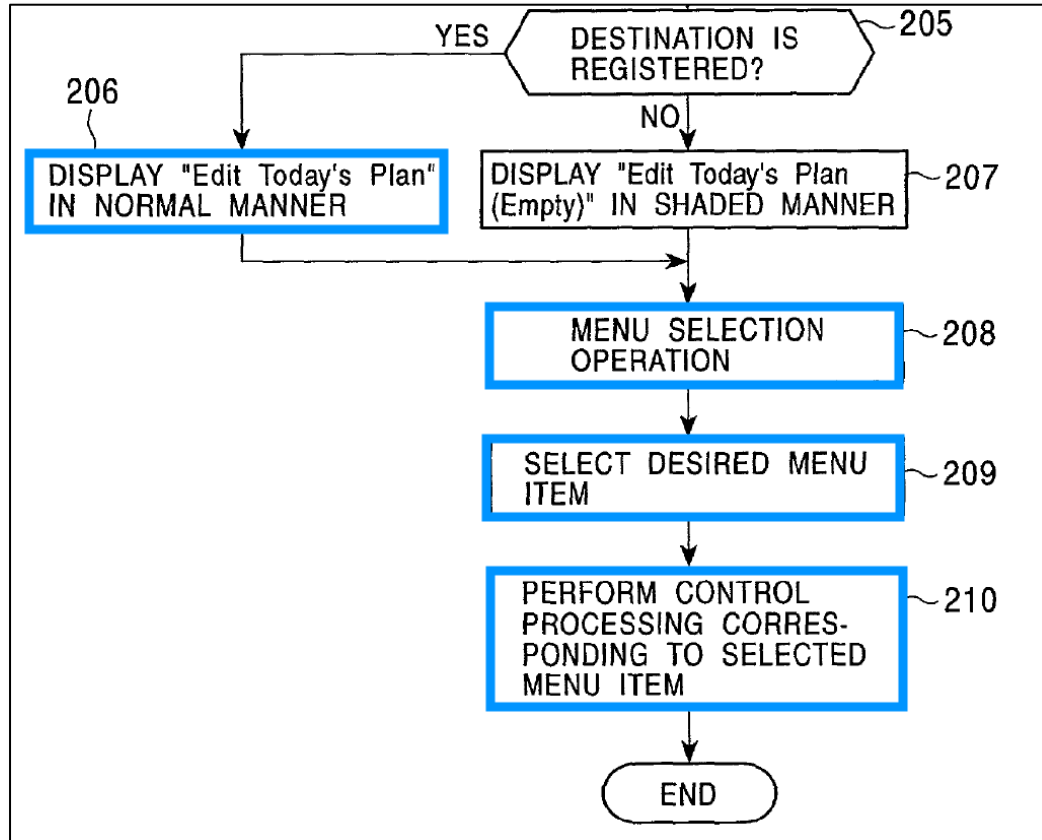
Conversely, Yokota teaches that when it is determined a function can be executed, enabling for execution the menu item corresponding to that function (*enabling the user control on the display*). EX1007-Yokota, [0030] (“when a predetermined menu item is selected, a function corresponding to the selected menu item is executed. The menu item displaying method includes the steps of determining whether a function corresponding to a menu item displayed on the screen can be executed.”), [0002].

To make its determination, Yokota teaches storing the “state of the apparatus.” EX1007-Yokota, [0031], [0052]. Based on the stored state, menu functions are either

disabled (cannot be selected or executed) or enabled (can be selected and executed). EX1007-Yokota, [0030]-[0031], [0052] (“A function executing apparatus according to the present invention displays menu items on a screen SCR and, when a predetermined menu item is selected, executes a function corresponding to the selected menu item...The function selecting control unit 4 determines based on the apparatus state whether a function corresponding to a menu item displayed on the screen SCR can be executed.”), *id.* (“The function executing control unit 6 executes the function corresponding to the selected menu item.”), [0069], [0075], [0076], [0083]. “[W]hen a menu item corresponding to a desired function is selected (step 106), the CPU 17 executes the function corresponding to the selected menu item (step 107).” EX1007-Yokota, [0072].

In one example, Yokota teaches a function that can be executed only during a particular mode (e.g., route guidance). EX1007-Yokota, [0056] (“a navigation apparatus is provided with a function which can be executed exclusively during route guidance. When route guidance is not in progress, the message ‘No Guidance’ is displayed on the field of the menu item corresponding to the function, whereby the user is informed that the menu item cannot be selected.”). When route guidance is in progress, the function is enabled and selectable because the condition for selecting the function was met. EX1003-Dec., ¶230.

Yokota also teaches disabling a menu item until a condition is met (or if a condition is not met), and when the condition is met, allowing the menu item to be selectable and executed. EX1007-Yokota, [0076]-[0077] (“When the user attempts to select the shaded menu item 60 or 62 by causing the menu bar to move thereto, since the menu bar skips over it, neither of the menu items 60 or 62 can be selected (step 208).”), *id.* (“Otherwise, by selecting the menu item corresponding to the desired function (step 209), the CPU 17 executes the function corresponding to the selected menu item (step 210).”), [0081], [0083]-[0084], [0087] (teaching displaying a message identifying the reason why the menu item cannot be selected). Fig. 6 depicts a flowchart including steps 208 and 210:



EX1007-Yokota, Fig. 6 (excerpt); EX1003-Dec., ¶231 (explaining Yokota's Fig. 6 teaches enabling a user control on a display when the determination at step 205 is YES and the flow moves to steps 206, 208-210).

b) Motivation to Combine Izuno-Minoshima-Canedy-Yokota

A POSITA would have been motivated and found it obvious to modify Izuno-Minoshima-Canedy's method of detecting alignment between the vehicle and charging station cores with Yokota's method of enabling a menu item if the associated function can be executed to advantageously allow user initiation of charging under proper conditions. EX1003-Dec., ¶¶232-233. A POSITA would have recognized that when the coils are aligned, inductive charging can be efficiently performed, and thus it would be advantageous to enable the user's menu item to allow initiating charging while the coils are aligned within a threshold. EX1003-Dec., ¶¶232-233. This modification would allow the system to enable the user control for initiating charging when alignment is detected and provide clear feedback and control to the user and prevent inefficient operation of the contactless charger including by disabling the initiating charge functionality when coil misalignment is detected. EX1003-Dec., ¶¶232-233.

Indeed, as discussed, Minoshima already describes indicating to a user via a vehicle display when the parked position is adequate to allow for inductive charging. EX1005-Minoshima, [0053], [0035].

Izuno further teaches using a vehicle display to inform the user of the charging status and that charging is initiated in response to a user-issued command. EX1003-Dec., ¶234. Therefore, a POSITA would have been motivated to use Yokota's known technique in Izuno-Minoshima-Canedy's system to enable a "start charging" command on the vehicle display when alignment within a threshold is detected to improve the similar devices in the same way. EX1003-Dec., ¶234.

A POSITA would have had a reasonable expectation of success when modifying Izuno-Minoshima-Canedy per Yokota. EX1003-Dec., ¶235. Enabling menu items when conditions are appropriate was a known technique in human-machine interfaces, as Yokota teaches. EX1003-Dec., ¶235. In particular, if a menu item is not disabled, it would have been enabled for user selection to execute the particular function associated with the menu item. EX1003-Dec., ¶235.

Implementing Yokota's technique in Izuno-Minoshima-Canedy would have required only straightforward and routine changes to programming instructions, which would have been well-within the skillset of a POSITA. EX1003-Dec., ¶236. Further, context-based/context-aware menu design was known in the prior art, such that a POSITA would have been aware of techniques for modifying menus to allow/enable items for selection. EX1003-Dec., ¶236. Additionally, devices such as Yokota's navigation device were known to be mounted in vehicles. EX1003-Dec., ¶236. Thus, a POSITA would have had a reasonable expectation of success when

modifying a vehicle such as Izuno-Minoshima-Canedy's vehicle per Yokota's teachings. EX1003-Dec., ¶236.

11. Claim 1[c]/[vii]: “in response to receiving a selection of the user control, initiate inductive charging via the first core and the second core.”

Izuno-Minoshima-Canedy-Yokota teaches Claim 1(c)(vii). Izuno teaches a user-issued command to start charging *initiates inductive charging* via the vehicle's charging coupler 15a (*first core*) and ground-side coupler 15b (*second core*). Izuno teaches that charging occurs using electromagnetic induction (*inductive charging*). EX1004-Izuno, [0015], [0019]-[0020], [0037]; Claim 1(Pre). Specifically, Izuno teaches a display in vehicle 1 where a user provides a charging start instruction. EX1004-Izuno, [0027] (“Users selects the charging mode using, for example, their own communication terminal 50 or an input device in the vehicle system 10.”), [0034] (“in step S28, the system checks whether a charging start instruction has been received from the user,”), *id.* (“If a charging start instruction from the user is received...”); [0022], [0018].

Furthermore, Izuno teaches when the user presses the start control, a signal is transmitted to server 100, server 100 calculates a charging schedule, and server 100 transmits the charging start signal to charging station 60 “in response to instructions from the user.” EX1004-Izuno, [0018], [0022] (“The service system server 100 periodically acquires and manages the user vehicle information, enabling optimal

and flexible charging control and monitoring...depending on what the user selects—automatic charging, start charging, or stop charging—it transmits a charging instruction to the charging station 60.”). Thus, when the user selects “start charging,” inductive charging via the first and second cores initiates. EX1003-Dec., ¶238.

As discussed above, Canedy teaches a processor/controller coupled with proximity sensors and a display via a communication bus. *See* Claim 1(b), 1(c)(i). Yokota teaches enabling a user control. *See* Claim 1(c)(vi). Thus, in the Izuno-Minoshima-Canedy-Yokota combination, the ECU/processor/controller is configured to perform the step of *in response to receiving a selection of the user control, initiate inductive charging via the first core and the second core*. EX1003-Dec., ¶239.

VI. GROUND 2: CLAIMS 7, 12-20 ARE OBVIOUS OVER IZUNO, MINOSHIMA, AND YOKOTA

Petitioner notes that Claims 7, 12-20 recite limitations captured in Claim 1, but do not recite a controller. Thus, Petitioner’s mappings for Claims 7, 12-20 are identical to those for Claim 1, but Canedy is not included.

A. Claim 7

1. ***Claim 7[Pre]: “A method of charging a battery of a vehicle, the method comprising:”***

See Claim 1(Pre).

2. ***Claim 7[a]: “detecting a positional relationship between a first core on the vehicle and a second core in a location exterior to the vehicle, the first and second cores enabling induction charging of the battery when sufficiently aligned with respect to one another;”***

Izuno-Minoshima teaches Claim 7(a). See Claims 1(Pre), 1(c)(i), 1(c)(v)-1(c)(vii).

3. ***Claim 7[b]: “detecting a misalignment of the first core with respect to the second core based at least in part on the positional relationship between the first core and the second core; and”***

Izuno-Minoshima teaches Claim 7(b). See Claim 1(c)(ii).

4. ***Claim 7[c]: “in response detecting the misalignment of the first core with respect to the second core, disabling a user control displayed on a display for controlling the induction charging of the battery.”***

Izuno-Minoshima-Yokota teaches Claim 7(c). See Claim 1(c)(iii).

B. Claim 12

1. ***Claim 12[Pre]: “The method of claim 7, wherein the positional relationship is a first positional relationship and further comprising:”***

See Claims 1(c)(ii), 7.

2. ***Claim 12[a]: “detecting a second positional relationship between the first core on the vehicle and the second core after detecting the first positional relationship,”***

See Claims 1(c)(iv), 7.

3. ***Claim 12[b]: “detecting an alignment of the first core with respect to the second core based within a predetermined threshold at least in part on the second positional relationship, and”***

See Claims 1(c)(v), 7. As discussed in Claim 1(c)(v), Minoshima’s distance for detecting alignment is “*predetermined*.” EX1005-Minoshima, Abstract, [0008]-[0009], [0013], [0011], [0041], [0065].

4. ***Claim 12[c]: “in response detecting the alignment [J]³ of the first core with respect to the second core, enabling the user control.”***

See Claims 1(c)(vi), 7.

- C. **Claim 13: “The method of claim 12, further comprising, in response to receiving a selection of the user control, initiating induction charging via the first core and the second core.”**

See Claims 1(c)(vii), 12.

- D. **Claim 14: “The method of claim 7, wherein the display is mounted within the vehicle.”**

See Claims 1(b), 7.

- E. **Claim 15**

1. ***Claim 15[Pre]: “A method of charging a battery of a vehicle, the method comprising:”***

Izuno teaches a method of charging a vehicle battery using electromagnetic induction (*a method of charging a battery of a vehicle*). See Claims 1(Pre), 7(Pre).

³ Correcting typographical error.

2. ***Claim 15[a]: “detecting a positional relationship between a first core on the vehicle and a second core in a location exterior to the vehicle, the first and second cores enabling induction charging of the battery when sufficiently aligned with respect to one another;”***

Izuno-Minoshima teaches Claim 15(a). *See* Claims 1(Pre), 1(c)(i), 1(v)-(vii).

3. ***Claim 15[b]: “detecting an alignment of the first core with respect to the second core within a predetermined threshold based at least in part on the positional relationship between the first core and the second core; and”***

Izuno-Minoshima teaches Claim 15(b). *See* Claims 1(c)(v), 12(b).

4. ***Claim 15[c]: “in response detecting the alignment of the first core with respect to the second core, enabling a user control displayed on a display for controlling the induction charging of the battery.”***

Izuno-Minoshima-Yokota teaches Claim 15(c). *See* Claim 1(c)(vi)-(vii).

F. Claim 16

1. ***Claim 16[Pre]: “The method of claim 15, wherein the positional relationship is a first positional relationship and further comprising:”***

See Claims 1(c)(iv), 15.

2. ***Claim 16[a]: “detecting a second positional relationship between the first core on the vehicle and the second core before detecting the [first]⁴ positional relationship;”***

See Claims 1(c)(i)-(ii), 15.

⁴ Correcting typographical error.

3. ***Claim 16[b]: “detecting a misalignment of the first core with respect to the second core based at least in part on the second positional relationship between the first core and the second core; and”***

See Claims 1(c)(i)-(ii), 15.

4. ***Claim 16[c]: “in response detecting the misalignment of the first core with respect to the second core, disabling the user control displayed on a display for controlling the induction charging of the battery.”***

See Claims 1(c)(iii), 15.

- G. **Claim 17: “The method of claim 16, further comprising providing information indicative of the second positional relationship to a user seated within the vehicle.”**

See Claims 1(b), 1(c)(i)-(iii), 16. In the combination, Minoshima’s “information indicating that the parking position is unsuitable” (e.g., “Parking Position NG”) and Yokota’s disabling of a menu item are each provided to the user and *information indicative of the second positional relationship* (i.e., misalignment).

See EX1003-Dec., ¶258; EX1005-Minoshima, [0011]-[0012], [0039].

- H. **Claim 18: “The method of claim 16, further comprising providing information indicative of the misalignment to a user seated within the vehicle.”**

See Claims 1(b), 1(c)(i)-(iii), 16-17.

- I. **Claim 19: “The method of claim 16, further comprising providing information indicative of changes of position of the vehicle with respect to the second core to a user seated within the vehicle.”**

See Claims 1(b), 1(c)(iv)-(vi), 16-17.

- J. Claim 20:** “The method of claim 15, further comprising initiating induction charging via the first core and the second core in response to receiving a selection of the user control.”

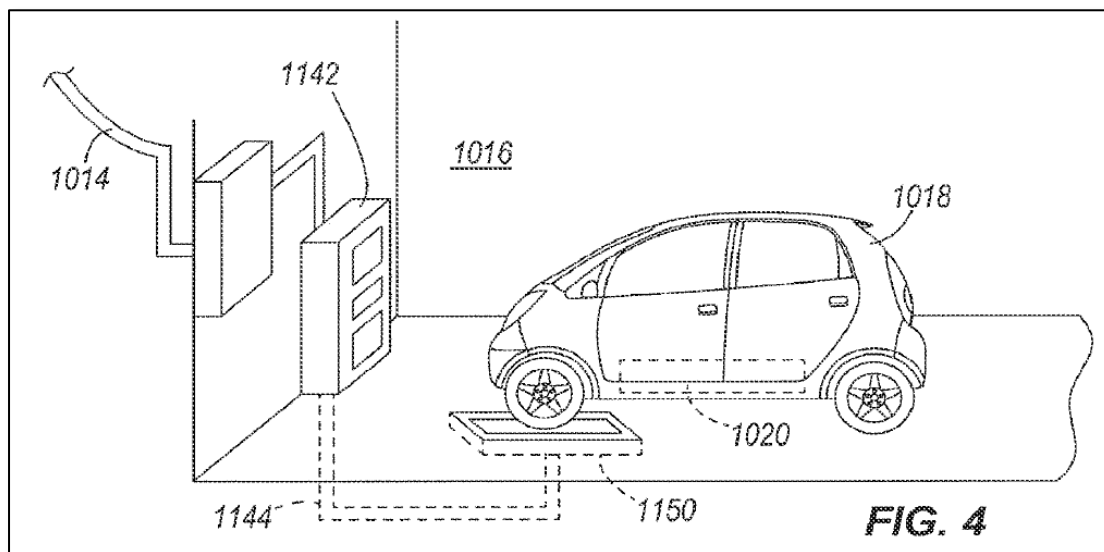
See Claims 1(c)(vii), 16.

VII. GROUND 3: CLAIM 2 IS OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, YOKOTA, AND ROSS

- A. Claim 2:** “The vehicle alignment system of claim 1, wherein the second core is part of a pad over which the first core is movable.”

1. '996 Patent's Charging Pad

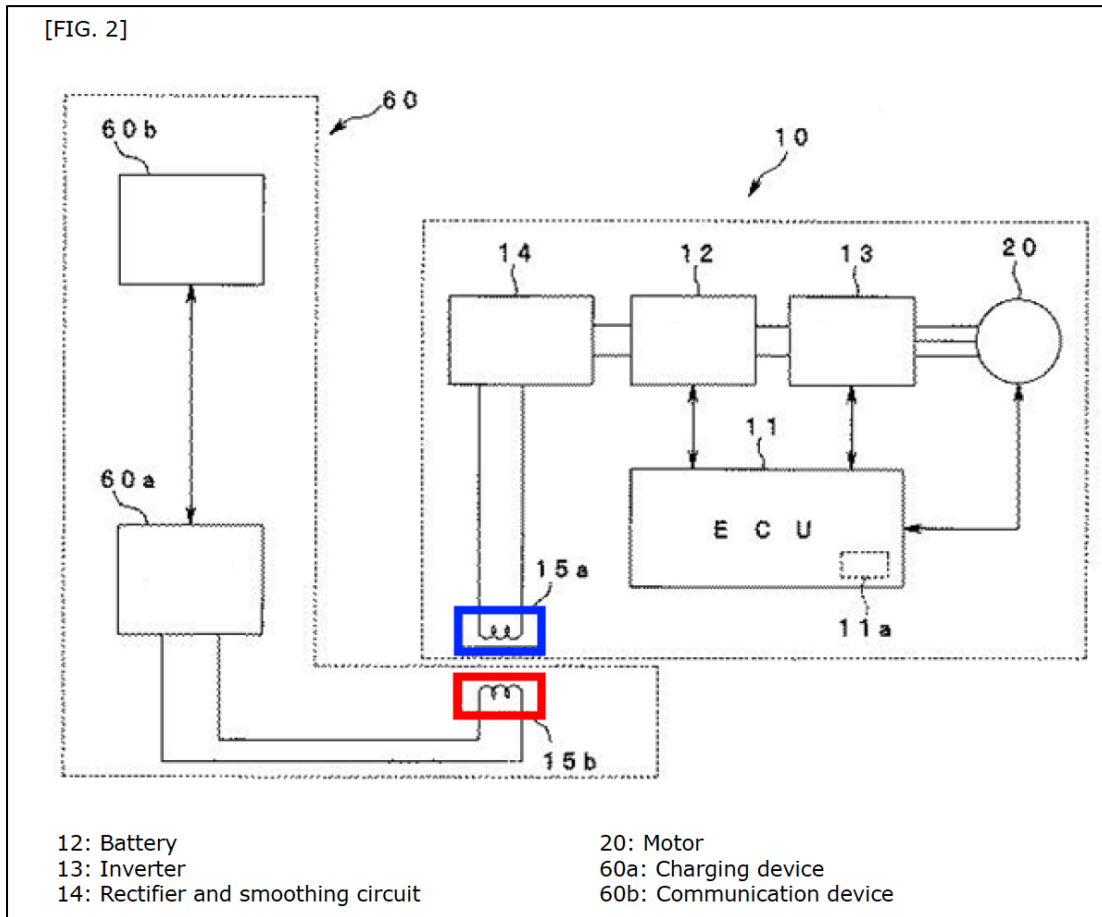
The '996 Patent depicts charging pad 1150 in Fig. 4:



EX1001, Fig. 4, 33:33-38. EX1003-Dec., ¶262.

2. Izuno's Charging Pad

Similarly, Izuno teaches coupler 15b in a parking space over which a user drives the vehicle to charge the battery. Fig. 2 depicts vehicle coupler 15a and charging station coupler 15b (*part of a pad*):

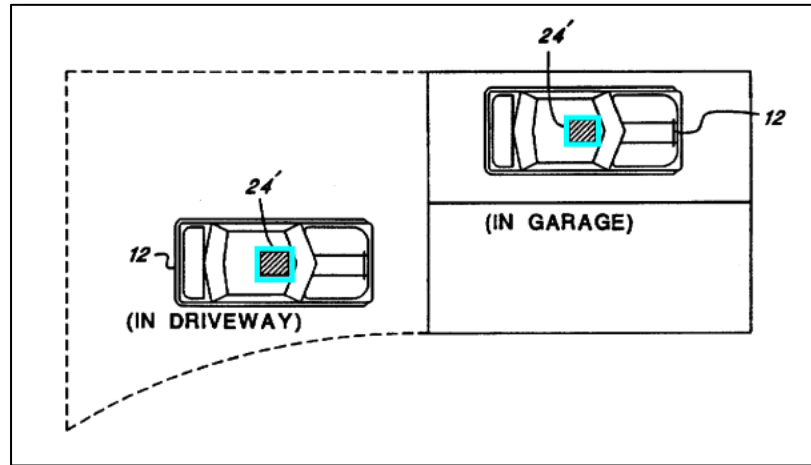


EX1004-Izuno, Fig. 2. Izuno's charging setup is a charging *pad* because a vehicle drives over the charger to perform inductive charging. EX1003-Dec., ¶¶263-265.

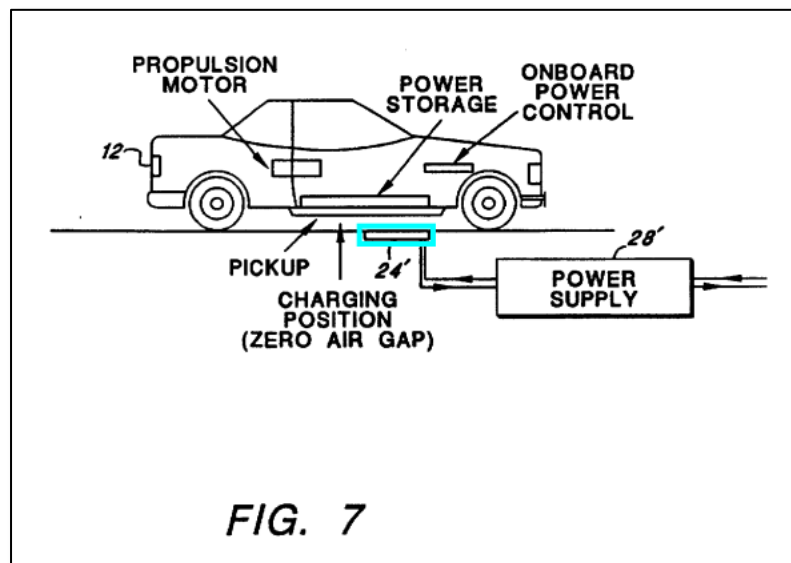
3. Ross's Charging Pad

To the extent it is argued Izuno does not teach a charging *pad*, Ross teaches a charging system for an electric vehicle utilizing charging pad 24 to inductively charge a vehicle's battery. EX1008-Ross, 18:1-10, 17:7-13, 9:11-43. Ross's charging pad 24 is "approximately 1 meter square and 3 cm thick" and "is installed on the surface of a driveway or garage floor." EX1008-Ross, 18:1-10. Ross teaches

“pad 24’ is used for an overnight recharging of the energy storage system 30” of the electric vehicle. *Id.* Fig. 7 depicts charging pad 24 and vehicles 12:



EX1008-Ross, Fig. 7 (excerpt). Charging pad 24 is located beneath a vehicle to perform inductive charging:



EX1008-Ross, Fig. 7 (excerpt).

4. *Motivation to Combine Izuno-Minoshima-Canedy-Yokota-Ross*

A POSITA would have been motivated and found it obvious to modify Izuno-Minoshima-Canedy-Yokota per Ross to utilize a charging pad instead of or in addition to Izuno's native charging arrangement. EX1003-Dec., ¶¶267-269. Utilizing a charging pad would have been a straightforward way to provide inductive charging at a user's home, for example, by arranging the charging pad in a garage or driveway. EX1003-Dec., ¶¶267-269. In another example, a charging pad would have been utilized in Izuno's native system in place of coupler 15b (and any other necessary related components), thus simplifying the parking space style charging arrangement. EX1003-Dec., ¶¶267-269. Thus, whether at a charging station such as Izuno's or at home, a user would have been able to use Izuno's native charging method with a charging pad, per Ross. EX1003-Dec., ¶¶267-269. This modification would have provided users with additional charging options that would not have required a permanent installation but instead the charging pad would have sat on a surface, such as a parking space, driveway, or garage floor. EX1003-Dec., ¶¶267-269. Using Ross's known technique of utilizing a charging pad for implementing inductive charging would have improved the similar Izuno combination in the same way as Ross. EX1003-Dec., ¶¶267-269. Further, this modification would have been a simple substitution of a charging pad for a parking-space charging station to obtain the predictable result of charging an electric vehicle. EX1003-Dec., ¶¶267-269.

A POSITA would have had a reasonable expectation of success when modifying the Izuno combination per Ross. EX1003-Dec., ¶¶270-271. Implementing Ross's charging pad would have required only straightforward modifications, such as a charging pad and sufficient electrical connections to utilize a charging pad in a user's home (e.g., garage or driveway) or at a charging station, such as in Izuno's native arrangement. EX1003-Dec., ¶¶270-271. Because the Izuno combination's vehicle is already configured to perform inductive charging, using a charging pad such as Ross's would have been a straightforward modification. EX1003-Dec., ¶¶270-271.

VIII. GROUND 4: CLAIM 3 IS OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, YOKOTA, AND KUKI

- A. Claim 3: The vehicle alignment system of claim 1, wherein the controller is configured to detect the first positional relationship between the first core and the second core based at least in part on detection of a magnetic field.**

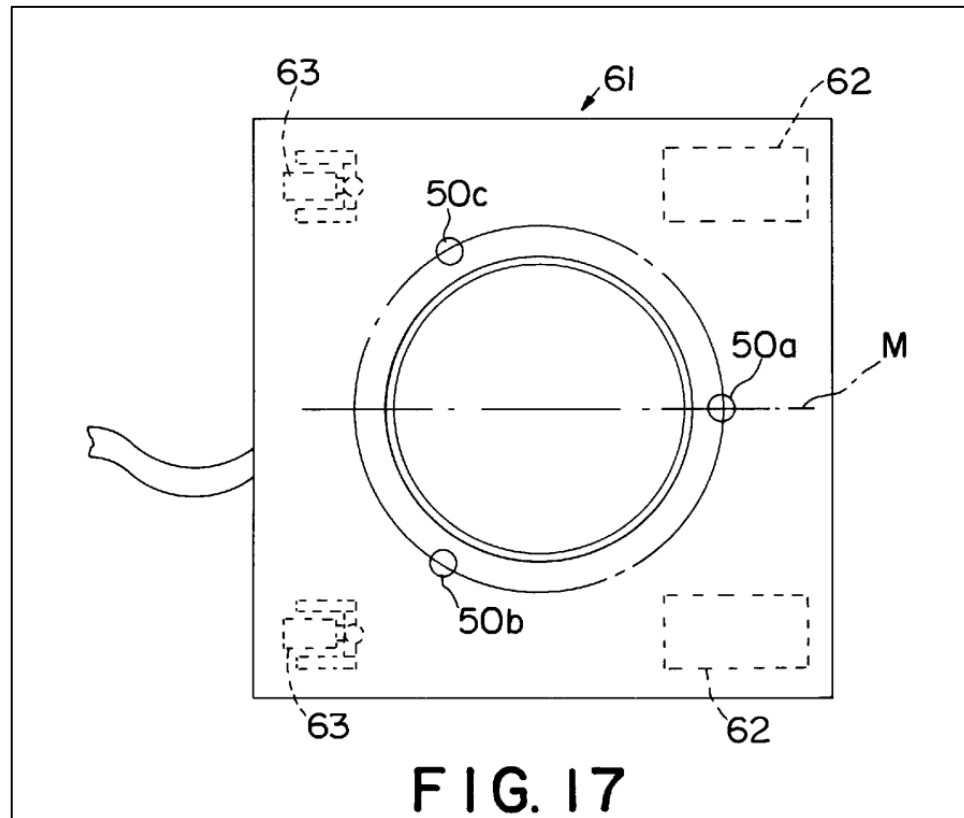
As discussed above, the Izuno combination teaches a controller configured to detect a first positional relationship between the two cores. *See* Claim 1. EX1003-Dec., ¶272.

Kuki teaches using magnetic sensors (magnetometers) for detecting positioning of cores in a vehicle and in a charger in an inductive charging system. In the modified Izuno combination, the proximity sensors would be supplemented with

Kuki teaches a vehicle inductive charging system utilizing three magnetic sensors (50a-c) for determining when the vehicle core and charger core are aligned. EX1009-Kuki, 10:19-34, 10:65-11:24, 12:39-51, Figs. 17, 21. In one embodiment, Kuki teaches arranging the sensors in a triangle formation, allowing for magnetic field strength to be detected in both X- and Y-axis directions. *Id.* Thus, when the magnetic field detected by each sensor is equal, the two cores are aligned. *Id.*; EX1003-Dec., ¶274. Fig. 21 depicts sensors 50a-c and a vehicle with a core to be charged inductively:



EX1009-Kuki, Fig. 21. Fig. 17 below depicts a zoomed in view of magnetic sensors 50a-c:



EX1009-Kuki, Fig. 17. While Kuki depicts magnetic sensors 50a-c in the charging coil apparatus, it was also known to locate magnetic sensors in the vehicle instead. EX1003-Dec., ¶275.

While either configuration would have resulted in a functional aligning system, Petitioner's combination simply adds magnetic sensors (or replaces proximity sensors with simple substitution) in the Izuno combination vehicle, including because the Izuno combination vehicle already includes a processor, display, and proximity sensors for providing positioning information to a driver.

EX1003-Dec., ¶276; EX1005-Minoshima, [0059]. Thus, Petitioner's proposed modification is merely combining prior art elements according to known methods or a simple substitution. EX1003-Dec., ¶276.

2. *Motivation to Combine Izuno-Minoshima-Canedy-Yokota-Kuki*

A POSITA would have been motivated and found it obvious to modify the Izuno combination to either supplement the proximity sensors with magnetic sensors or to do a simple substitution of magnetic sensors instead of proximity sensors to provide a more direct and accurate measurement for determining when the cores are aligned compared to proximity sensors. EX1003-Dec., ¶277.

Kuki's known technique of using magnetic sensors for positioning cores for inductive charging would have improved the similar Izuno-Minoshima-Canedy-Yokota vehicle and system in the same way as Kuki's vehicle and system. EX1003-Dec., ¶¶278-280. This modification is merely combining prior art elements (e.g., sensors, vehicle) according to known methods to yield predictable result of configuring a controller to use magnetic sensors to detect magnetic field strength to perform positioning of cores for inductive charging. EX1003-Dec., ¶¶278-280. Alternatively, when modifying the Izuno combination by utilizing magnetic sensors instead of proximity sensors, this simple substitution of one known element/sensor for another element/sensor would have yielded predictable results. EX1003-Dec., ¶¶278-280.

A POSITA would have had a reasonable expectation of success for several reasons. First, vehicles using magnetic sensors for positioning and other functions were known in the prior art. EX1003-Dec., ¶¶281-282. Thus, a POSITA would have expected a similar result when utilizing magnetic sensors in the Izuno vehicle combination. EX1003-Dec., ¶¶281-282. Second, using three or more sensors like Kuki discloses allows for triangulating positioning based on detection of magnetic field strength. Thus, the Izuno combination would have detected core alignment in both the X- and Y-axis. EX1003-Dec., ¶¶281-282. This would have led a POSITA to a reasonable expectation of success when using magnetic sensors for aligning the two cores. EX1003-Dec., ¶¶281-282.

Third, magnetic sensors were commercially available, off-the-shelf components that a POSITA would have been aware of. EX1003-Dec., ¶¶283-284. Modifying Izuno would have required simply adding magnetic sensors around the vehicle-side coil in a configuration such as Kuki discloses and performing any necessary modifications to programming instructions to utilize additional or different sensors, which would have been straightforward and routine. EX1003-Dec., ¶¶283-284. Indeed, Kuki teaches storing programming instructions in memory (storage device 183). EX1009-Kuki, 19:45-52, 19:62-65, Fig. 44. In the Izuno combination vehicle, such programming instructions would have been stored in

vehicle memory and processed by the vehicle's processor. EX1003-Dec., ¶¶283-284.

IX. GROUND 5: CLAIMS 4-6 ARE OBVIOUS OVER IZUNO, MINOSHIMA, CANEDY, YOKOTA, AND SHIMIZU

- A. Claim 4: The vehicle alignment system of claim 1, wherein the controller is further configured to, in response to detecting the misalignment, generate an indicator for display on the display, the indicator indicating a direction of movement of the vehicle for improved alignment of the first core with respect to the second core.**

1. *Minoshima's Indicator Generation*

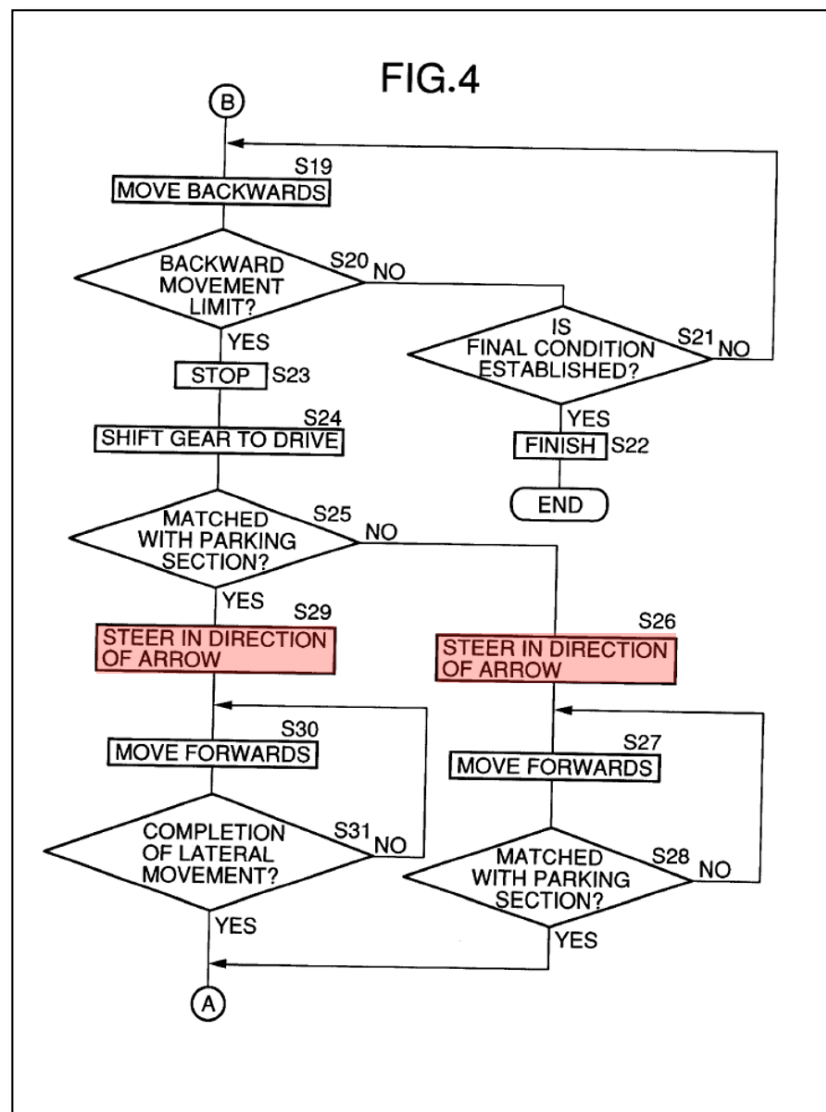
As discussed above, the Izuno combination vehicle includes a controller configured to control a display and provide directions to a user for repositioning a vehicle so that the cores are aligned for inductive charging. *See* Claim 1. Minoshima teaches providing an indicator on a vehicle display to indicate misalignment/alignment of the cores, such as “the direction of misalignment when the parking orientation is unsuitable... [and] enabling the driver to determine whether the misalignment is left or right.” EX1005-Minoshima, [0056]; *see* Claim 1; EX1003-Dec., ¶285.

The motivation to modify Izuno per Minoshima provided in Claims 1(c)(i)-(v) applies herein.

2. *Shimizu's Indicator Generation*

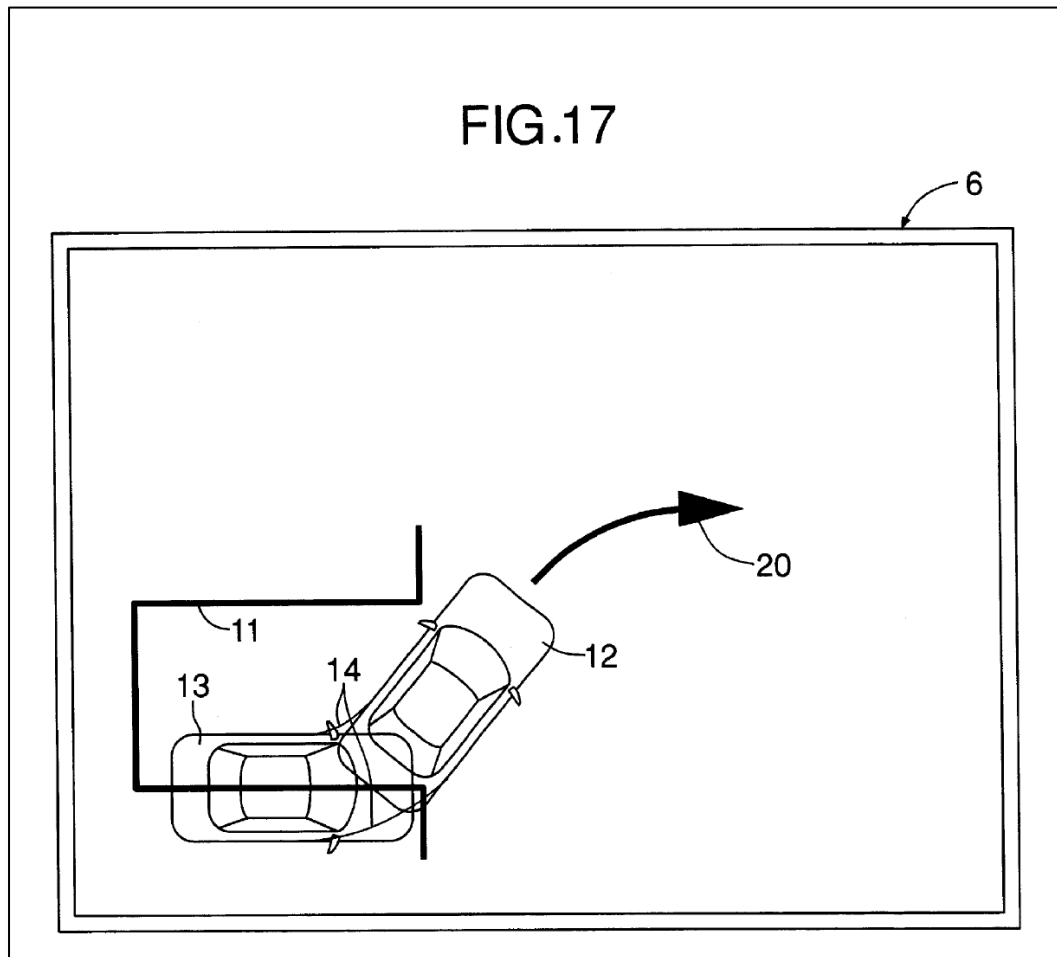
To the extent PO argues the Izuno combination does not teach *generating an indicator...indicating a direction of movement of the vehicle for improved*

alignment, Shimizu does. Shimizu teaches a system for aiding a driver in parking where the vehicle includes a display for displaying parking-aiding information including a target parking position and a vehicle position. EX1010-Shimizu, Abstract, 5:7-13, 5:41-48, 13:1-43; EX1003-Dec., ¶287. Fig. 4 depicts a flowchart including a driver steering in the direction of an arrow on display 6 to properly park the vehicle in the target space:



EX1010-Shimizu, Fig. 4.

Specifically, Shimizu teaches displaying a vehicle and indicator (e.g., arrow) on a display where the arrow is in relation to a graphical representation of the vehicle to aid the driver in positioning the vehicle within the target parking space:



EX1010-Shimizu, Fig. 17, *see also id.*, Figs. 18-19. EX1003-Dec., ¶288.

3. *Motivation to Combine Izuno-Minoshima-Canedy-Yokota-Shimizu*

A POSITA would have been motivated and found it obvious to modify Izuno-Minoshima-Canedy-Yokota per Shimizu to advantageously configure a controller to

provide a directional indicator (e.g., arrow) on a display to assist in repositioning a vehicle to a particular parking position, such as a position where the two cores are aligned and inductive charging can begin. EX1003-Dec., ¶289. Shimizu's arrow indicators would have provided simple, accurate, easy-to-understand directions for repositioning the vehicle. EX1003-Dec., ¶289. This use of Shimizu's known technique for assisting a driver in parking would have improved the similar Izuno-Minoshima-Canedy-Yokota vehicle in the same way as Shimizu's vehicle. EX1003-Dec., ¶289.

Where arrows are used in place of some other indicator (e.g., lights), modifying the Izuno combination's vehicle would have been a simple substitution of arrows instead of lights or other indicators, and would have yielded predictable results of assisting a driver. EX1003-Dec., ¶¶290-291. Using arrows in lieu of or in addition to other indicators, such as lights and words would have been obvious to try since there are a finite number of symbols used to indicate direction to a user on a display (e.g., words, arrows), and the modification would have had a reasonable expectation of success in better assisting the driver in positioning the vehicle for alignment. EX1003-Dec., ¶¶290-291.

A POSITA would have had a reasonable expectation of success when modifying the Izuno combination per Shimizu. EX1003-Dec., ¶¶292-293. Izuno-Minoshima already teaches determining proper alignment of charging cores and

notifying a user to reposition the vehicle. *See* Claim 1. Minoshima teaches providing indications to a driver to reposition the vehicle including on display 34 and/or indicator lights 32. EX1005-Minoshima, [0052], [0056], Figs. 6-7 (depicting indicator lights 32 and display 34); EX1003-Dec., ¶¶292-293. Shimizu expressly discloses depicting an arrow on a display to indicate to a driver the direction to reposition the vehicle to a target parking position. EX1003-Dec., ¶¶292-293.

Thus, modifying the Izuno combination per Shimizu would have required only routine and straightforward changes to programming instructions to depict an arrow on a display in addition to or in lieu of Minoshima's positional indication teachings. EX1003-Dec., ¶¶294-295. No hardware modification would have been required, as the Izuno combination already includes a processor, display, and sensors. EX1003-Dec., ¶¶294-295. Specifically, as discussed above, the Izuno combination already teaches using a controller configured to control a display, such that controlling a display to depict arrows would have been a natural use of the Izuno combination's existing hardware. EX1003-Dec., ¶¶294-295. Additionally, modifying programming instructions would have been well-within the skillset of a POSITA, leading to a reasonable expectation of success. EX1003-Dec., ¶¶294-295.

- B. Claim 5: The vehicle alignment system of claim 4, wherein the indicator comprises an arrow indicating the direction of movement.**

Izuno-Minoshima-Canedy-Yokota-Shimizu teaches displaying *an arrow indicating the direction of movement*. See Claim 4.

- C. Claim 6: The vehicle alignment system of claim 4, wherein the controller is configured to generate the indicator in a position relative to a graphical representation of at least part of the vehicle displayed on the display.**

See Claim 4.

X. GROUND 6: CLAIMS 8-10 ARE OBVIOUS OVER IZUNO, MINOSHIMA, YOKOTA, AND SHIMIZU

- A. Claim 8: “The method of claim 7, further comprising, in response to detecting the misalignment of the first core with respect to the second core, generating an indicator for display on the display, the indicator indicating a direction of movement of the vehicle for improved alignment of the first core with respect to the second core.”**

See Claims 4, 7.

- B. Claim 9: “The method of claim 8, wherein the indicator comprises an arrow indicating the direction of movement.”**

See Claims 5, 7-8.

- C. Claim 10: “The method of claim 8, wherein the indicator is displayed in a position relative to a graphical representation of at least part of the vehicle displayed on the display.”**

See Claims 6-8.

XI. GROUND 7: CLAIM 11 IS OBVIOUS OVER IZUNO, MINOSHIMA, YOKOTA, AND ROSS

A. Claim 11: “The method of claim 7, wherein the second core is part of a pad over which the first core is movable.”

See Claims 2, 7.

XII. CONCLUSION

Petitioner respectfully requests *inter partes* review of the Challenged Claims.

Respectfully submitted,

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COUNSEL FOR PETITIONER

XIII. MANDATORY NOTICES UNDER 37 C.F.R. §42.8(A)(1)

A. Real Party-In-Interest

Petitioner is the real party-in-interest. 37 C.F.R. §42.8(b)(1).

B. Related Matters

The Parties are currently involved in the following Litigation involving the '996 Patent (and related patents): *ChargeLogic LLC v. Tesla, Inc.*, W.D. Tex., Case No. 7:26-cv-00100. Petitioner is not aware of any other proceedings involving the '996 Patent.

C. Lead and Back-Up Counsel

Petitioner provides the following designation and service information for lead and back-up counsel. 37 C.F.R. §§42.8(b)(3) and (b)(4).

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D. 37 C.F.R. § 42.8(b)(4) – Service Information

Please address all correspondence to the lead and back-up counsel as shown above. Petitioner consents to electronic service by e-mail at the e-mail addresses provided above.

CLAIM LISTING APPENDIX
U.S. Patent No. 11,508,996 for Claims 1-20

Claim Designation	Claim Language
Claim 1[Pre]	A vehicle alignment system for an inductive vehicular battery charger having a first core movable with respect to a second core to charge a battery of a vehicle, the vehicle alignment system comprising:
Claim 1[a]	a controller; and
Claim 1[b]	a display mounted within the vehicle, oriented for view by a user seated in the vehicle, and coupled to the controller;
Claim 1[c]	wherein the controller is configured to:
Claim 1[c(i)]	detect a first positional relationship between the first core and the second core at a first time,
Claim 1[c(ii)]	detect a misalignment of the first core with respect to the second core based at least in part on the first positional relationship between the fir[st] core and the second core,
Claim 1[c(iii)]	in response to detecting the misalignment, disable at least one user control on the display usable to control the inductive charging of the battery,
Claim 1[c(iv)]	detect a second positional relationship between the first core and the second core at a second time occurring after movement of the vehicle,
Claim 1[c(v)]	detect an alignment of the first core with respect to the second core within a threshold based at least in part on the second positional relationship between the first core and the second core,
Claim 1[c(vi)]	in response to detecting the alignment, enable the user control on the display, and
Claim 1[c(vii)]	in response to receiving a selection of the user control, initiate inductive charging via the first core and the second core.
Claim 2	The vehicle alignment system of claim 1, wherein the second core is part of a pad over which the first core is movable.
Claim 3	The vehicle alignment system of claim 1, wherein the controller is configured to detect the first positional relationship between the first core and the second core based at least in part on detection of a magnetic field.

Claim Designation	Claim Language
Claim 4	The vehicle alignment system of claim 1, wherein the controller is further configured to, in response to detecting the misalignment, generate an indicator for display on the display, the indicator indicating a direction of movement of the vehicle for improved alignment of the first core with respect to the second core.
Claim 5	The vehicle alignment system of claim 4, wherein the indicator comprises an arrow indicating the direction of movement.
Claim 6	The vehicle alignment system of claim 4, wherein the controller is configured to generate the indicator in a position relative to a graphical representation of at least part of the vehicle displayed on the display.
Claim 7[Pre]	A method of charging a battery of a vehicle, the method comprising:
Claim 7[a]	detecting a positional relationship between a first core on the vehicle and a second core in a location exterior to the vehicle, the first and second cores enabling induction charging of the battery when sufficiently aligned with respect to one another;
Claim 7[b]	detecting a misalignment of the first core with respect to the second core based at least in part on the positional relationship between the first core and the second core; and
Claim 7[c]	in response detecting the misalignment of the first core with respect to the second core, disabling a user control displayed on a display for controlling the induction charging of the battery.
Claim 8	The method of claim 7, further comprising, in response to detecting the misalignment of the first core with respect to the second core, generating an indicator for display on the display, the indicator indicating a direction of movement of the vehicle for improved alignment of the first core with respect to the second core.
Claim 9	The method of claim 8, wherein the indicator comprises an arrow indicating the direction of movement.

Claim Designation	Claim Language
Claim 10	The method of claim 8, wherein the indicator is displayed in a position relative to a graphical representation of at least part of the vehicle displayed on the display.
Claim 11	The method of claim 7, wherein the second core is part of a pad over which the first core is movable.
Claim 12[Pre]	The method of claim 7, wherein the positional relationship is a first positional relationship and further comprising:
Claim 12[a]	detecting a second positional relationship between the first core on the vehicle and the second core after detecting the first positional relationship,
Claim 12[b]	detecting an alignment of the first core with respect to the second core based within a predetermined threshold at least in part on the second positional relationship, and
Claim 12[c]	in response detecting the alignment misalignment of the first core with respect to the second core, enabling the user control.
Claim 13	The method of claim 12, further comprising, in response to receiving a selection of the user control, initiating induction charging via the first core and the second core.
Claim 14	The method of claim 7, wherein the display is mounted within the vehicle.
Claim 15[Pre]	A method of charging a battery of a vehicle, the method comprising:
Claim 15[a]	detecting a positional relationship between a first core on the vehicle and a second core in a location exterior to the vehicle, the first and second cores enabling induction charging of the battery when sufficiently aligned with respect to one another;
Claim 15[b]	detecting an alignment of the first core with respect to the second core within a predetermined threshold based at least in part on the positional relationship between the first core and the second core; and

Claim Designation	Claim Language
Claim 15[c]	in response detecting the alignment of the first core with respect to the second core, enabling a user control displayed on a display for controlling the induction charging of the battery.
Claim 16[Pre]	The method of claim 15, wherein the positional relationship is a first positional relationship and further comprising:
Claim 16[a]	detecting a second positional relationship between the first core on the vehicle and the second core before detecting the second positional relationship;
Claim 16[b]	detecting a misalignment of the first core with respect to the second core based at least in part on the second positional relationship between the first core and the second core; and
Claim 16[c]	in response detecting the misalignment of the first core with respect to the second core, disabling the user control displayed on a display for controlling the induction charging of the battery.
Claim 17	The method of claim 16, further comprising providing information indicative of the second positional relationship to a user seated within the vehicle.
Claim 18	The method of claim 16, further comprising providing information indicative of the misalignment to a user seated within the vehicle.
Claim 19	The method of claim 16, further comprising providing information indicative of changes of position of the vehicle with respect to the second core to a user seated within the vehicle.
Claim 20	The method of claim 15, further comprising initiating induction charging via the first core and the second core in response to receiving a selection of the user control.

APPENDIX OF EXHIBITS

Exhibit 1001	U.S. Patent No. 11,508,996 (“the ’996 Patent”)
Exhibit 1002	U.S. Patent No. 11,508,996 File History (“the ’996 File History”)
Exhibit 1003	Declaration of Scott Andrews
Exhibit 1004	Japanese Application Publication 2006-74868 to Izuno et al. (“Izuno”)
Exhibit 1005	Japanese Application Publication H09-182212 to Minoshima et al. (“Minoshima”)
Exhibit 1006	U.S. Patent No. 5,701,222 to Canedy (“Canedy”)
Exhibit 1007	U.S. Patent Application Pub. No. 2002/0105549 to Yokota (“Yokota”)
Exhibit 1008	U.S. Patent No. 5,669,470 to Ross (“Ross”)
Exhibit 1009	U.S. Patent No. 5,821,731 to Kuki et al. (“Kuki”)
Exhibit 1010	U.S. Patent No. 6,657,555 to Shimizu et al. (“Shimizu”)
Exhibit 1011	Willett Kempton and Jasna Tomić. <i>Vehicle-to-grid power fundamentals: Calculating capacity and net revenue</i> . Journal of Power Sources. 2005. 144. pp. 268–279 (“Kempton”)
Exhibit 1012	Chan, C.C., <i>The State of the Art of Electric and Hybrid Vehicles</i> , February 2002, Vol. 90, No. 2, IEEE (“Chan”)
Exhibit 1013	<i>Electric Vehicle Battery Systems</i> , Sandeep Dhameja, Newnes, 2002 (“Sandeep”)
Exhibit 1014	Weed, R. <i>Electric Vehicles: Copper Applications in Electrical</i> . February 1998. (“Weed”)
Exhibit 1015	Mahmood, Nasrul Humaimi, et al. <i>Cableless battery charger using induction technique for electric vehicles</i> . Proceedings. Student Conference on Research and Development, 2003. SCORED 2003. IEEE, 2003. (“Mahmood”)
Exhibit 1016	Laouamer, R., et al. <i>A multi-resonant converter for non-contact charging with electromagnetic coupling</i> . Proceedings of the IECON'97 23rd International Conference on Industrial Electronics, Control, and Instrumentation. Vol. 2. IEEE, 1997. (“Laouamer”)
Exhibit 1017	Covic, Grant A., et al. <i>A three-phase inductive power transfer system for roadway-powered vehicles</i> . IEEE transactions on industrial electronics 54.6 (2007). (“Covic”)

Exhibit 1018	Esser, Albert. <i>Contactless charging and communication system for electric vehicles</i> . Conference Record of the 1993 IEEE Industry Applications Conference Twenty-Eighth IAS Annual Meeting. IEEE, 1993. (“Esser”)
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Exhibit 1026	U.S. Patent No. 7,084,859 to Pryor (“Pryor”)
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Exhibit 1028	U.S. Patent Publication No. 2003/0230443 to Cramer et al. (“Cramer”)
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CERTIFICATION OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. § 42.24 that the foregoing Petition for *Inter Partes* Review, excluding any table of contents, mandatory notices under 37 C.F.R. § 42.8, certificates of service or word count, or appendix of exhibits, contains 13,901 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: June 18, 2026

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**CERTIFICATE OF SERVICE ON PATENT OWNER
UNDER 37 C.F.R. § 42.105**

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(b), the undersigned certifies that on June 18, 2026, a complete and entire copy of this Petition for *Inter Partes* Review and Exhibits were provided via Federal Express to the Patent Owner by serving the correspondence address of record for the '996 Patent:

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Further, a courtesy copy of this Petition for *Inter Partes* Review was sent via email to Patent Owner's litigation counsel:

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