

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Langlotz	Attorney Docket No. 49649-0056IP1
U.S. Patent No.:	11,932,230	
Issue Date:	March 19, 2024	
Appl. Serial No.:	18/205,823	
Filing Date:	June 5, 2023	
Title:	VEHICLE GEAR SELECTION CONTROL	

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**PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT
NO. 11,932,230 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42**

TABLE OF CONTENTS

I.	REQUIREMENTS FOR IPR	1
A.	Grounds for Standing.....	1
B.	Challenge and Relief Requested.....	1
II.	THE '230 PATENT	3
A.	Brief Description.....	3
B.	Prosecution History.....	6
C.	Level of Ordinary Skill in the Art.....	6
D.	Claim Construction	6
III.	THE CHALLENGED CLAIMS ARE UNPATENTABLE.....	7
A.	GROUND 1A—Obvious based on Joos (Claims 1-4, 13, 15, 17).....	7
1.	Overview of Joos.....	7
2.	Claim Element Analysis.....	8
B.	GROUND 1B—Obvious based on Joos in view of Kischkat (Claims 5, 9-12, 18).....	31
1.	Overview of Kischkat.....	31
2.	Combination of Joos and Kischkat.....	32
3.	Claim Element Analysis.....	35
C.	GROUND 1C—Obvious based on Joos in view of Kischkat and Alexi (Claims 5, 7, 15-16)	43
1.	Overview of Alexi.....	43
2.	Combination of Joos, Kischkat, and Alexi	45
3.	Claim Element Analysis.....	47
D.	GROUND 1D—Obvious based on Joos in view of Kischkat and Matters (Claims 5, 8, 13-14)	49
1.	Overview of Matters.....	49
2.	Combination of Joos, Kischkat, and Matters	50
3.	Claim Element Analysis.....	52
E.	GROUND 2A—Obvious based on Joos in view of Bettger (Claims 1-4, 13, 15, 17)	54
1.	Overview of Bettger	54
2.	Combination of Joos and Bettger.....	55
3.	Claim Element Analysis.....	58
F.	GROUND 2B—Obvious based on Joos in view of Bettger and Kischkat (Claims 5-6, 9-12, 18).....	60
1.	Combination of Joos, Bettger, and Kischkat.....	60
2.	Claim Element Analysis.....	61

G.	GROUND 2C—Obvious based on Joos in view of Bettger, Kischkat, and Allexi (Claims 5, 7, 15-16)	62
H.	GROUND 2D—Obvious based on Joos in view of Bettger, Kischkat, and Matters (Claims 5, 8, 13-14)	62
I.	GROUND 3A—Obvious based on Joos in view of Bayer (Claims 1-4, 13, 15, 17)	63
1.	Overview of Bayer	63
2.	Combination of Joos and Bayer	64
3.	Claim Element Analysis	67
J.	GROUND 3B—Obvious based on Joos in view of Bayer and Kischkat (Claims 5, 9-12)	70
K.	GROUND 3C—Obvious based on Joos in view of Bayer, Kischkat, and Allexi (Claims 5, 7, 15-16)	70
L.	GROUND 3D—Obvious based on Joos in view of Bayer, Kischkat, and Matters (Claims 5, 8, 13-14)	71
IV.	CONCLUSION AND FEES	71
V.	MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)	71
A.	Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)	71
B.	Related Matters Under 37 C.F.R. § 42.8(b)(2)	71
C.	Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)	72
D.	Service Information	73

LIST OF EXHIBITS

TESLA-1001	U.S. Patent No. 11,932,230 to Langlotz (“the ’230 Patent”)
TESLA-1002	Excerpts from the Prosecution History of the ’230 Patent
TESLA-1003	Declaration and Curriculum Vitae of Jason Janet, Ph.D.
TESLA-1004	U.S. Patent Application Publication No. 2019/0233009 to Joos et al. (“Joos”)
TESLA-1005	European Patent No. EP2135788B1 to Kischkat (“Kischkat”), English Translation, Original Document, and Certification
TESLA-1006	U.S. Patent Application Publication No. 2019/0161086 to Bettger (“Bettger”)
TESLA-1007	U.S. Patent Application Publication No. 2007/0282502 to Bayer et al. (“Bayer”)
TESLA-1008	Abdallah et al., <i>Real-Time Vehicle Localization Using Steering Wheel Angle in Urban Cities</i> , 2023 IEEE International Conference on Mobility, Operations, Services and Technologies (“Abdallah”)
TESLA-1009	U.S. Patent No. 10,077,073 to Allexi et al. (“Allexi”)
TESLA-1010	U.S. Patent Application Publication No. 2014/0222252 to Matters et al. (“Matters”)
TESLA-1011	U.S. Patent Application Publication No. 2018/0201319 to Rogers
TESLA-1012	U.S. Patent Application Publication No. 2020/0369140 to McCarron et al.
TESLA-1013	U.S. Patent Application Publication No. 2018/0093655 to Healy et al.

TESLA-1014	U.S. Patent Application Publication No. 2022/0355636 to Harmon et al.
TESLA-1015	U.S. Patent Application Publication No. 2019/0178998 to Pacala et al.
TESLA-1016	U.S. Patent Application Publication No. 2019/0146500 to Yalla et al.
TESLA-1017	U.S. Patent Application Publication No. 2020/0180633 to Wu
TESLA-1018	U.S. Patent Application Publication No. 2020/0369262 to Suzuki et al. (“Suzuki”)
TESLA-1019	U.S. Patent Application Publication No. 2014/0200769 to Noh (“Noh”)
TESLA-1020	U.S. Patent No. 11,753,000 to Tashiro et al. (“Tashiro”)
TESLA-1021	U.S. Patent Application Publication No. 2007/0291130 to Broggi et al. (“Broggi”)
TESLA-1022	U.S. Patent Application Publication No. 2019/0291721 to Sakano et al. (“Sakano”)
TESLA-1023	RESERVED
TESLA-1024	Parking & Reversing In & Out of Angled Spaces, A1 Driving School (Nov. 23, 2022), <i>available at</i> https://www.a1drivingschool.co.nz/guides/parking-and-reversing-in-and-out-of-angled-spaces/
TESLA-1025	How to Back Up, Safe2Drive (Sept. 26, 2023), <i>available at</i> https://web.archive.org/web/20230926120717/https://www.safe2drive.com/how-to/how-to-backup
TESLA-1026	RESERVED
TESLA-1027	U.S. Patent Application Publication No. 2020/0133272 to

Chong (“Chong”)

TESLA-1028	U.S. Patent Application Publication No. 2022/0297744 to Watanabe (“Watanabe”)
TESLA-1029	U.S. Patent Application Publication No. 2019/0317516 to Zhu (“Zhu”)
TESLA-1030-1099	[RESERVED]
TESLA-1100	Original Complaint, <i>Bulletproof Property Management LLC v. Tesla, Inc.</i> , Civil Action No. 1:25-cv-00665 (W.D. Tex. May 5, 2025)
TESLA-1101	Amended Complaint, <i>Bulletproof Property Management LLC v. Tesla, Inc.</i> , Civil Action No. 1:25-cv-00665 (W.D. Tex. August 11, 2025)

LISTING OF CHALLENGED CLAIMS

Claim 1	
1[p]	A motor vehicle comprising:
1[a]	a frame having wheels;
1[b]	a motor connected to the frame;
1[c]	a steering control connected to the wheels to establish a steering angle;
1[d]	a controller operably connected to the steering control, to the motor, and to the wheels;
1[e]	the controller operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode; and
1[f]	the controller operable to select a direction for driving the wheels in response to a pattern of steering angle movements, without operator indication of a direction.
Claim 2	
2	The motor vehicle of claim 1 wherein the controller is operable to change from reverse mode to drive mode without operation of a selector by a driver.
Claim 3	
3	The motor vehicle of claim 1 wherein the controller is operable while the vehicle is underway in one of the forward and reverse directions, and has stopped momentarily, to determine whether to remain in the same direction or to change direction.
Claim 4	
4	The motor vehicle of claim 1 wherein the pattern of steering angle movements includes steering in a first direction, then steering in the opposite direction.
Claim 5	
5	The motor vehicle of claim 1 wherein the controller is operable to

	offer an auto-shift in response to a prior pattern of vehicle operation based on at least one of distance traveled, velocity profile, and steering angle profile.
Claim 6	
6	The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if steering angles in a limited prior period were greater than a selected threshold.
Claim 7	
7	The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if velocities are less than a selected threshold.
Claim 8	
8	The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if distance traveled is less than a selected threshold.
Claim 9	
9	The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if a first limited distance associated with vehicle length was covered with a steering angle less than a first threshold, and a second distance was traveled with a steering angle greater than a second selected threshold and in a first direction, and the vehicle subsequently stops, and the steering angle is adjusted to a second direction opposite the first direction.
Claim 10	
10	The motor vehicle of claim 1 including a driver input device operably connected to the controller, and wherein the controller is operable to offer an auto-shift and enact the auto-shift in response to a user acceptance action on the driver input device.
Claim 11	
11	The motor vehicle of claim 10 wherein the driver input device is a brake pedal.
Claim 12	
12	The motor vehicle of claim 10 wherein the driver input device is a

	control selected from the group of controls including buttons, knobs, levers, and touch sensitive displays.
Claim 13	
13	The motor vehicle of claim 1 wherein the controller is operable to select a direction for wheel driving in response to a pattern of distance traveled.
Claim 14	
14	The motor vehicle of claim 13 wherein the controller is operable to offer an auto-shift only if the distance traveled is less than a selected threshold.
Claim 15	
15	The motor vehicle of claim 1 wherein the controller is operable to select a direction for wheel driving in response to a pattern of velocity.
Claim 16	
16	The motor vehicle of claim 15 wherein the controller is operable to offer an auto-shift only if the velocity is less than a selected threshold.
Claim 17	
17	The motor vehicle of claim 1 wherein the steering angle movements are determined by any of steering sensors on the vehicle and vision systems on the vehicle.
Claim 18	
18[p]	A motor vehicle for operation by a driver, comprising:
18[a]	a frame having wheels;
18[b]	a motor connected to the frame;
18[c]	a steering control connected to the wheels to establish a steering angle;
18[d]	a controller operably connected to the steering control, to the motor, and to the wheels;

18[e]	the controller operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode; and
18[f]	the controller operable when the vehicle has been operated in reverse to offer the driver an auto-shift to drive; and
18[g]	the offer of an auto-shift being based on at least one of time traveled from a parked position, distance traveled from a parked position, velocity of travel since parked, steering angle, and vehicle location.

Tesla, Inc. (“Petitioner” or “Tesla”) petitions for *Inter Partes* Review (“IPR”) of claims 1-18 (“the Challenged Claims”) of U.S. Patent No. 11,932,230 (“the ’230 Patent”). Compelling evidence presented in this Petition demonstrates at least a reasonable likelihood that Tesla will prevail with respect to at least one of the Challenged Claims.

I. REQUIREMENTS FOR IPR

A. Grounds for Standing

Petitioner certifies that the ’230 Patent is available for IPR. This Petition is being filed within one year of service of a complaint against Tesla. *See* TESLA-1100. Tesla is not barred or estopped from requesting review of the Challenged Claims on the below-identified grounds.

B. Challenge and Relief Requested

Tesla requests IPR of the Challenged Claims on the grounds indicated below. Grounds 1A-3D are supported and corroborated by evidence cited throughout this Petition, including by the expert declaration of Dr. Jason Janet. TESLA-1003, ¶58.

Ground	Claims	35 U.S.C. § 103
1A	1-4, 13, 15, 17	Joos
1B	5, 9-12, 18	Joos in view of Kischkat
1C	5, 7, 15-16	Joos in view of Kischkat and Allexi
1D	5, 8, 13-14	Joos in view of Kischkat and Matters

Ground	Claims	35 U.S.C. § 103
2A	1-4, 13, 15, 17	Joos in view of Bettger
2B	5-6, 9-12, 18	Joos in view of Bettger and Kischkat
2C	5, 7, 15-16	Joos in view of Bettger, Kischkat, and Allexi
2D	5, 8, 13-14	Joos in view of Bettger, Kischkat, and Matters
3A	1-4, 13, 15, 17	Joos in view of Bayer
3B	5, 9-12	Joos in view of Bayer and Kischkat
3C	5, 7, 15-16	Joos in view of Bayer, Kischkat, and Allexi
3D	5, 8, 13-14	Joos in view of Bayer, Kischkat, and Matters

The filing date of the '230 Patent is June 5, 2023 ("Critical Date"). Each of the references in Grounds 1A-3D pre-dates the Critical Date.

Reference	Filed	Published	AIA Prior Art Basis
Joos	1/19/2017	8/1/2019	§102(a)(1)-(2)
Kischkat	---	8/29/2012	§102(a)(1)
Bayer	11/30/2004	12/6/2007	§102(a)(1)-(2)
Allexi	10/25/2013	9/18/2018	§102(a)(1)-(2)
Matters	4/11/2014	8/7/2014	§102(a)(1)-(2)
Bettger	11/28/2018	5/30/2019	§102(a)(1)-(2)

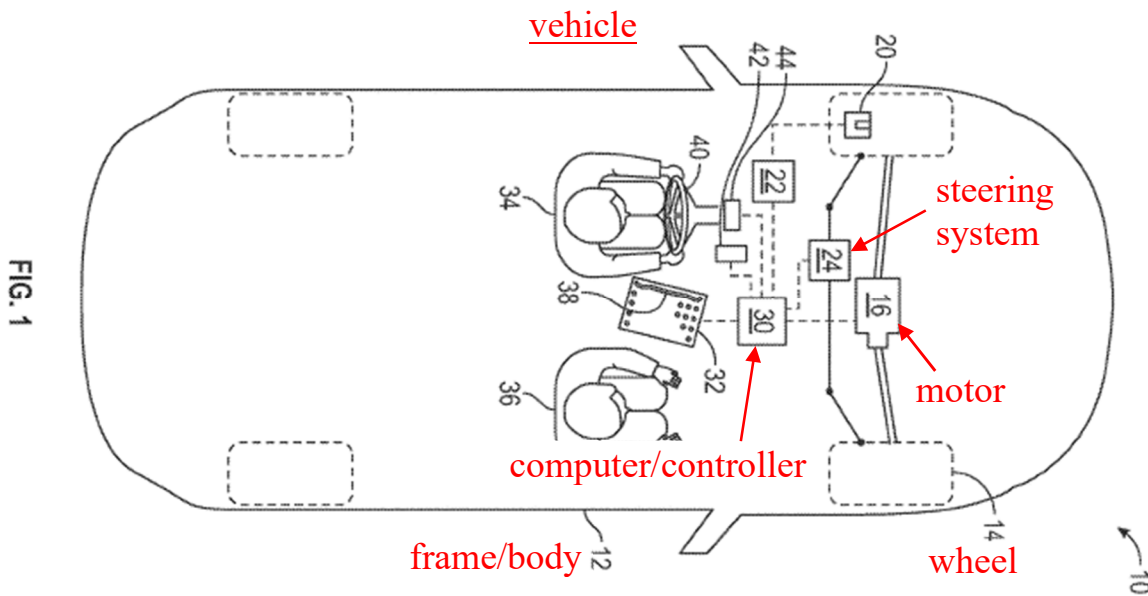
All references are analogous art as they are all directed to the same field of endeavor (e.g., motor vehicle operational control systems), and they are also

reasonably pertinent to at least one problem that the inventors of the '230 Patent sought to address (e.g., distracting or non-intuitive gear shifters and vehicle controls). *See* TESLA-1001, 1:5-6 (“present invention relates to motor vehicles and operational control systems”), 1:37-49 (“these gear direction systems may have disadvantages, or have an opportunity for automation to provide convenience”), 1:53-59 (“may be a distraction, ... and may be [] non-intuitive”); TESLA-1004, [0001] (“driver assistance system for a motor vehicle”); TESLA-1005, [0001] (“park-steer assist system”); TESLA-1006, [0008] (“a driver can be assisted when reversing”); TESLA-1007, [0001]-[0006] (“driver steering assistance”); TESLA-1009, 1:51-65 (“assisted parking procedure of a vehicle”); TESLA-1010, [0002]-[0003] (“parking assistance system”); TESLA-1003, ¶¶43-57.

II. THE '230 PATENT

A. Brief Description

The '230 Patent generally describes “motor vehicles and operational control systems” that offer or enact an auto-shift between reverse and drive gears. TESLA-1001, 1:5-6, 2:19-24; TESLA-1003, ¶¶35-38. FIG. 1 illustrates the disclosed vehicle:



TESLA-1001, FIG. 1¹ (rotated)

The '230 Patent describes a “typical operation of the system... in the context of ‘unparking,’ when a driver backs out of a parking spot in reverse, steers to adjust direction while reversing, then shifts to drive, steers the other direction, then straightens out to proceed.” TESLA-1001, 2:49-61. The '230 Patent illustrates in FIG. 2 “the sequence of unparking.” TESLA-1001, 3:1-2. “The upper trace 110 indicates steering wheel angle on a time-based horizontal chart. The lower trace 120 indicates velocity. The lower images A-F depict the vehicle 130 in a parking space 132, and are located at their relative positions on the time axis.” TESLA-1001, 3:2-36.

¹ Annotations and color added to figures unless otherwise noted.

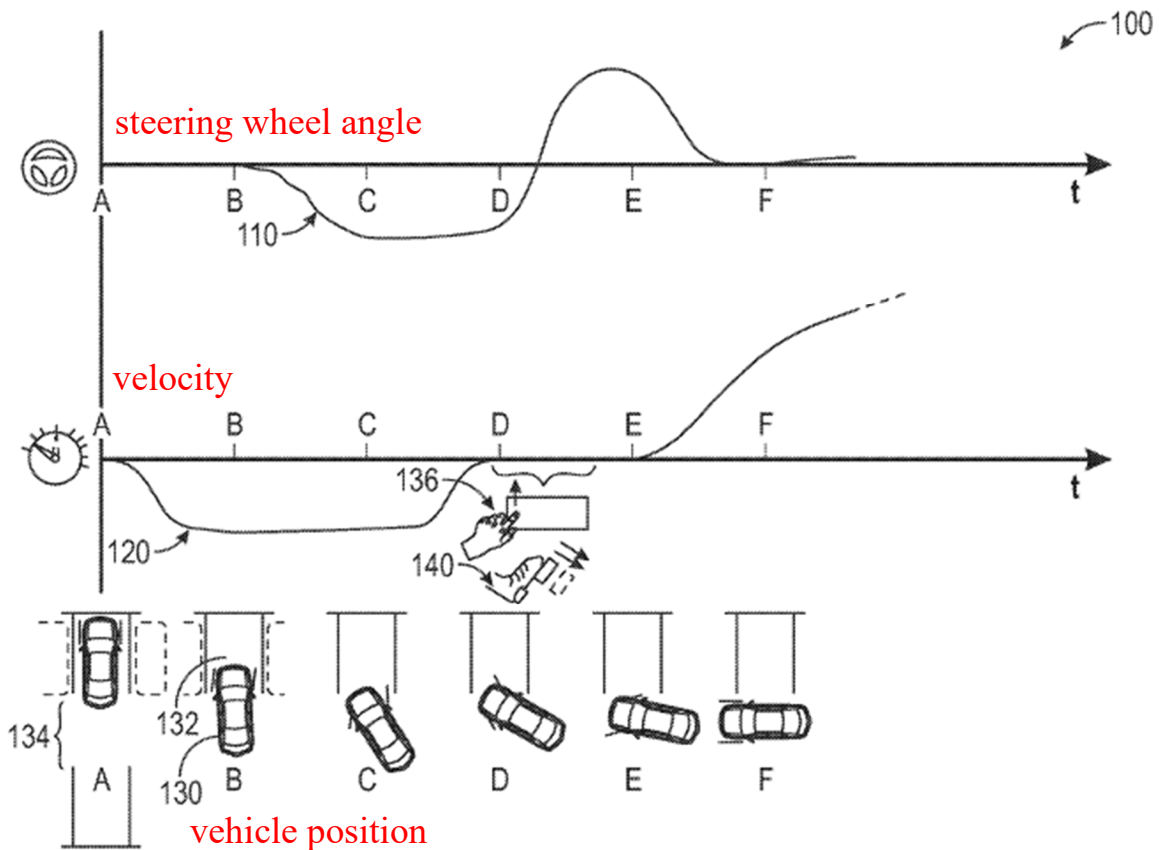


FIG. 2

TESLA-1001, FIG. 2

According to the specification, “[t]he controller may be programmed with specific functions or algorithms as to when an auto-shift is clearly safe to offer or enact, and when if offered, acceptance by the driver is likely desired and not an unwanted distraction.” TESLA-1001, 3:42-45. The system may “determine actual patterns when auto-shifting might be safely offered,” for example, “based on wheel angle patterns, velocity patterns, with certain thresholds of their various amounts, derivatives, and integrals.” TESLA-1001, 3:45-56.

B. Prosecution History

The application that issued as the '230 Patent was allowed with no prior art rejections. As reasons for allowance, the examiner stated that no prior art discloses elements 1[f] or 18[g]. TESLA-1002, 77-78. As demonstrated below in Grounds 1A-3D, however, the prior art and evidence cited in this Petition would have rendered obvious the claim elements that the examiner believed to be missing from the prior art. TESLA-1003, ¶39.

C. Level of Ordinary Skill in the Art

For purposes of this IPR, a person of ordinary skill in the art (“POSITA”) would have had a Bachelor’s degree in electrical engineering, computer engineering, computer science, physics, or a related field, and at least two years of experience in the research, design or development of autonomous systems for motor vehicles, or the equivalent, as of the Critical Date. TESLA-1003, ¶¶40-42. Increased educational experience can make up for less work experience, and vice versa. *Id.*

D. Claim Construction

All claim terms should be construed according to the *Phillips* standard. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. § 42.100. No formal claim constructions are presently necessary because “claim terms need only be construed to the extent necessary to resolve the controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). Petitioner reserves the

right to respond to any constructions offered by Patent Owner or adopted by the Board. Petitioner is not conceding that each challenged claim satisfies all statutory requirements, nor is Petitioner waiving any arguments concerning claim scope or grounds that can only be raised in district court.

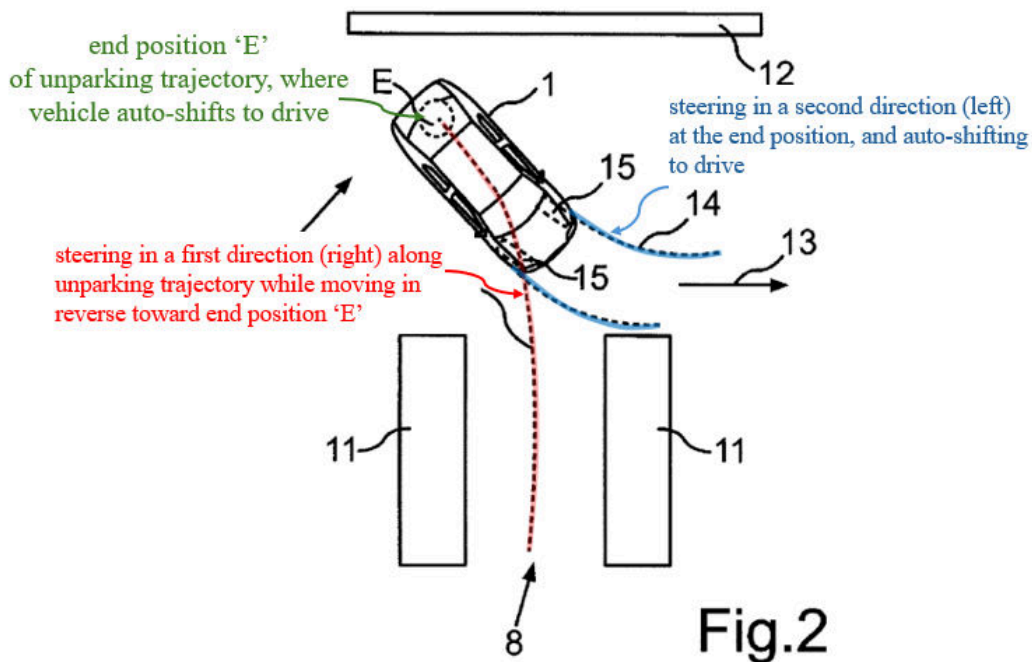
III. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. GROUND 1A—Obvious based on Joos (Claims 1-4, 13, 15, 17)

1. Overview of Joos²

Joos describes “a method for unparking a motor vehicle from a cross-parking space, with which the motor vehicle is [maneuvered] along an unparking trajectory at least semi-autonomously from the cross-parking space onto a road bounding on the cross-parking space, wherein during said semi-autonomous [maneuvering] the motor vehicle carries out at least one reversing movement along the unparking trajectory, an end position is determined and the semi-autonomous [maneuvering] of the motor vehicle along the unparking trajectory is ended at the end position.” TESLA-1004, [0001], [0008].

² General descriptions provided for the references (and combinations thereof) are incorporated into each subsection and mapping of the claims that includes citations to these references.



TESLA-1004, FIG. 2 (annotated)

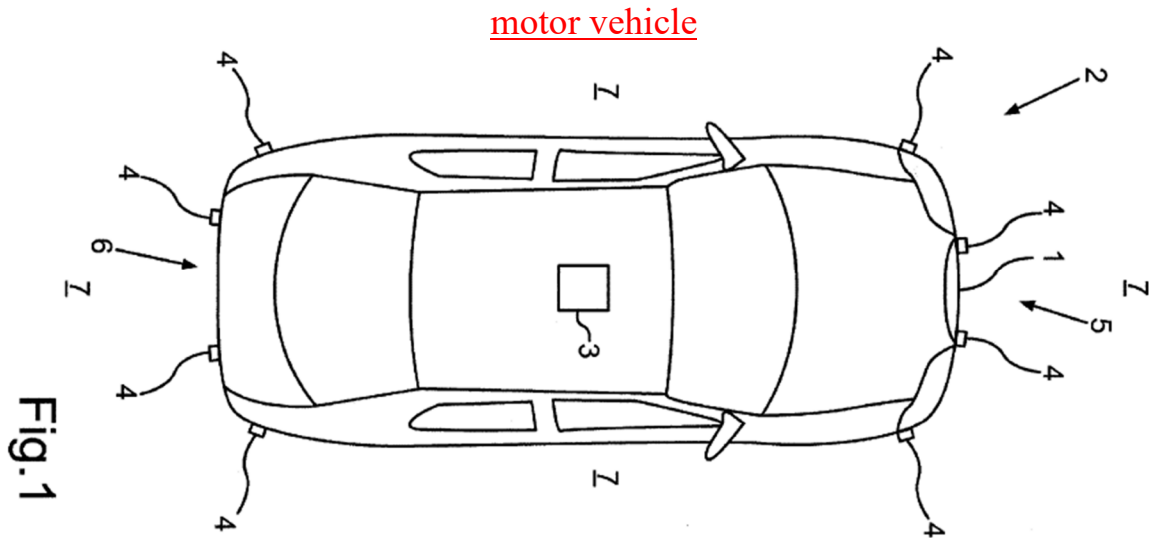
In Joos, “after reaching the end position a forward gear is engaged or an instruction to engage the forward gear is issued to the driver of the motor vehicle.” TESLA-1004, [0017], [0038]. Accordingly, Joos provides that “semi-autonomous [maneuvering] of the motor vehicle is ended, or the control of the motor vehicle is handed over to the driver, if the end position is reached, the specified steering angle has been set by the driver assistance system and the forward gear has been engaged.” TESLA-1004, [0018]; TESLA-1003, ¶¶43-45.

2. Claim Element Analysis

(a) Element 1[p]

To the extent the preamble is a limitation, Joos renders it obvious. TESLA-1003, ¶¶59-60. Joos discloses “a *motor vehicle*” including the motor vehicle 1

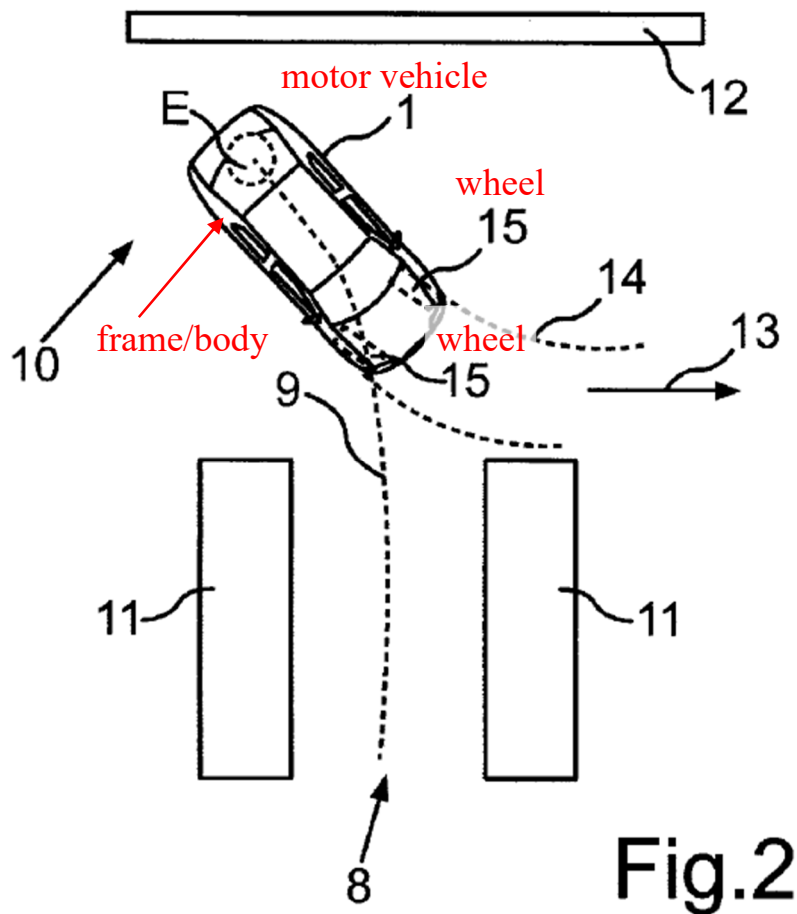
depicted in FIG. 1 below. TESLA-1004, Abstract, [0001], [0005]-[0014], [0031],
FIG. 1.



TESLA-1004, FIG. 1 (rotated)

(b) Element 1[a]

Joos renders obvious 1[a]. TESLA-1003, ¶¶61-62. Joos discloses that the motor vehicle has a “body” (*frame*) and “wheels.” TESLA-1004, [0014] (“the external surface of the **body** of the motor vehicle”), [0016] (“**wheels** of the motor vehicle”). Joos also discloses “orient[ing] the steerable **wheels** of the motor vehicle in such a way that the steering has the predefined steering angle.” TESLA-1004, [0016]. FIG. 1 (above) and FIG. 2 (below) shows the motor vehicle 1 having a “body” and “wheels 15” (*a frame having wheels*). TESLA-1004, [0038].



TESLA-1004, FIG. 2

(c) Element 1[b]

Joos renders obvious 1[b]. TESLA-1003, ¶¶63-64. Joos discloses that the motor vehicle has “a drive *motor*.” TESLA-1004, [0002], [0008], [0021]. The motor is *connected to the frame*; indeed, Joos’s vehicle travels as an integrated unit including the motor and frame together. TESLA-1004, FIGs. 2-3; TESLA-1003, ¶64. A POSITA also would have found it obvious to connect the motor to the frame of Joos’s motor vehicle to ensure the motor is adequately supported in the vehicle according to well-established vehicle assembly techniques. TESLA-

1003, ¶64 (citing TESLA-1012, [0127] (vehicle “frame structure 102 on which may be mounted the various functional systems, subsystems and components of the vehicle such as the motors, suspension, wheels, and passenger compartments, and the vehicle body 104 itself.”); TESLA-1014, [0076] (“the motor 302 is coupled to the first end frame 204 and operatively coupled to the first and second wheels 208A, 208B.”)).

(d) Element 1[c]

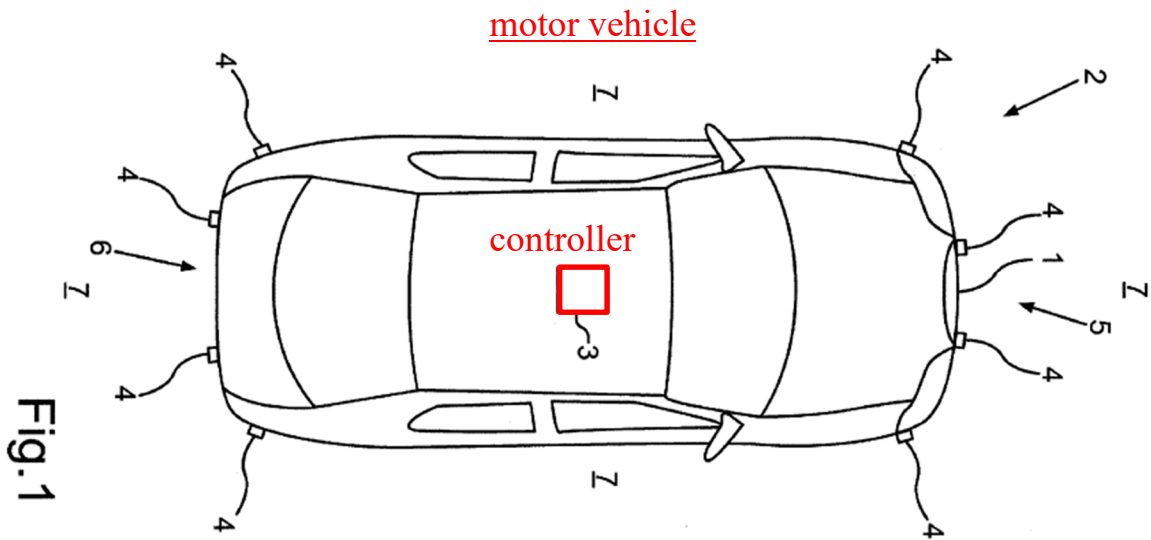
Joos renders obvious 1[c]. TESLA-1003, ¶¶65-66. Joos discloses that the motor vehicle has a “**steering wheel**” and a “**steering system**” that each individually or together provide a “*steering control*.” TESLA-1004, [0014]-[0015], [0033].

Joos explains that “the driver assistance system can intervene in the **steering** of the motor vehicle once again and can orient the **steerable wheels** of the motor vehicle in such a way that the steering has the predefined **steering angle**.” TESLA-1004, [0016], [0033]. Additionally, “the driver of the vehicle can move on the lane of the road if he turns the steering wheel fully.” TESLA-1004, [0015]. Because the steering wheel and/or steering system (*steering control*) in Joos are operable by the driver and driver assistance system to generate a steering input that causes the vehicle to turn its wheels to change its driving direction, the steering wheel and steering each individually or together provide *a steering control connected to the*

wheels to establish a steering angle. TESLA-1003, ¶67.

(e) Element 1[d]

Joos renders obvious 1[d]. TESLA-1003, ¶¶68-69. Joos discloses a “driver assistance system” for a motor vehicle that includes “**a controller or an electronic control unit**, with which during the unparking [maneuver] **control signals are output to the steering system of the motor vehicle and possibly to the brake system and/or the drive motor.**” TESLA-1004, [0021], [0031]. “The driver assistance system 2 is [] embodied to continuously detect a movement of the motor vehicle 1 by means of odometry.” TESLA-1004, [0033], [0037]-[0038]. By continuously monitoring movement of the vehicle by odometry, the *controller* of the driver assistance system (*drive system*) monitors the *steering control*. TESLA-1004, [0016], [0021], [0031], [0033], [0037]-[0038], FIG. 2. Estimating the location of a moving vehicle by odometry involves monitoring the steering angle and other factors (*e.g.*, velocity or distance traveled) over time. TESLA-1003, ¶69 (citing TESLA-1008, 9; TESLA-1027, [0010], [0015]). “The **controller 3 can thus also receive data from a speed sensor and/or a steering angle sensor**, for example. Moreover, the **controller 3 is designed to output corresponding control signals to the steering system** of the motor vehicle 1.” TESLA-1004, [0033], [0037]-[0038].



TESLA-1004, FIG. 1 (rotated)

The controller of Joos's driver assistance system is *operably connected to the* steering system including the steering wheel (*steering control*) to detect steering inputs; indeed, Joos's controller receives data from a steering angle sensor of the steering system and issues control signals to the steering system that are operable to cause the wheels to adjust their angle in accordance with the steering input from the steering system including the steering wheel. TESLA-1004, [0016], [0021], [0031], [0033], [0037]-[0038]; TESLA-1003, ¶70. The steering angle sensor is part of a steering system (*steering control*); indeed, the steering angle sensor provides a feedback signal relating to the steering angle that allows the vehicle to be properly steered. TESLA-1004, [0033], [0037]-[0038]; TESLA-1003, ¶70 (citing TESLA-1008, 4-8, 1, 2; TESLA-1028, [0033]-[0036]).

A POSITA also would have recognized that Joos's drive system/controller

monitors the steering control while autonomously or semi-autonomously driving in the reverse direction; indeed, the drive system/controller autonomously or semi-autonomously guides the vehicle along the unparking trajectory to the calculated end position E. TESLA-1004, [0008]. It was known and obvious to use closed-loop steering feedback in this context to minimize a difference between the steering angles needed to follow the unparking trajectory and the measured steering angles obtained through monitoring of the steering control. TESLA-1003, ¶71 (citing TESLA-1029, [0072]-[0073]).

Joos's controller of the driver assistance system also is operably connected to the drive motor of the motor vehicle that controls their operation. TESLA-1003, ¶72. The controller of the driver assistance system issues control signals to the motor that are operable to cause the wheels to accelerate in angular velocity. TESLA-1004, [0016], [0021], [0031], [0033], [0037]-[0038].

Joos's drive system/controller is also *operably connected to the wheels* via each of the steering system, brake system, and drive motor since the drive system/controller issues control signals to the motor and brake system that cause the angular motion of the wheels to increase or decrease, and because the controller issues control signals to the steering system that are operable to cause the wheels to adjust their steering angle. TESLA-1004, [0016], [0021], [0031], [0033], [0037]-[0038]; TESLA-1003, ¶73. Operably connecting Joos's controller

to the steering control, motor, and wheels also would have been obvious to a POSITA to enable the driver assistance system to brake, accelerate, and steer the motor vehicle as needed to carry out autonomous or semi-autonomous tasks such as the disclosed unparking maneuver and in accordance with well-established vehicle assembly techniques. TESLA-1003, ¶74; *cf.*, TESLA-1001, 2:14-24, FIG. 1 (substantially similar features disclosed in the '230 Patent's preferred embodiments).

(f) Element 1[e]

Joos renders obvious 1[e]. TESLA-1003, ¶¶75-76. Joos discloses that a “driver assistance system can for example comprise **a controller or an electronic control unit**, with which during the unparking [maneuver] **control signals are output to** the steering system of the motor vehicle and possibly to the brake system and/or **the drive motor**. Thus, an autonomous unparking [maneuver] can be carried out using the driver assistance system.” TESLA-1004, [0021], FIG. 2. Joos also discloses that “the driver assistance system itself can change from the **reverse gear** into the **forward gear**. A gear change can thus be carried out by the driver assistance system.” TESLA-1004, [0017]. In Joos, if necessary, “a **forward movement** and a further **reversing movement** are carried out for [maneuvering] the motor vehicle along the unparking trajectory.” TESLA-1004, [0020], FIGs. 3-5. For example, “a **forward movement** and then a further **reversing movement**

can be carried out. The performance of the forward movement and the subsequent reverse movement can also be carried out multiple times. It can thus be provided that the motor vehicle is moved back and forth until the end point can be reached.”

TESLA-1004, [0020], [0039]-[0040]. Accordingly, Joos provides a *controller* operable to shift between the reverse and forward gears *to selectively drive the wheels in a forward direction in a drive mode and a rearward direction in a reverse mode*. TESLA-1003, ¶76.

(g) Element 1[f]

Joos renders obvious 1[f]. TESLA-1003, ¶¶77-78. In particular, the *controller* of Joos’s driver assistance system is operable to *select* a (forward) *direction* for driving the wheels by auto-shifting from reverse to drive at the end position E of the autonomous or semi-autonomous unparking maneuver without “operator indication of direction,” but rather *in response to a pattern of steering angle movements* made during the maneuver. As described further below, Joos’s *pattern of steering angle movements* includes at least **(1)** steering in a first direction (*e.g.*, right) while reversing to reach the end position E of the unparking maneuver and **(2)** steering in the opposite direction (*e.g.*, left) at the end position E to set “a predetermined or adjusted steering angle,” *e.g.*, “a maximum steering angle,” for the anticipated forward movement of the vehicle when manual control

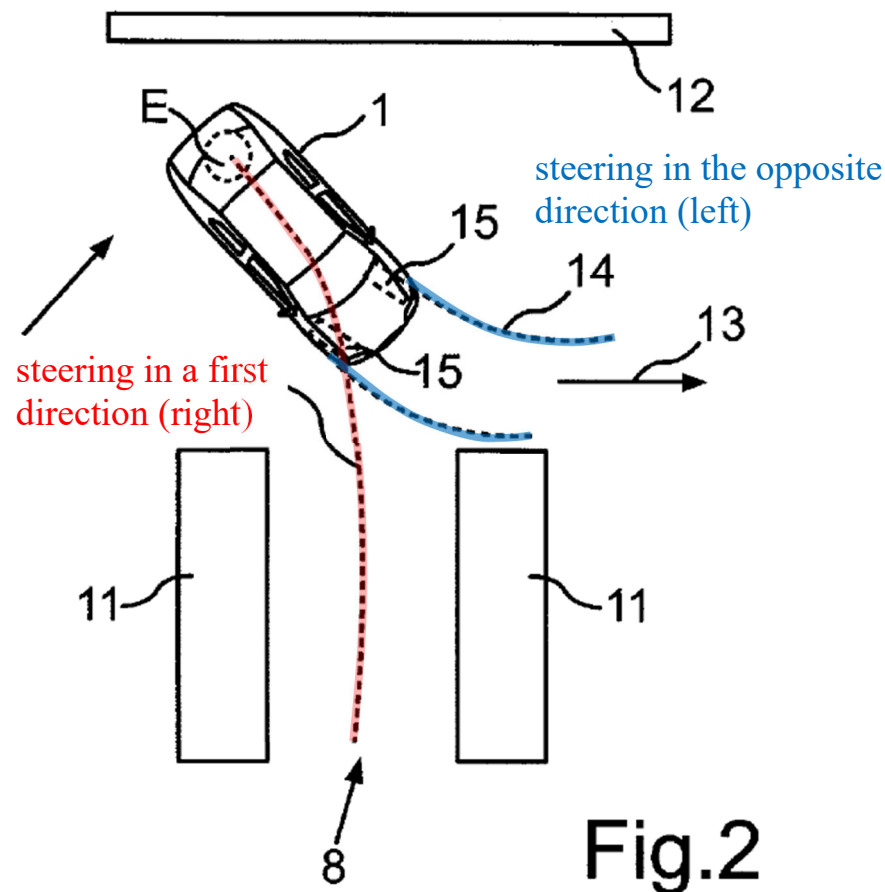
of the vehicle is returned to the driver at the end of the unparking maneuver.³

TESLA-1004, [0010], [0014] (“on reaching the end position a steering angle is set that enables collision-free forward movement”), [0015] (“the end position is determined under the assumption that a predefined steering angle, in particular a maximum steering angle, is set during manual control of the motor vehicle”), [0037]-[0038], FIG. 2; TESLA-1003, ¶78.

In more detail, Joos discloses that the driver assistance system sets the steering angle in a first direction while traveling “along the unparking trajectory” “in the reversing direction” “until it has reached an end position” where “the autonomous parking [maneuver] is ended” and “the motor vehicle is stopped.” TESLA-1004, [0008], [0016]-[0017]. The steering adjustments made while reversing from the parking space to the end position E of the maneuver provides at least a first one or more *steering angle movements* of the *pattern*. TESLA-1003, ¶79. For example, as shown in FIG. 2 (reproduced further below), the driver assistance system may apply steering angle movement(s) to turn the wheels to the right while reversing to the end position E. *Id.*; TESLA-1004, FIG. 2.

³ The pattern of steering angle movements described in this example is the same pattern recited in claim 4. *Infra*, III.A.2(j).

Once the vehicle arrives and stops at the end position E of the unparking maneuver, Joos discloses that the driver assistance system steers the wheels in the opposite direction from the direction steered while the vehicle was reversing to set “a predefined steering angle, in particular a maximum steering angle” “so that the driver can carry out [a] collision-free forward movement without changing the adjusted steering angle.” TESLA-1004, [0010], [0015], [0016] (“the motor vehicle is stopped at the end position and the wheels are turned by means of the driver assistance system while the motor vehicle is stationary”), [0037]-[0038]. The steering adjustments made to set the predefined steering angle for the anticipated forward motion of the vehicle at the end position E provides an additional *steering angle movement* of the *pattern* that follows the steering angle movement(s) made when the vehicle was reversing to the end position E. TESLA-1003, ¶80. For example, as shown in FIG. 2 (reproduced below), the driver assistance system may turn the wheels to the left at the end position E. *Id.*; TESLA-1004, FIG. 2.



TESLA-1004, FIG. 2 (annotated)

Joos also explains that the driver assistance system/controller is *operable to select a direction for driving the wheels* after the reversing movement. TESLA-1003, ¶81. For example, Joos discloses that after “the end position is reached, the driver assistance system itself can change from the reverse gear into the forward gear.” TESLA-1004, [0017], [0038], [0018] (“if the end position is reached, the specified steering angle has been set by the driver assistance system and the forward gear has been engaged”). The driver assistance system’s automatic changing from the reverse gear into the forward gear includes *selecting* a (forward)

direction for driving the wheels of the motor vehicle. TESLA-1003, ¶81.

Because the vehicle is steered in a first direction while reversing to reach the end position E of the unparking maneuver and is then steered in the opposite direction to achieve the predefined steering angle that will allow the driver to safely pull the vehicle forward when manual control of the vehicle is returned to the driver, and because this ***pattern of steering angle movements*** indicated by control signals from the driver assistance system must be detected for the requisite steering to be performed for the vehicle to arrive at the end position E and be placed in a state where the drive system auto-shifts from reverse to drive, Joos's controller is ***operable to select a direction for driving the wheels in response to a pattern of steering angle movements***. TESLA-1003, ¶82. For example, as shown in FIG. 2, the vehicle is reversed while applying a steering angle movement in the first direction (turned to the right) until it reaches the end position E. Also shown in FIG. 2, the maximum steering angle set while the vehicle is stopped at the end position is a steering angle in the opposite direction (turned to the left) "so that the motor vehicle 1 can be oriented along the driving direction 13 in a single forward movement starting from the end position E." TESLA-1004, [0036]; *see also id.*, [0008], [0015], [0028], [0037], [0009]-[0010], FIG. 2.

Thus, by shifting gears from reverse to drive as a result of detecting a steering angle movement that steers the wheels first in a rightward direction to

reverse the vehicle to the desired end position E, and detecting a steering angle movement that steers the wheels in a leftward direction to set the specified (e.g., maximum) steering angle that ensures the driver will not collide with adjacent vehicles 11 during forward movement, Joos's driver assistance system (*drive system*) *selects* a (forward) *direction* for driving the wheels *in response to the pattern of steering angle movements* that includes steering in the rightward direction and steering in the opposite (leftward) direction. TESLA-1003, ¶83.

To be sure, Joos's controller selects to auto-shift to drive (*selecting a direction for driving the wheels*) at the end position E of the unparking maneuver only after and in response to this pattern of steering angle movements that includes setting the predefined steering angle at the end position E by steering in the opposite direction from the steering angle while reversing. TESLA-1003, ¶84. Joos explicitly states that the driver "take[s] over directly and rapidly" from the driver assistance system to manually operate the vehicle once the vehicle shifts to drive. TESLA-1004, [0017], [0038]. The pull-forward steering angle would therefore need to be set *before* the drive system/controller auto-shifts to drive for the driver to "take over directly and rapidly" as disclosed. TESLA-1003, ¶84. Additionally, Joos explains that the *last* action to occur when "the automatic or autonomous unparking manoeuvre is [] ended" is to "engage the forward gear." TESLA-1004, [0017]-[0018]; *see also id.*, [0009], [0011]-[0012], [0014]-[0015], [0037]-[0039].

This means that the pull-forward steering angle must be set *before* the forward gear is engaged because the pull-forward steering angle is set by the driver assistance system before the automatic or autonomous unparking maneuver is ended. *Id.*; TESLA-1003, ¶84.

A POSITA also would have found it obvious to condition Joos's auto-shift to drive (*select a direction for driving the wheels*) at the end position E of the unparking trajectory on completion of the pattern of steering angle movements, including detecting that the pull-forward steering angle has been set while the vehicle is parked at the end position. TESLA-1003, ¶85. Indeed, this would have been obvious and beneficial to ensure full control of the vehicle could be handed back to the driver more quickly upon shifting to drive and to ensure the driver would not pull forward from the end position before the steering angle is set. TESLA-1004, [0017] ("driver ... take[s] over directly and rapidly"); *Id.* Joos teaches that the steering angle is set to avoid collisions and to allow the vehicle to properly orient itself in the lane of travel when the driver pulls forward while maintaining the set steering angle. TESLA-1004, [0010], [0014]-[0016], [0036]-[0038]. Maintenance of the set steering angle also allows the vehicle to avoid collisions with other parked vehicles. *Id.* Allowing the driver to pull forward before the steering angle is set introduces risk of collisions with other vehicles and prevents the vehicle from being properly oriented such that it could move forward

into the lane of travel, all of which may compromise safety. *Id.*; TESLA-1004, [0010], [0014]-[0016], [0036]-[0038]. Accordingly, a POSITA would have been motivated to configure Joos's drive system/controller to auto-shift to drive based on the pull-forward steering angle first being set to enhance safety and provide a more intuitive driving experience that would allow the driver to immediately assume full control of the vehicle once the vehicle shifts to drive. TESLA-1003, ¶85. Allowing the driver to more quickly assume control of the vehicle after the auto-shift to drive also furthers Joos's objective of "enabl[ing] the driver of the motor vehicle to take over directly and rapidly." TESLA-1004, [0017]. Further, it provides added convenience because the set steering angle allows the driver to simply pull forward into the direction of the lane of travel while avoiding collisions with nearby vehicles or objects (*e.g.*, vehicle in adjacent parking spaces). *Id.*, [0014]; TESLA-1003, ¶85. Even basic driver's education instructional materials teach drivers to set the pull-forward steering angle before shifting to drive upon exiting a parking space. *See, e.g.*, TESLA-1003, ¶85; TESLA-1024, 1 ("We keep reversing until the car is fully straight ... Once straight, we straighten up the wheel and stop. We select Drive."); TESLA-1025, 3 ("7. Straighten your wheels and stop. 8. Shift your car into 'Drive' and accelerate slowly.").

Moreover, configuring the drive system/controller to auto-shift to drive only after setting the steering angle would have been obvious to try. TESLA-1003, ¶86.

Joos discloses both setting of the steering angle and shifting to drive as two actions that must occur at the end of the unparking procedure before control is handed back to the user. *Id.*; TESLA-1004, [0018]. A finite number of options exist for sequencing these actions. TESLA-1003, ¶86. Namely, the steering angle could only be set before, during, or after the auto-shift to drive of the vehicle. TESLA-1003, ¶86. Considering these limited options and the known benefits of setting the steering angle before auto-shifting to drive as described above, it would have been obvious to implement Joos such that the auto-shift to drive would occur only if the steering angle had been successfully set beforehand. TESLA-1003, ¶86. A POSITA would have reasonably expected success because implementing the system in this manner would merely involve applying capabilities that the driver assistance system in Joos was already configured to perform (*e.g.*, setting the steering angle and auto-shifting to drive). *Id.* Joos's vehicle is also capable of adjusting the steering angle while in a reverse gear as evident from the curved trajectory taken by the vehicle when reversing from the parking space. *Id.*; TESLA-1004, FIG. 2; *see also id.*, [0039]-[0040] & FIGs. 3-5 (disclosing additional steering angle movements in the *pattern of steering angle movements* when the end position E cannot be reached in a single reversing motion); TESLA-1003, ¶87.

Further, in Joos, the driver assistance system's auto-shift to drive (*select a*

direction for driving the wheels) is accomplished *without operator indication of a direction*. TESLA-1003, ¶88. This is evident, or at least obvious, because the driver never manipulates the vehicle's gear selector or any other control that specifies a particular direction at end position E when the driver assistance system determines to shift the vehicle from reverse to drive. TESLA-1004, [0017] ("gear change can thus be carried out by the driver assistance system"); *cf.*, TESLA-1001, 1:38-36, 3:36-41, 4:44-54 ('230 Patent disclosing similar inputs that do not involve operator indication of direction); TESLA-1003, ¶88.

(h) Claim 2

Joos renders obvious claim 2. TESLA-1003, ¶¶89-90. Joos teaches that the "gear change can [] be **carried out by the driver assistance system**" rather than the driver. TESLA-1004, [0017]; *supra*, 1[f] (explaining how Joos's auto-shift from reverse to drive is performed without operator selection of a direction consistent with examples disclosed in the specification of the '230 Patent). TESLA-1003, ¶90; *cf.* TESLA-1001, 1:27-36, 4:37-54. Joos's driver assistance system/controller auto-shifts from reverse to drive *without operation of a selector by a driver*; indeed, the driver is not involved in shifting gears at the end position E of the unparking maneuver. *Id.*

A POSITA also would have found it obvious that Joos's driver would not operate a selector to change the drive direction when driver assistance system shifts

gears because Joos explicitly delineates scenarios where the driver is issued an instruction to manually shift to drive and where the driver assistance system instead auto-shifts to drive without the driver's operation of a selector. *See* TESLA-1004, [0017], [0038]; TESLA-1003, ¶91.

(i) Claim 3

Joos renders obvious claim 3. TESLA-1003, ¶¶92-93. Joos discloses that “the motor vehicle is stopped at the end position” and “[a]fter the end position is reached, the driver assistance system itself can change from the reverse gear into the forward gear” thereby ending the assisted unparking maneuver, returning manual control of the vehicle to the driver, and allowing the driver to drive in the forward direction. TESLA-1004, [0016]-[0017]. Because Joos's driver assistance system/controller only auto-shifts to drive to end the unparking maneuver if the vehicle has reached the target end position E, the driver assistance system/controller is operable while the vehicle is underway in the reverse direction, and has stopped momentarily at the end position E, to determine whether to remain in the same direction or to change direction based on whether vehicle is determined to have successfully reached the end position E. *Id.*, [0017]-[0018], [0038], FIG. 2. If the vehicle determines that it has reached the end position E such that manual control can be safely handed back to the driver, the driver assistance system/controller determines to change the direction from reverse to drive. *Id.* If

the vehicle stops while reversing but determines that it has not reached the end position, then it would be obvious that the driver assistance system/controller determines whether to remain in the same direction or to change direction based on whether the surrounding environment would allow the vehicle to continue reversing to the end position or whether the vehicle needs to pull forward to an intermediate position before reversing again to reach the end position (as described in Joos with respect to FIGs. 3-5). *Id.*, [0039]-[0040], FIGs. 3-5; TESLA-1003, ¶93. For example, it would have been obvious to momentarily stop the vehicle while reversing toward the end position E to avoid a temporary obstacle such as a pedestrian that walks behind the vehicle, in which case the driver assistance system/controller would determine to continue reversing toward the end position. TESLA-1003, ¶93 (citing TESLA-1009, 1:31-32 (“emergency braking systems are used to avoid hitting an obstacle”), 1:16-47). However, if there is insufficient space to continue reversing toward the end position as taught in Joos, then the controller determines to change directions and pull forward to an intermediate position. TESLA-1004, [0039]-[0040], FIGs. 3-5; TESLA-1003, ¶93.

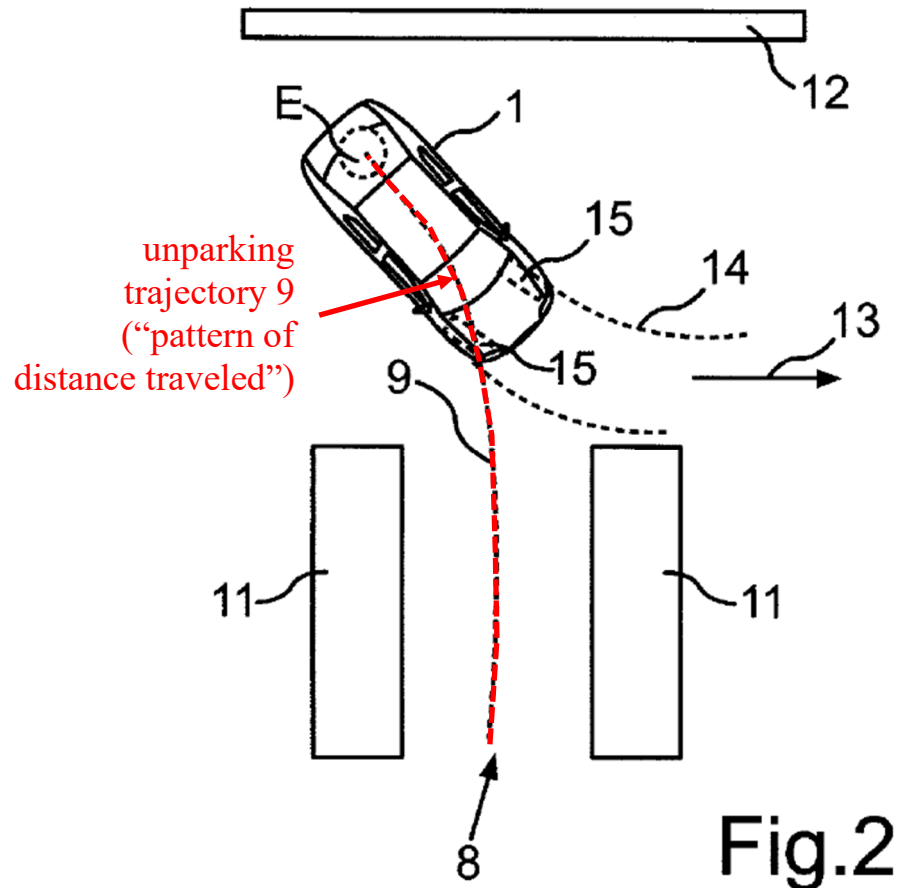
(j) Claim 4

Joos renders obvious claim 4 for the reasons discussed above with respect to Element 1[f]. *Supra*, 1[f]; TESLA-1003, ¶94.

(k) Claim 13

Joos renders obvious claim 13. TESLA-1003, ¶¶95-96. Joos discloses that “after reaching the end position” of the assisted unparking maneuver “a forward gear is engaged” by the driver assistance system. TESLA-1004, [0017]; *see also id.*, [0018], [0034]-[0038], FIG. 2. Specifically, “the motor vehicle 1 is manoeuvred along an unparking trajectory 9” to the end position E, where the vehicle stops before the driver assistance system shifts to the forward gear. *Id.*, [0034], [0006], [0016] (“motor vehicle is stopped at the end position”). “In principle, the unparking trajectory can be predetermined. The unparking trajectory can also be defined using objects bounding on the cross-parking space” and “the unparking trajectory is adjusted when unparking the motor vehicle using sensor data that are detected with sensors of the motor vehicle.” *Id.*, [0008]. The unparking trajectory 9 defines a ***pattern of distance traveled***, such as a pattern comprising a first distance traveled while reversing substantially straight out of the cross-parking space and a second distance traveled while reversing with a sharper steering angle toward the end position E once the vehicle has sufficiently cleared the cross-parking space. TESLA-1003, ¶96. Because the vehicle must follow the unparking trajectory 9 to reach the end position E, and because the driver assistance system requires that the vehicle stop at the end position E for the forward gear to be engaged (***select a direction for wheel driving***), Joos’s controller of the driver assistance system is ***operable to select***

a direction for wheel driving in response to a pattern of distance traveled. TESLA-1003, ¶¶96.



TESLA-1004, FIG. 2 (annotated)

(I) Claim 15

Joos renders obvious claim 15. TESLA-1003, ¶¶97-98. Joos discloses that “after reaching the end position” of the assisted unparking maneuver “a forward gear is engaged” by the driver assistance system. TESLA-1004, [0017]; *see also id.*, [0018], [0034]-[0038], FIG. 2. Specifically, “the motor vehicle 1 is manoeuvred along

an unparking trajectory 9” to the end position E, where the vehicle stops before the driver assistance system shifts to the forward gear. *Id.*, [0034], [0006], [0016] (“motor vehicle is stopped at the end position”). Because the vehicle must follow the unparking trajectory 9 to reach the end position E by reversing with a negative velocity, and because the driver assistance system requires that the vehicle then stop at the end position E, thereby attaining a velocity of zero, for the forward gear to be engaged (*select a direction for wheel driving*), Joos’s controller of the driver assistance system is *operable to select a direction for wheel driving in response to a pattern of velocity* (e.g., a negative velocity followed by a zero velocity). TESLA-1003, ¶98.

(m) Claim 17

Joos renders obvious claim 15. TESLA-1003, ¶¶99-100. Joos first determines steering angle movements by *steering sensors* on the vehicle. For example, Joos discloses that the controller receives data from a “**steering angle sensor**,” which the controller uses to “output corresponding control signals to the steering system of the motor vehicle 1.” TESLA-1004, [0033]. Joos also determines steering angle movements by *vision systems* on the vehicle. For example, Joos discloses that “[u]sing sensors of the motor vehicle or the driver assistance system of the motor vehicle, objects can be detected that bound on the cross-parking space. The sensor can be for example an ultrasonic sensor, **a radar sensor, a laser sensor or a**

camera. Furthermore, it can be provided that the sensor data that is provided by the sensors are analysed by the controller of the motor vehicle. ... [T]he motor vehicle is reversed along the unparking trajectory until it can be steered past the objects bounding on the cross-parking space without collisions.” TESLA-1004, [0012], [0032], [0035]; *see also id.*, [0008] (“the unparking trajectory is adjusted when unparking the motor vehicle using sensor data that are detected with **sensors** of the motor vehicle”), [0009].

B. GROUND 1B—Obvious based on Joos in view of Kischkat (Claims 5, 9-12, 18)

1. Overview of Kischkat

Kischkat describes “a motor vehicle comprising an electronically shiftable automatic transmission and a park-steer assist system for supporting a parking process.” TESLA-1005, [0001], [0009]. Kischkat discloses that “during a parking process supported by the assistance system, the signal for shifting the automatic transmission from a forward driving mode to a reverse driving mode or vice versa after automatic braking to a standstill can be given via the accelerator or brake pedal[,] via a voice input into a voice control system[,] or by actuating a control element on the steering wheel, dashboard, or key side.” TESLA-1005, [0009]; *generally id.*, [0001]-[0025], [0036], FIGs. 1-2. Kischkat also describes the driver giving “a confirmation response to change direction – if necessary, after asking via

the voice control system or the vehicle's loudspeaker whether a change of direction is desired. For example, if the voice control system or assistance system asks 'Change direction?', the driver simply has to answer 'yes'." TESLA-1005, [0016]; TESLA-1003, ¶¶46-47.

2. Combination of Joos and Kischkat

A POSITA would have found it obvious to implement the gear shift that occurs at the end of Joos's unparking trajectory in accordance with Kischkat's option for offering an automated gear shift that would be made only upon confirmation from the driver. TESLA-1003, ¶101.

In more detail, Joos describes two options for engaging the forward gear after reversing during an unparking maneuver. TESLA-1004, [0017], [0038]. In the first option, "the driver assistance system itself can change from the reverse gear into the forward gear." *Id.*, [0017]. In the second option, "an instruction to engage the forward gear is issued to the driver of the motor vehicle" and "[t]he driver of the vehicle... engage[s] the forward gear." *Id.*, [0017], [0038]. The first option relieves the driver of the burden of manually shifting to the forward gear, but the driver may alternatively prefer to confirm agreement with the gear change before the driver assistance system effects the change automatically. *Id.* The second option provides the driver with more control, but still the driver will need to manually manipulate the vehicle's gear shifter to indicate the forward direction and engage the forward

gear. TESLA-1003, ¶102.

Because each of Joos's options for shifting gears during the unparking procedure carry distinct tradeoffs, a POSITA would have turned to references like Kischkat that describe techniques for shifting gears that require a different level of driver involvement. TESLA-1003, ¶103.

As discussed above, Kischkat describes the option of automatically shifting gears using a driver assistance system—but only after the driver assistance system offers to shift gears and the driver is able to accept or reject the offer via a control input other than the vehicle's manual gear selector. TESLA-1005, [0003], [0016], [0010]-[0012], [0019]; *supra*, §III.B.1. Multiple reasons would have prompted a POSITA to pursue a Joos-Kischkat combination that expands Joos's options for shifting gears according to the techniques described in Kischkat. TESLA-1003, ¶104.

First, a POSITA would have pursued the combination to provide drivers with another option for shifting from reverse to drive during the unparking procedure that would achieve distinct benefits from those attained by Joos's original solution. TESLA-1003, ¶105. Considering these distinct benefits, a POSITA would have expected Kischkat's option to be preferred by a significant population of drivers. TESLA-1003, ¶¶105-106. For example, Kischkat's offer/acceptance technique allows the driver to retain control in accepting/rejecting a proposed gear shift before

the driver assistance system makes the change. *Id.* At the same time, Kischkat's solution relieves the driver of the burden of manually manipulating the gear selector. TESLA-1005, [0012]; TESLA-1003, ¶¶105-106.

Second, a POSITA would have applied Kischkat's suggestion for offering an automated gear shift that could be confirmed by the driver before the gear shift is made in Joos's system to ensure valets, new drivers, or others who are unfamiliar with the driver assistance system are better capable of operating the vehicle and are not surprised by an unexpected change in direction of the vehicle. TESLA-1003, ¶107.

Third, a POSITA would have applied Kischkat's suggestion for offering an automated gear shift in Joos's system to achieve known benefits like those expressly described in Kischkat. TESLA-1003, ¶108. For example, Kischkat explains that "the use of the accelerator or brake pedal is advantageous in that the driver does not have to turn his attention away from what he is doing at all, since it is easy for him to press one or the other pedal to signal.... It is also very easy for him to operate a control element, as he does not have to be careful to use a certain predetermined position" to select a specific gear. TESLA-1005, [0013]; *see also id.*, [0009], [0012]-[0013], [0016], [0019]; TESLA-1003, ¶108.

Fourth, a POSITA would have pursued the Joos-Kischkat combination because it merely involves the application of known techniques (*e.g.*, Kischkat's

automated gear shift conditioned on a driver’s confirmatory response) to improve a conventional system (*e.g.*, Joos’s semi-autonomous parking system) to achieve predictable results. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) (“a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.”); *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380-81 (Fed. Cir. 2023) (“It’s enough... to show that there was a known problem... in the art, that [another known teaching]... helped address that issue, and that combining the teachings... wasn’t beyond the skill of an ordinary artisan. Nothing more is required to show a motivation to combine under *KSR*.”). Here, a POSITA would have recognized the tradeoffs associated with the gear shifting options provided in Joos and would have appreciated that some drivers would prefer a third option like that described in Kischkat. TESLA-1003, ¶109. Kischkat’s techniques would have benefited these drivers for each of the reasons described above. *Id.*; *see also id.* ¶¶110-113 (describing additional motivations).

A POSITA would have reasonably expected success implementing the Joos-Kischkat combination, especially since both references describe straightforward techniques for shifting gears during a parking/unparking process. TESLA-1003, ¶114. Indeed, Kischkat explicitly states that its techniques can be “easily” implemented. TESLA-1005, [0010]; TESLA-1003, ¶114.

3. Claim Element Analysis

(a) Claim 5

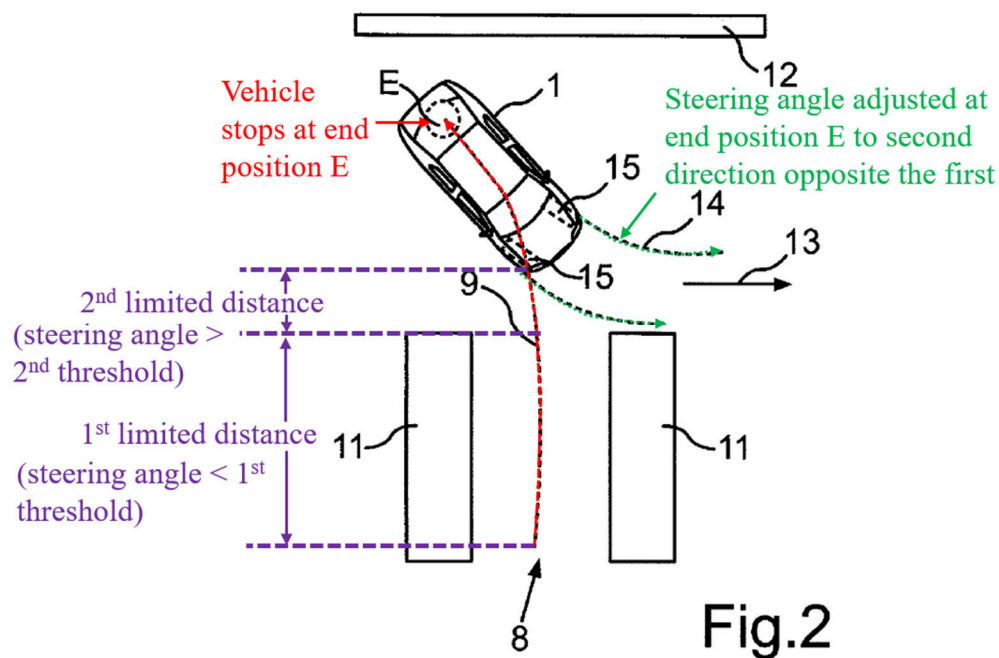
Joos-Kischkat renders obvious claim 5. TESLA-1003, ¶¶115-116. As discussed above, the controller of Joos's driver assistance system auto-shifts to drive (*e.g.*, engages the forward gear) at the end position E of the unparking trajectory 9 in response to a pattern of distance traveled (*see* Ground 1A at Claim 13), a pattern of velocity that constitutes a velocity profile (*see* Ground 1A at Claim 15), and a pattern of steering angles that constitutes a steering angle profile (*see* Ground 1A at 1[f]). *Supra*, §§III.A.2(g), III.A.2(k), III.A.2(l). Joos's pattern of distance traveled, pattern of velocity (velocity profile), and pattern of steering angle movements (steering angle profile) are all "prior" patterns that represent vehicle operation before the driver assistance system auto-shifts to drive and that represent prior defined conditions for the auto-shift to occur (*e.g.*, conditions for the vehicle to travel distances along the unparking trajectory to end position E, to stop at the end position E, and for the predefined steering angles to be set). TESLA-1004, [0016]-[0018], [0008]-[0009]; *supra*, §§III.A.2(g), III.A.2(k), III.A.2(l). Further, based on Kischkat, the Joos-Kischkat vehicle offers to auto-shift rather than directly proceeding to auto-shift without the driver's acceptance. *Supra*, §§III.B.1, III.B.2, III.B.3(l). Therefore, in the Joos-Kichkat combination, the controller is operable to *offer an auto-shift in response to a prior pattern of vehicle operation based on at least one of distance traveled, velocity profile, and steering angle profile*. TESLA-

1003, ¶116.

(b) Claim 9

Joos-Kischkat renders obvious claim 9. TESLA-1003, ¶¶117-118. As shown in FIG. 2 (below), Joos discloses that the vehicle 1 reverses from a cross-bounding parking space to an end position E along trajectory 9 during the assisted unparking maneuver. TESLA-1004, [0008]-[0010], [0036]-[0038], FIG. 2. During the reversing movement, the vehicle 1 travels a first distance with the steering angle turned only a small amount to the right as the vehicle 1 moves clear of nearby vehicles on either side of the parking space (*a first limited distance associated with vehicle length* (e.g., length of vehicles 11). *Id.* The steering angle during this portion of the movement is less than a first threshold selected to prevent vehicle 1 from turning too sharply and colliding with vehicle 11. *Id.*, [0014] (“exclude collisions”), [0037]. The controller of vehicle 1’s driver assistance system then turns the wheel more sharply to the right while reversing *a second limited distance* to reach end position E, located back and to the side of vehicle 1’s original parking space. *Id.* The steering angle during this portion of the movement is more than a second selected threshold as needed to swing the vehicle with the correct orientation to reach the predefined end position E. *Id.*, [0008]-[0009]. The vehicle 1 subsequently stops at end position E. *Id.*, [0016]. While stopped at end position E, the controller then adjusts the steering angle to the left (*a second direction opposite*

the first direction) for the anticipated forward motion of the vehicle 1. *Id.*, [0014]-[0018], [0037]-[0038]. Because each of these actions must be performed for vehicle 1 to reach end position E where the controller offers the auto-shift to drive (*see supra*, §III.B.2), the Joos-Kischkat controller is operable to offer an auto-shift only if the conditions recited in claim 9 are satisfied. TESLA-1003, ¶118.



TESLA-1004, FIG. 2 (annotated)

(c) Claim 10

Joos-Kischkat renders obvious claim 10. TESLA-1003, ¶¶119-120. Kischkat discloses that various “elements provided on the vehicle, which otherwise serves a different purpose, [can be] modified or configured in such a way that the shift signal for changing the driving gear can be given via this element.” TESLA-1005, [0010].

For example, an “accelerator or brake pedal,” a “voice control system,” or “a steering wheel button or a scroll wheel or similar,” can all be configured as an input device for receiving a driver’s acceptance of an offer to auto-shift between reverse and forward gears. *Id.*, [0010]-[0013], [0016]-[0018]; *supra*, §III.B.1.

As described above (*supra*, §III.B.2), it would have been obvious to apply Kischkat’s techniques in combination with Joos such that the brake pedal or other elements in the vehicle would be configured as *a driver input device operably connected to the controller, the controller operable to offer an auto-shift and to enact the auto-shift in response to a user acceptance action on the driver input device*. TESLA-1005, [0009], [0011] (“switching of the transmission is realized by a simple acknowledging action”), [0016] (“[I]f the ... **assistance system asks ‘Change direction?’, the driver simply has to answer ‘yes’.**”), [0036]; *infra*, 18[f]; TESLA-1003, ¶121.

(d) Claim 11

Joos-Kischkat renders obvious claim 11 for the reasons discussed above with respect to claim 10. TESLA-1003, ¶122; TESLA-1005, [0009] (“the signal for shifting the automatic transmission ... can be given via the ... brake pedal”).

(e) Claim 12

Joos-Kischkat renders obvious claim 12 for the reasons discussed above with respect to claim 10. TESLA-1003, ¶123; TESLA-1005, [0013] (“it is sufficient to

simply operate this control element, for example, a steering wheel button or a scroll wheel or similar”), [0017] (“switching signal is given via a control element on the steering wheel or dashboard side, a button, a knob, scroll wheel, or touch field is expediently used”), [0018], [0027], [0036].

(f) Element 18[p]

Supra, Ground 1A at 1[p]; TESLA-1004, [0006] (“manual driving of the motor vehicle can be carried out by a vehicle driver”), [0009]-[0014]; TESLA-1003, ¶124.

(g) Element 18[a]

Supra, Ground 1A at 1[a]; TESLA-1003, ¶125.

(h) Element 18[b]

Supra, Ground 1A at 1[b]; TESLA-1003, ¶126.

(i) Element 18[c]

Supra, Ground 1A at 1[c]; TESLA-1003, ¶127.

(j) Element 18[d]

Supra, Ground 1A at 1[d]; TESLA-1003, ¶128.

(k) Element 18[e]

Supra, Ground 1A at 1[e]; TESLA-1003, ¶129.

(l) Element 18[f]

Joos-Kischkat renders obvious 18[f]. TESLA-1003, ¶¶130-131. Joos discloses that, during the assisted unparking maneuver, the vehicle is operated in

reverse until “reaching the end position” where “a forward gear is engaged” by the driver assistance system. TESLA-1004, [0017]; *see also id.*, [0018], [0034]-[0038], FIG. 2. Specifically, “the motor vehicle 1 is manoeuvred along an unparking trajectory 9” to the end position E, where the vehicle stops before the driver assistance system shifts to the forward gear. *Id.*, [0034], [0006], [0016] (“motor vehicle is stopped at the end position”).

To the extent Joos does not explicitly disclose the claimed “*offer*,” Kischkat discloses this feature. *Supra*, III.B.1; TESLA-1003, ¶132. For example, Kischkat discloses that “during a parking process supported by the assistance system, the signal for **shifting the automatic transmission from a forward driving mode to a reverse driving mode or vice versa** after automatic braking to a standstill can be given via the accelerator or brake pedal via a voice input into a voice control system or by actuating a control element on the steering wheel, dashboard, or key side.” TESLA-1005, [0009]. Kischkat also describes the driver giving “a confirmation response to change direction – if necessary, after asking via the voice control system or the vehicle’s loudspeaker whether a change of direction is desired. For example, if the voice control system or **the assistance system asks ‘Change direction?’**, the driver simply has to answer ‘yes’.” TESLA-1005, [0016]. “In order to inform the driver that he must give a shift signal, an optical and/or acoustic and/or haptic information signal is expediently given to him.” TESLA-1005, [0019], [0036]. The

driver assistance system asking the driver whether the assistance system should change direction and/or informing the driver that a shift signal must be given constitutes an *offer [to] the driver [of] an auto-shift to drive*. TESLA-1003, ¶132. It would have been obvious to apply Kischkat's techniques in combination with Joos as described above in Section III.B.2 such that the driver assistance system would first offer to auto-shift to drive at the end position E of Joos's unparking trajectory 9 and would wait for the driver's confirmation response before carrying out the auto-shift. *Supra*, III.B.2. Therefore, in the Joos-Kischkat combination, the *controller is operable when the vehicle has been operated in reverse to offer the driver an auto-shift to drive*. TESLA-1003, ¶132.

(m) Element 18[g]

Joos-Kischkat renders obvious 18[g]. TESLA-1003, ¶¶133-134. As discussed above, Joos's auto-shift to drive at the end position E of the unparking trajectory 9 is based on at least distance traveled from a parked position (*see* Ground 1A at Claim 13), velocity of travel since parked (*see* Ground 1A at Claim 15), and steering angle (*see* Ground 1A at 1[f]). *Supra*, §§III.A.2(g), III.A.2(k), III.A.2(l). Further, based on Kischkat, the Joos-Kischkat vehicle offers to auto-shift rather than directly proceeding to auto-shift without the driver's acceptance. *Supra*, §§III.B.1, III.B.2, III.B.3(l). Therefore, in the Joos-Kichkat combination, *the offer of an auto-shift is based on at least one of distance traveled from a parked position, velocity of travel*

since parked, and steering angle. TESLA-1003, ¶134.

C. GROUND 1C—Obvious based on Joos in view of Kischkat and Alexi (Claims 5, 7, 15-16)

1. Overview of Alexi

Alexi describes an “assisted parking procedure” that includes... “leaving a parking space in the... reverse direction.” TESLA-1009, 4:9-15. Alexi explains that “[p]arking maneuvers with good parking results follow a typical pattern. In addition to the pure control or steering of the vehicle, the speed of the vehicle must be within a certain range; that is, application of the rate/speed versus the distance or time results in a typical curve.” TESLA-1009, 2:14-18. Accordingly, Alexi describes a vehicle with “a velocity or speed limiter limiting the speed of the vehicle during parking to a speed less than or equal to an upper speed limit.” TESLA-1009, 3:18-29.

Alexi’s FIG. 2 (below) illustrates the assisted parking procedure. TESLA-1009, 4:61-6:67.

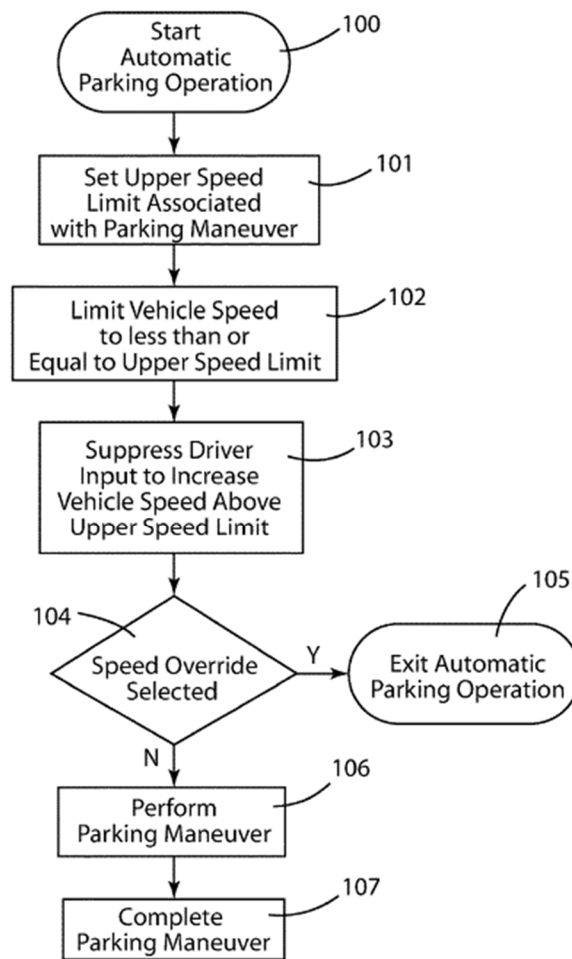


Fig. 2

TESLA-1009, FIG. 2

Allexi's FIG. 6 (below) "shows the velocity plotted against the time of the parking process." TESLA-1009, 5:59-61. "Several examples or possibilities for implementing a predefined speed profile or a dynamic speed limitation include an adjustable speed limitation device or variable speed; predefined braking interventions as a function of ultrasonic sensors to simulate a behavior shown in FIGS. 5 and 6; or use of a combination of speed limit and braking interventions

especially for low speeds less than 5 km/h.” TESLA-1009, 6:22-28; TESLA-1003, ¶¶48-51.

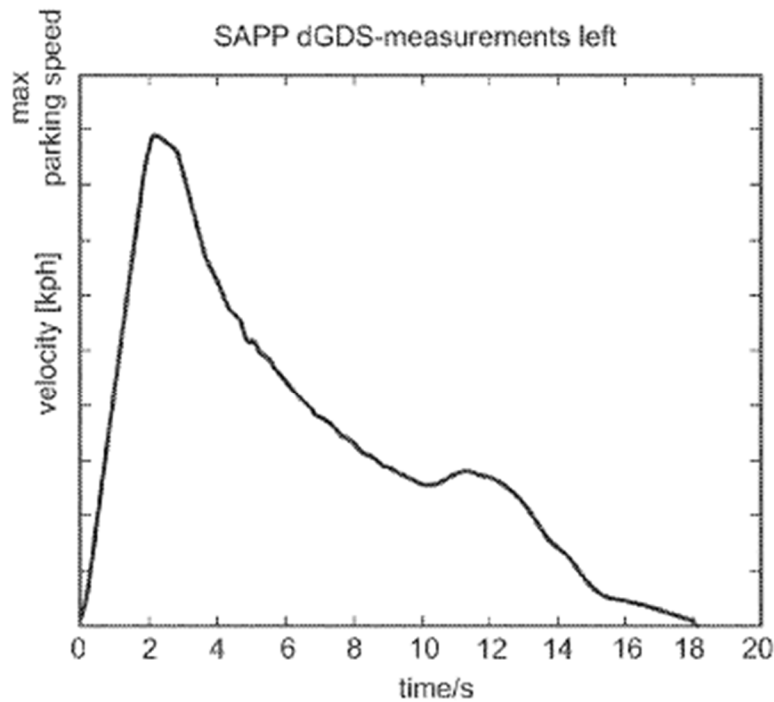


Fig. 6

TESLA-1009, FIG. 6

2. Combination of Joos, Kischkat, and Alexi

A POSITA would have found it obvious to further modify the Joos-Kischkat vehicle from Ground 1B based on Alexi to implement “a velocity or speed limiter” that would limit the speed of the vehicle during an autonomous or semi-autonomous unparking procedure to a speed less than an upper speed limit threshold. *Supra*, §III.C.1; TESLA-1009, 3:18-29, 1:51-2:49, FIG. 2; TESLA-1003, ¶135. In the resulting Joos-Kischkat-Alexi combination, the assisted unparking procedure is “cancelled” if the vehicle speed exceeds a defined speed limit. TESLA-1009, 1:34-

36, 2:50-3:8, 4:61-67, 5:35-39; TESLA-1003, ¶135. Thus, the assisted unparking procedure is maintained, and the Joos-Kischkat-Allexi vehicle would only successfully reach the target (end) position E of the unparking trajectory where an auto-shift to drive is made, if the vehicle's velocity does not exceed the speed limit. *Supra*, §III.C.1; TESLA-1009, 3:18-29, 5:19-29, 6:16-28, FIG. 6; *see also id.*, 4:9-15, 2:14-18, 3:18-29, 6:22-28; TESLA-1003, ¶135.

A POSITA would have been motivated to pursue the combination for multiple reasons. TESLA-1003, ¶136. Allexi explains that the application of a fixed or dynamic speed limit while “entering” or “leaving” a parking space beneficially provides “a higher degree of automation with a higher success rate, as well as enabling assisted parking on sloping or sloped surface.” TESLA-1009, 2:8-10; TESLA-1003, ¶136. Allexi's technique “prevents the vehicle from travel faster than a defined or calculated speed for the calculated moving/parking path. Thus, a disruption of the parking maneuver or process based on excessive speed can be prevented. In addition, limiting the speed reduces the need for warnings to the driver to slow down and avoid disruption of the parking function.” TESLA-1009, 2:35-41, 2:19-21, 4:11-15. A POSITA also would have appreciated the importance of limiting vehicle speed both during parking and unparking procedures because low speeds are characteristic of parking and unparking. TESLA-1003, ¶136 (citing TESLA-1006, [0003], [0026], [0035]).

Applying Alexi's techniques in combination with Joos and Kischkat also would have been obvious as a matter of law; indeed, the combination merely involves combining prior art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 415-421. A POSITA would have reasonably expected success implementing the combination. TESLA-1003, ¶137. Indeed, Joos, Kischkat, and Alexi each describe autonomous or semi-autonomous parking/unparking systems and adding a velocity limiter to a similar system would have been well within the skill of a POSITA. *Id.*

3. Claim Element Analysis

(a) Claim 5

Joos-Kischkat-Alexi renders obvious claim 5. TESLA-1003, ¶¶138-139. As discussed in further detail below (*infra*, Ground 1C at claim 15), the controller of the Joos-Kischkat-Alexi's driver assistance system offers an auto-shift to drive (*e.g.*, offers to engage the forward gear) at the end position E of the unparking trajectory 9 in response to a prior pattern of velocity that represents a velocity profile. *Supra*, §III.C.3(c). This prior pattern of vehicle operations is based on a velocity profile because the offer to auto-shift to drive only occurs if the vehicle has achieved the requisite velocity profile including reversing to the end position E in accordance with Alexi's speed-limited operation and ultimately stopping at the end position E (zero velocity). TESLA-1004, [0015]-[0018], FIG. 2; TESLA-1009, 2:14-18, 3:18-

29, 5:59-61, 6:22-28, FIGs. 2, 6.; *supra*, §§III.C.1-III.C.2; TESLA-1003, ¶139.

(b) Claim 7

Joos-Kischkat-Allexi renders obvious claim 7. TESLA-1003, ¶¶140-141. As discussed above in §III.C.2, a POSITA would have implemented the Joos-Kischkat-Allexi vehicle to include a velocity or speed limiter that limits the speed of the vehicle during unparking to a speed less than or equal to an upper speed limit, as suggested by Allexi. TESLA-1009, 3:18-29, 1:51-2:49, 4:54-5:18, FIG. 2; *supra*, §III.C.2; TESLA-1003, ¶141. In the combination, Allexi teaches that the unparking procedure is “cancelled” if the vehicle speeds during travel exceed a defined speed limit. TESLA-1009, 1:34-36, 2:50-3:8, 4:61-67, 5:35-39; TESLA-1003, ¶141. Thus, the unparking procedure is maintained, and the vehicle only successfully reaches the target (end) position of the unparking trajectory where the offer to auto-shift to drive occurs, if the vehicle’s velocities do not exceed the speed limit (*offer an auto-shift only if velocities are less than a selected threshold*). TESLA-1009, 4:9-15, 2:14-21, 3:18-29, 6:21-28, FIGs. 2-3, 5-6; TESLA-1003, ¶141. Requiring that the vehicle speed be limited is also consistent with Joos’s teaching that the vehicle be stopped before auto-shifting to engage the forward gear. TESLA-1004, [0016]-[0018]; TESLA-1003, ¶141.

(c) Claim 15

Joos-Kischkat-Allexi renders claim 15 obvious. TESLA-1003, ¶¶142-143.

Allexi teaches that “[p]arking maneuvers with good parking results”—which include maneuvers for “leaving” a parking space—“follow a typical pattern.” TESLA-1009, 2:14-18; *supra*, III.C.1. In particular, the “application of the rate/speed versus the distance or time results in a typical curve.” *Id.* In this context, Allexi proposes, and the combination includes, a vehicle velocity or speed limiter that applies a “dynamic speed limitation.” *Id.*, 6:21-28. The “dynamic speed limitation” varies the vehicle speed limit as a function of “the distance or time” that the vehicle travels along the unparking trajectory consistent with the “typical pattern” of velocities of the vehicle during an unparking maneuver. *Id.*; TESLA-1003, ¶143. Because the Joos-Kischkat-Allexi vehicle must abide by a pattern of velocities allowed by the dynamic speed limitation to successfully traverse the unparking trajectory 9 and reach the target (end) position E where offer to auto-shift to drive occurs (otherwise the maneuver is cancelled), the vehicle controller is operable to select to auto-shift to drive and thus *select a direction for wheel driving in response to the pattern of velocity*. *Id.*

(d) Claim 16

Supra, Ground 1C at Claims 7 and 15. TESLA-1003, ¶144.

D. GROUND 1D—Obvious based on Joos in view of Kischkat and Matters (Claims 5, 8, 13-14)

1. Overview of Matters

Matters describes a “parking assistance system.” TESLA-1010, [0002]. Like

Joos, Matters's parking assistance system implements "an unparking mode" in which the system "unparks the vehicle 1 out of the parking space." TESLA-1010, [0041], [0055]-[0056]. In Matters, "the distance of the vehicle can be measured via sensors inside the vehicle. As soon as a defined distance in the forwards direction or the reverse direction has been reached or exceeded, the vehicle is preferably automatically halted by braking without user interaction. In this way, the action radius of the vehicle is limited in order to minimize the potential risk." TESLA-1010, [0076]. Matters discloses that in parking and unparking, "the vehicle always only travels a maximum, specific distance, for example a maximum of 1.2 times the length of the vehicle." TESLA-1010, [0054]. Accordingly, in Matters, "a check is made as to whether the vehicle 1 has already exceeded a maximum allowing movement distance during the parking procedure," and if so, further movement is "halted." TESLA-1010, [0069], [0076], [0054]; TESLA-1003, ¶52.

2. Combination of Joos, Kischkat, and Matters

A POSITA would have found it obvious to further modify the Joos-Kischkat vehicle from Ground 1B (*supra*, §III.B.2) based on Matters such that the vehicle would monitor the distance traveled during each reverse and forward movement of the vehicle in an unparking procedure, and would prevent further movement if the distance traveled exceeded a maximum allowable distance. *Supra*, §III.D.1; TESLA-1010, [0054], [0069], [0076], ; TESLA-1003, ¶145. In the resulting Joos-Kischkat-

Matters combination, the determination that the vehicle has arrived at the end position E (as taught in Joos) where the offer to auto-shift from reverse to drive is made (as taught in Kischkat) would be further based on the distance traveled during the unparking process not exceeding the maximum allowable distance for the unparking procedure (as taught in Matters). TESLA-1010, [0069]; *supra*, §III.D.1; TESLA-1003, ¶145.

A POSITA would have been motivated to apply Matters's techniques in combination with Joos and Kischkat "in order to minimize [] potential risk," e.g., risk that the vehicle collides with an object or moves into an unsafe location such as a cross-bound traffic lane. TESLA-1010, [0076]; TESLA-1003, ¶146. Matters's techniques would have benefitted Joos's vehicle by better ensuring the unparking procedure ends and the auto-shift or offer to auto-shift occurs in a safe, predictable environment. *Id.* For example, it is well known that parking lots and garages are often tight and crowded, and unparking a vehicle often involves short, precise movements. TESLA-1003, ¶146. Limiting the distance of forward/reverse movements during an assisted unparking maneuver ensures the vehicle does not travel too far into potentially hazardous zones (e.g., pedestrian walkways, traffic lanes) before the driver takes control or the system reassesses. *Id.* The longer the vehicle travels autonomously, the higher the chance of encountering unexpected obstacles like moving vehicles, pedestrians, or debris. *Id.*

Applying Matters's techniques in combination with Joos and Kischkat also would have been obvious as a matter of law because the combination merely involves combining prior art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 415-421. A POSITA likewise would have reasonably expected success implementing the combination. TESLA-1003, ¶147. Indeed, Joos, Kischkat, and Matters each describe autonomous or semi-autonomous parking/unparking systems and applying Matters's techniques to limit the distance traveled during an unparking maneuver in a similar system would have been well within the capabilities of a POSITA. *Id.*

3. Claim Element Analysis

(a) Claim 5

Joos-Kischkat-Matters renders obvious claim 5. TESLA-1003, ¶148. As discussed in further detail below (*infra*, Ground 1D at claim 13), the controller of the Joos-Kischkat-Allexi's driver assistance system offers an auto-shift to drive (*e.g.*, offers to engage the forward gear) at the end position E of the unparking trajectory 9 based on distance traveled. *Supra*, §III.D.3(c); TESLA-1004, [0015]-[0018], FIG. 2; TESLA-1010, [0041], [0069], [0076], [0054]-[0056]; TESLA-1003, ¶148.

(b) Claim 8

Joos-Kischkat-Matters renders obvious claim 8. TESLA-1003, ¶¶149-150.

The Joos-Kischkat-Matters vehicle implements Matters's technique for monitoring the distance traveled during an assisted unparking maneuver and imposes a maximum allowable distance for reversing during the maneuver. *Supra*, §III.D.1, III.D.2; TESLA-1010, [0041], [0054]-[0056], [0069], [0076], ; TESLA-1003, ¶150. In the combination, the determination that the vehicle has arrived at the end position where the *offer to auto-shift* from reverse to drive occurs is therefore responsive to the distance traveled during the unparking process not exceeding the maximum allowable travel distance (*selected threshold*) for the unparking procedure. TESLA-1004, [0016]-[0018]; TESLA-1010, [0076]; TESLA-1003, ¶¶150-151. Accordingly, the controller of the Joos-Kischkat-Matters vehicle is *operable to offer an auto-shift only if distance traveled is less than a selected threshold. Id.*

(c) Claim 13

Joos-Kischkat-Matters renders obvious claim 13. TESLA-1003, ¶¶152-153. As described above, the distance traveled by the Joos-Kischkat-Matters vehicle must follow a pattern of distance traveled defined by the unparking trajectory 9 (as taught in Joos) and that is limited by Matter's maximum allowable travel distance (selected threshold) to reach the target (end) position E where the offer to auto-shift to drive is made. TESLA-1004, [0008]-[0009], [0016]-[0018], FIG. 2; TESLA-1010, [0076]; *supra*, §§III.A.2(k), III.D.3(b); TESLA-1003, ¶153. If these

aspects of the pattern are not satisfied, the unparking maneuver is cancelled or the vehicle does not reach the end position E and the controller would not select a direction for wheel driving by offering the auto-shift to drive as taught in Joos. *Id.* Accordingly, the controller of the Joos-Kischkat-Matters vehicle is ***operable to select a direction for wheel driving in response to a pattern of distance traveled.*** *Id.*

(d) Claim 14

Supra, Ground 1C at Claims 7 and 15. TESLA-1003, ¶154.

E. GROUND 2A—Obvious based on Joos in view of Bettger (Claims 1-4, 13, 15, 17)

1. Overview of Bettger

Bettger describes “assisted performance of a reverse-turning maneuver of a vehicle.” TESLA-1006, [0002], [0036]. In Bettger, if “the driver of the vehicle agrees with executing the reverse-turning maneuver, he confirms the same by... carrying out a certain steering movement, for example, a steering movement of an angle which lies above a certain threshold value and which corresponds to the steering movement that is necessary for carrying out the reverse-turning maneuver.” TESLA-1006, [0044], [0021]. “Receipt by the processing unit 14 of the driver’s confirmation causes the processing unit to perform computerized determination and outputting of instructions for carrying out the reverse-turning maneuver.” TESLA-1006, [0045], [0017]. When the vehicle’s orientation permits travelling in a forward

direction, a vehicle dynamics controller 18 selects “the appropriate transmission gear range” and shifts gears from the REVERSE range “to the DRIVE range” so that the “vehicle can now continue travelling rapidly forwards.” TESLA-1006, [0047], [0045]; TESLA-1003, ¶¶53-54.

2. Combination of Joos and Bettger

It would have been obvious to modify Joos in view of Bettger’s suggestion for the driver to confirm initiation of an assisted reverse-turning maneuver based on the driver’s steering input to the vehicle. TESLA-1003, ¶¶155-156. In the combination, the Joos-Bettger vehicle would initiate Joos’s autonomous or semi-autonomous unparking maneuver—*i.e.*, a type of reverse-turning maneuver like those taught in Bettger—only following confirmation by the driver. TESLA-1006, [0021], [0043]-[0047], FIGs. 1-2. More specifically, the driver would provide confirmation by “carrying out a certain steering movement, for example, a steering movement of an angle which lies above a certain threshold value and which corresponds to the steering movement that is necessary for carrying out the reverse-turning maneuver.” TESLA-1006, [0044]. For example, in the combination, while the vehicle is parked, or even after the driver begins reversing from the parking space, “[i]f it is determined that the maneuver is permitted, an audible, haptic or visible signal may be output to the driver of the vehicle.” TESLA-1006, [0043]. The driver would then signal confirmation to initiate the

maneuver (or at least initiate the assisted maneuver) by “carrying out a certain steering angle movement” that “corresponds to the steering movement” for carrying out the unparking maneuver (*e.g.*, steering angle movement for following Joos’s “predetermined” “unparking trajectory”). *Id.*, [0044]. In response to this initiating steering movement, the driver assistance system would intervene in one or more aspects of the vehicle’s operation (*e.g.*, steering, acceleration, braking) to carry out Joos’s autonomous or semi-autonomous unparking maneuver. TESLA-1004, [0008], [0017]; TESLA-1006, [0044]-[0047].

Once the vehicle arrives and stops at the end position of Joos’s unparking trajectory, and the pull-forward steering angle is set as taught in Joos, the controller of the driver assistance system in the Joos-Bettger vehicle changes from the reverse mode to drive mode by auto-shifting from a reverse gear to a drive gear as taught in each of Joos and Bettger. TESLA-1004, [0017], [0038]; TESLA-1006, [0045], [0047]. Because the driver’s steering input that sets a steering angle greater than a threshold as taught in Bettger triggers initiation of the assisted unparking maneuver that culminates in auto-shifting from reverse to drive at the end position E as taught in Joos, the controller/driver assistance system in the Joos-Bettger vehicle initiates the assisted unparking maneuver and shifts from reverse to drive at the end position E in response to the initiating steering input. TESLA-1003, ¶157. Multiple reasons would have prompted a POSITA to implement Joos in

accordance with Bettger's teachings in this manner. TESLA-1003, ¶157.

First, Bettger's approach would promote safety and improve the user experience by allowing the driver to confirm that an assisted reverse-turning unparking maneuver should be initiated by adjusting the steering angle by at least a threshold value. TESLA-1003, ¶158. As Bettger explains, by requiring driver confirmation, "unintentional performance of a reverse-turning maneuver can advantageously be prevented." TESLA-1006, [0021]. Thus, Bettger's driver confirmation allows the driver to retain control in accepting/rejecting a proposed unparking maneuver before the driver assistance system initiates the maneuver (or intervenes to assist in the maneuver), rather than leaving the determination entirely up to the vehicle. TESLA-1006, [0043]-[0044]; TESLA-1003, ¶158.

Second, a POSITA would have applied Bettger's suggestion to require driver confirmation for initiating an assisted unparking maneuver to ensure valets, new drivers, or others who are unfamiliar with the driver assistance system are better capable of operating the vehicle and are not surprised by unexpected autonomous driving by the vehicle. TESLA-1003, ¶159.

Third, a POSITA would have combined Joos and Bettger as described above because Bettger's suggestion for allowing the driver to confirm initiation of an unparking maneuver via a steering input while reversing that "corresponds to the steering input that is necessary for carrying out the reverse-turning maneuver"

provides a convenient and natural confirmation mechanism that avoids burdening the driver with offering confirmation via other controls that are not ordinarily used when reversing the vehicle. TESLA-1003, ¶160.

Fourth, a POSITA would have pursued the combination because it merely involves the application of known techniques (*e.g.*, Bettger’s confirmatory steering input to initiate an unparking maneuver) to improve a conventional system (*e.g.*, Joos’s autonomous or semi-autonomous unparking assistant) to achieve predictable results. *KSR*, 550 U.S. at 421 (2007); *Intel*, 61 F.4th at 1380-81.

A POSITA would have reasonably expected success implementing the combination at least because Joos and Bettger each describe established driver assistance systems designed for use in similar contexts (*e.g.*, reverse-turning unparking maneuvers). TESLA-1003, ¶161.

3. Claim Element Analysis

Ground 2A incorporates the analysis of Ground 1A. Where Ground 1A relies on the teachings of Joos, Ground 2A relies on the combined teachings of Joos and Bettger. Integration of Bettger in Joos does not disturb the mapping of Joos’s teachings to each of the claim elements in claims 1-4, 6, 13, 15, and 17 addressed in Ground 1A but not addressed below because the Joos-Bettger combination maintains the aspects of Joos’s teachings mapped to these claim elements in Ground 1A. For brevity, only claim elements whose mappings are materially affected by the

integration of Bettger in the combination are addressed below. TESLA-1003, ¶162.

(a) Element 1[f]

Joos-Bettger renders obvious 1[f]. TESLA-1003, ¶¶163-164. As discussed above (*supra*, §III.E.2), the controller of the driver assistance system of the Joos-Bettger vehicle initiates Joos's assisted unparking maneuver—*i.e.*, a type of reverse-turning maneuver like those taught in Bettger—only following confirmation by the driver. TESLA-1006, [0021], [0043]-[0047], FIGs. 1-2. More specifically, the driver would provide confirmation by “carrying out a certain steering movement, for example, a steering movement of an angle which lies above a certain threshold value and which corresponds to the steering movement that is necessary for carrying out the reverse-turning maneuver.” TESLA-1006, [0044]; *supra*, III.E.1. In the combination, the “the steering movement that is necessary for carrying out” Joos's assisted unparking (reverse-turning) maneuver includes a steering movement that is necessary to reverse the vehicle to the target (end) position E of the unparking trajectory 9. TESLA-1004, [0008]-[0009], FIG. 2. As Joos shows in FIG. 2, this steering movement involves turning the wheels to the right while reversing. *Id.* Once the vehicle reaches and stops at the target (end) position E, a steering angle movement is made to turn the wheels in the opposite direction in anticipation that the driver will pull forward from the end position while maintaining this steering angle. TESLA-1004, [0010], [0015]-[0018], [0037]-[0038]. Because the steering

movement in a first direction (*e.g.*, right) to confirm initiation of the unparking maneuver (as taught in Bettger) and then the steering movement in the opposite direction (*e.g.*, left) at the target (end) position E (as taught in Joos) must be carried out for the controller to select to engage the forward gear for a forward driving direction, Joos-Bettger's controller is *operable to select a direction for driving the wheels in response to a pattern of steering angle movements*. TESLA-1003, ¶164; *supra*, Ground 1A at 1[f], [4]. This is accomplished *without operator indication of a direction* for the reasons previously discussed. *Supra*, Ground 1A at 1[f].

(b) Claim 4

Supra, Ground 2A at 1[f]. TESLA-1003, ¶165.

F. GROUND 2B—Obvious based on Joos in view of Bettger and Kischkat (Claims 5-6, 9-12, 18)

1. Combination of Joos, Bettger, and Kischkat

It would have been obvious to combine Joos (as modified by Bettger (*supra*, §III.E.2)) with Kischkat for each of the reasons described above in Ground 1B. *Supra*, §III.B.2; TESLA-1003, ¶166. The resulting Joos-Bettger-Kischkat combination maintains the functionality of the Joos-Bettger combination from Ground 2A but further adds Kischkat's techniques as described above in Ground 1B. *Id.* The Joos-Bettger-Kischkat combination provides the additional features recited

in claims 5, 9-12 and 18⁴ for each of the reasons described for the same claims in Ground 1B. *Supra*, §III.B.3 (Claims 5, 9-12, 18); TESLA-1003, ¶166. The Joos-Bettger-Kischkat combination also provides claim 6 for the reasons discussed below. *Id.*

2. Claim Element Analysis

(a) Claim 6

Joos-Bettger-Kischkat renders obvious claim 6. TESLA-1003, ¶¶167-168. Bettger teaches that the driver provides confirmation by “carrying out a certain steering movement, for example, a steering movement of an **angle which lies above a certain threshold value.**” TESLA-1006, [0044]; *supra*, III.E.1. Because this steering movement must be made in the Joos-Bettger-Kischkat-combination for the assisted unparking procedure to be initiated and for the offer to auto-shift to be made (the offer is part of the assisted unparking procedure), *the controller is operable to*

⁴ The “*steering angle*” recited in 18[g] is met in the Joos-Bettger-Kischkat combination by the driver’s confirmation steering input as taught in Bettger. TESLA-1006, [0044]; *supra*, III.E.1. The offer to auto-shift is conditioned on this steering angle for the reasons discussed above in Ground 2A at 1[f] and in III.B.2. TESLA-1003, ¶166 (Footnote 4).

offer an auto-shift only if steering angles in a limited prior period were greater than a selected threshold. TESLA-1003, ¶168; *supra*, §III.E.1, III.E.2, III.B.2. Joos also teaches that the steering angle set at the end position E is a “maximum” angle that is greater than a selected threshold below the maximum. TESLA-1004, [0015], [0037]-[0039]; TESLA-1003, ¶168.

G. GROUND 2C—Obvious based on Joos in view of Bettger, Kischkat, and Alexi (Claims 5, 7, 15-16)

It would have been obvious to combine Joos (as modified by Bettger (*supra*, §III.E.2) and Kischkat (*supra*, III.B.2)) with Alexi for each of the reasons described above in Ground 1C. *Supra*, §III.C.2; TESLA-1003, ¶169. The resulting Joos-Bettger-Kischkat-Alexi combination maintains the functionality of the Joos-Bettger-Kischkat combination from Ground 2B but further adds Alexi’s techniques as described above in Ground 1C. *Id.* The Joos-Bettger-Kischkat-Alexi combination provides the additional features recited in claims 5, 7, and 15-16 for each of the reasons described for the same claims in Ground 1C. *Supra*, §III.C.3 (Claims 5, 7, and 15-16); TESLA-1003, ¶169.

H. GROUND 2D—Obvious based on Joos in view of Bettger, Kischkat, and Matters (Claims 5, 8, 13-14)

It would have been obvious to combine Joos (as modified by Bettger (*supra*, §III.E.2) and Kischkat (*supra*, III.B.2)) with Matters for each of the reasons described above in Ground 1D. *Supra*, §III.D.2; TESLA-1003, ¶170. The resulting

Joos-Bettger-Kischkat-Matters combination maintains the functionality of the Joos-Bettger-Kischkat combination from Ground 2B but further adds Matters's techniques as described above in Ground 1D. *Id.* The Joos-Bettger-Kischkat-Matters combination provides the additional features recited in claims 5, 8 and 13-14 for each of the reasons described for the same claims in Ground 1D. *Supra*, §III.D.3 (Claims 5, 8 and 13-14); TESLA-1003, ¶170.

**I. GROUND 3A—Obvious based on Joos in view of Bayer
(Claims 1-4, 13, 15, 17)**

1. Overview of Bayer

Bayer describes “a parking aid for a motor vehicle” that continuously adjusts the torque applied to the steering wheel to assist a driver in steering the vehicle along a planned trajectory during a parking maneuver. TESLA-1007, [0001]. Bayer's motor vehicle includes “a vehicle steering [system] with a manual steering wheel and a steering torque regulating module by which a steering torque can be impressed upon the steering wheel” to provide “driver steering assistance.” TESLA-1007, [0001]-[0003], [0006], [0012], [0024]. In Bayer, a steering angle control module calculates a trajectory for a parking maneuver and provides steering assistance to the driver that will cause “the vehicle [to] move[] on [the] trajectory.” TESLA-1007, [0049], [0054]. Bayer's “parking aid gives the driver... handling instructions for steering through an additional steering torque. This haptic feedback supports the

driver in parking in a manner that is convenient for him.” TESLA-1007, [0013]; *see also id.*, [0024]. “If the driver follows the handling instructions for steering, *i.e.*, correctly implements the corresponding steering instructions applied through the additional steering torque, the driver will certainly be in agreement with the steering operation.” TESLA-1007, [0014]. The vehicle can also “be braked as a function of the driver recognition” and “as soon as the driver’s torque has exceeded a threshold value.” TESLA-1007, [0065]. “In this case the vehicle is stopped until the correct steering torque prevails again,” which “makes it difficult to or even prevents the driver from unintentionally departing from the preselected trajectory.” *Id.*; *see also id.*, [0043], [0056]-[0057]; ; TESLA-1003, ¶¶55-57.

2. Combination of Joos and Bayer

A POSITA would have found it obvious to integrate Bayer’s “driving steering assistance” techniques in Joos’s semi-autonomous vehicle and unparking system. TESLA-1003, ¶171; *supra*, §III.I.1. In the resulting combination, Joos’s “driver assistance system” would implement Bayer’s “driving steering assistance” techniques such that the driver would be guided in steering the vehicle along a prescribed unparking trajectory as taught in Joos to the targeted “end position E” of the unparking trajectory. TESLA-1004, [0008], [0010], [0016]-[0018], FIG. 2; TESLA-1003, ¶171. Consistent with Bayer’s teachings, the steering assistance would be indicated by “a steering torque applied to the steering wheel” and/or

“steering stops” that would aid the driver in maintaining or adjusting the angle of the steering wheel while reversing to the angle(s) needed for the vehicle to be correctly steered along the unparking trajectory to the end position E. TESLA-1007, [0028]; *see also id.*, [0001]-[0006], [0049], [0054], [0064]-[0065], Abstract; TESLA-1003, ¶171.

The Joos-Bayer vehicle would further include a “driver recognition module” and related capabilities as taught in Bayer “to determine whether the driver is properly monitoring” the unparking procedure and to check whether the driver is providing either not enough or too much force to the steering wheel. TESLA-1005, [0045]; *see also id.*, [0046], [0057]-[0058], [0065]; TESLA-1003, ¶172. Bayer’s techniques would thus allow Joos’s vehicle to attain the benefit of semi-autonomous steering interventions—*i.e.*, a type of intervention that Joos explicitly acknowledged was a suitable solution. TESLA-1004, [0008] (“the driver assistance system interven[ing] in the steering”).

Multiple reasons would have motivated a POSITA to pursue the combination before the alleged invention of the ’230 Patent. TESLA-1003, ¶173.

First, a POSITA would have applied Bayer’s steering assistance in Joos to assist drivers in properly following Joos’s unparking trajectory, thereby improving the driver’s ability to consistently, reliably, and efficiently reach the target end position of the trajectory. TESLA-1003, ¶174. Joos requires the motor vehicle to

reach the targeted end position for the unparking maneuver to be completed, meaning that it is important for the vehicle to reliably reach the end position if Joos's unparking procedure is to be successfully completed on a consistent basis. TESLA-1004, [0006], [0008]-[0009]; TESLA-1003, ¶174. Bayer's steering assistance techniques would predictably aid the driver in operating the vehicle to follow a trajectory to the end position, especially since Bayer's techniques are specifically designed for this purpose. TESLA-1007, [0065], [0049], [0054], [0064], [0075].

Second, a POSITA would have applied Bayer's steering assistance to Joos to increase safety by ensuring the driver remains engaged during the unparking maneuver and ready to assume control of the vehicle at a moment's notice. TESLA-1003, ¶175; TESLA-1007, [0008]-[0009].

Third, a POSITA would have applied Bayer's steering assistance to Joos to increase safety through a driver recognition module that would monitor the driver's compliance with the steering instructions and allow the driver to quickly abort a trajectory (*e.g.*, to avoid collisions or for any other reason). TESLA-1003, ¶176. For example, Bayer explains that "[t]he vehicle may... be braked as a function of the driver recognition... as soon as the driver's torque has exceeded a threshold value." TESLA-1007, [0065]. "The... procedure is also terminated if the maximum torque of the artificial steering stop has been exceeded and the vehicle has come to a stop." *Id.*, [0068], [0064]-[0070].

Fourth, a POSITA would have applied Bayer's steering assistance techniques in Joos because Bayer's techniques beneficially provide "haptic feedback [that] supports the driver in parking in a manner that is convenient for him." TESLA-1007, [0013]; TESLA-1003, ¶177.

Fifth, a POSITA would have pursued the Joos-Bayer combination because it merely involves the application of known techniques (*e.g.*, Bayer's steering assistance techniques) to improve a known system (*e.g.*, Joos's semi-autonomous parking system) to achieve predictable results. *KSR*, 550 U.S. at 421; *Intel*, 61 F.4th at 1380-81. Here, there were known problems associated with driver assistance systems available as of the Critical Date that fully relieved the driver of responsibility for steering during an autonomous or semi-autonomous parking/unparking maneuver like that described in Joos. TESLA-1007, [0008]-[0009]; TESLA-1004, [0008]. Bayer's techniques helped address that problem (and provided the other benefits discussed above). TESLA-1003, ¶178.

A POSITA would have reasonably expected success implementing the Joos-Bayer combination, especially as Joos and Bayer both describe established driver steering assistance systems designed for use in similar contexts (*e.g.*, parking/unparking maneuvers). TESLA-1003, ¶¶179-180; TESLA-1007, [0071]-[0072].

3. Claim Element Analysis

Ground 3A incorporates the analysis of Ground 1A. Where Ground 1A relies on the teachings of Joos, Ground 3A relies on the combined teachings of Joos and Bayer. Integration of Bayer in Joos does not disturb the mapping of Joos's teachings to each of the claim elements in claims 1-4, 6, 13, 15, and 17 addressed in Ground 1A but not addressed below because the Joos-Bayer combination maintains the aspects of Joos's teachings mapped to these claim elements in Ground 1A. For brevity, only claim elements whose mappings are materially affected by the integration of Bayer in the combination are addressed below. TESLA-1003, ¶181.

(a) Element 1[f]

Joos-Bayer renders obvious 1[f]. TESLA-1003, ¶¶182-183. As described above (*supra*, §III.A.2(g) (Ground 1A at 1[f])), Joos's controller *selects a direction for driving the wheels in response to a pattern of steering angle movements, without operator indication of a direction*, where the pattern includes includes (1) steering in a first direction (*e.g.*, right) while reversing to reach the end position E of the unparking maneuver and (2) steering in the opposite direction (*e.g.*, left) at the end position E to set "a predetermined or adjusted steering angle," *e.g.*, "a maximum steering angle," for the anticipated forward movement of the vehicle when manual control of the vehicle is returned to the driver at the end of the unparking maneuver. TESLA-1004, [0010], [0014]-[0015], [0037]-[0038], FIG. 2; *supra*, §III.A.2(g) TESLA-1003, ¶183. In the combination, Bayer further teaches a parking/unparking

procedure in which a steering assistance system guides the driver in steering the vehicle to follow a prescribed trajectory like Joos's unparking trajectory 9. TESLA-1007, [0001]-[0003], [0006], [0012], [0016]-[0018], [0020]-[0021], [0024], [0065]; *supra*, III.I.1.

The Joos-Bayer vehicle provides these same steering angle movements as Joos, except that the driver steers the vehicle during the unparking maneuver guided by Bayer's steering assistance. *Supra*, III.I.2. The ***pattern of steering angle movements*** in the Joos-Bayer combination corresponds to the sequence of steering angle movements provided by the driver in compliance with the prescribed pattern of steering torque adjustments and steering stops indicated by Bayer's steering assistance necessary to follow Joos's unparking trajectory and set the pull-forward steering angle at the end position E. *Id.* The Joos-Bayer controller is operable to select a drive direction by auto-shifting to drive at the end position E in response to this pattern of steering angle movements for each of the reasons discussed above (*supra*, §III.A.2(g) (Ground 1A at 1[f])), and further because Bayer's technique enforces compliance with the steering assistance; otherwise, the maneuver is aborted or the vehicle is stopped such that the vehicle would not successfully reach the end position E where the auto-shift would occur if the driver did not comply with the prescribed pattern of steering angle movements. TESLA-1007, [0020]-[0021], [0043], [0056]-[0057], [0065]; TESLA-1003, ¶184.

(b) Claim 4

Supra, Ground 3A at 1[f]. TESLA-1003, ¶185.

J. GROUND 3B—Obvious based on Joos in view of Bayer and Kischkat (Claims 5, 9-12)

It would have been obvious to combine Joos (as modified by Bayer (*supra*, §III.I.2)) with Kischkat for each of the reasons described above in Ground 1B. *Supra*, §III.B.2; TESLA-1003, ¶186. The resulting Joos-Bayer-Kischkat combination maintains the functionality of the Joos-Bayer combination from Ground 3A but further adds Kischkat's techniques as described above in Ground 1B. *Id.* The Joos-Bayer-Kischkat combination provides the additional features recited in claims 5 and 9-12 for each of the reasons described for the same claims in Ground 1B. *Supra*, §III.B.3 (Claims 5 and 9-12); TESLA-1003, ¶186.

K. GROUND 3C—Obvious based on Joos in view of Bayer, Kischkat, and Alexi (Claims 5, 7, 15-16)

It would have been obvious to combine Joos (as modified by Bayer (*supra*, §III.I.2) and Kischkat (*supra*, III.B.2)) with Alexi for each of the reasons described above in Ground 1C. *Supra*, §III.C.2; TESLA-1003, ¶187. The resulting Joos-Bayer-Kischkat-Alexi combination maintains the functionality of the Joos-Bayer-Kischkat combination from Ground 3B but further adds Alexi's techniques as described above in Ground 1C. *Id.* The Joos-Bayer-Kischkat-Alexi combination provides the additional features recited in claims 5, 7, and 15-16 for each of the reasons described

for the same claims in Ground 1C. *Supra*, §III.C.3 (Claims 5, 7, and 15-16); TESLA-1003, ¶187.

L. GROUND 3D—Obvious based on Joos in view of Bayer, Kischkat, and Matters (Claims 5, 8, 13-14)

It would have been obvious to combine Joos (as modified by Bayer (*supra*, §III.I.2) and Kischkat (*supra*, III.B.2)) with Matters for each of the reasons described above in Ground 1D. *Supra*, §III.D.2; TESLA-1003, ¶188. The resulting Joos-Bayer-Kischkat-Matters combination maintains the functionality of the Joos-Bayer-Kischkat combination from Ground 3B but further adds Matters's techniques as described above in Ground 1D. *Id.* The Joos-Bayer-Kischkat-Matters combination provides the additional features recited in claims 5, 8 and 13-14 for each of the reasons described for the same claims in Ground 1D. *Supra*, §III.D.3 (Claims 5, 8 and 13-14); TESLA-1003, ¶188.

IV. CONCLUSION AND FEES

The Challenged Claims are unpatentable. Petitioner authorizes charge of fees to Deposit Account 06-1050.

V. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

Tesla, Inc. is the real party-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The '230 Patent is the subject of civil action *Bulletproof Property*

Management, LLC v. Tesla, Inc. et al., Case No. 1:25-cv-00665 (W.D. Tex.) filed May 5, 2025 (“Texas Litigation”). Petitioner is not aware of any disclaimers, reexamination certificates, or IPR petitions addressing the ’230 Patent.

The ’230 Patent is one of seven related patents that Bulletproof asserts in the Texas Litigation. Petitioner is filing IPR petitions on each of the seven asserted patents in the following proceedings:

Patent No.	IPR Proceeding No.
11,932,230	IPR2026-00227
12,221,104	IPR2026-00219
12,227,184	IPR2026-00204
12,233,871	IPR2026-00222
12,240,456	IPR2026-00228
12,240,457	IPR2026-00205
12,240,458	IPR2026-00229

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

Lead Counsel	Backup counsel
W. Karl Renner, Reg. No. 41,265 Fish & Richardson P.C. 60 South Sixth Street, Suite 3200 Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 Email: IPR49649-0056IP1@fr.com	Nicholas Stephens, Reg. No. 74,320 Kim H. Leung, Reg. No. 64,399 60 South Sixth Street, Suite 3200 Minneapolis, MN 55402 Tel: 202-783-5070 Fax: 877-769-7945 IPR49649-0056IP1@fr.com

	Ashraf Fawzy, Reg. No. 67,914 Tesla, Inc. 800 Connecticut Ave NW Washington, DC 20006 T: 202-905-9221 Email: afawzy@tesla.com
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D. Service Information

Please address all correspondence and service to the address listed above.

Petitioner consents to electronic service by email at IPR49649-0056IP1@fr.com
and afawzy@tesla.com.

Respectfully submitted,

Dated: January 23, 2026

/W. Karl Renner/
W. Karl Renner, Reg. No. 41,265
Nicholas Stephens, Reg. No. 74,320
Kim H. Leung, Reg. No. 64,399
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
T: 202-783-5070
F: 877-769-7945

Ashraf Fawzy, Reg. No. 67,914
Tesla, Inc.
800 Connecticut Ave NW
Washington, DC 20006
T: 202-905-9221

(Control No. IPR2026-00227)

Attorneys for Petitioner

CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,939 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated: January 23, 2026

/W. Karl Renner/

W. Karl Renner, Reg. No. 41,265
Nicholas Stephens, Reg. No. 74,320
Kim H. Leung, Reg. No. 64,399
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
T: 202-783-5070
F: 877-769-7945

Ashraf Fawzy, Reg. No. 67,914
Tesla, Inc.
800 Connecticut Ave NW
Washington, DC 20006
T: 202-905-9221

Attorneys for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) et seq. and 42.105(b), the undersigned certifies that on January 23, 2026, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided by USPS Priority Express, to the Patent Owner, by serving the correspondence address of record as follows:

LANGLOTZ PATENT & TRADEMARK WORKS, LLC
PO BOX 660675 #37585
Dallas, TX 75266-0675
(888) 852-4246

/Crena Pacheco/

Crena Pacheco
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
pacheco@fr.com