

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

TESLA, INC.,
Petitioner,
v.
iQAR INC.,
Patent Owner.

Case No. IPR2024-00630
U.S. Patent No. 10,850,616 B2

DECLARATION OF DR. DAVID M. BEVLY

TABLE OF CONTENTS

TABLE OF CONTENTS 2

I. INTRODUCTION 3

II. EDUCATION BACKGROUND, PROFESSIONAL EXPERIENCE, AND
OTHER QUALIFICATIONS 3

III. ASSIGNMENT AND MATERIALS CONSIDERED 8

IV. UNDERSTANDING OF THE LAW 11

V. LEVEL OF SKILL IN THE ART 13

VI. THE '616 PATENT 14

VII. CLAIM CONSTRUCTION.....17

VIII. The Claims of the '616 patent Are Supported by Koebler 650.....21

 A. Koebler650 Disclosure of Various Sensors and Conditions.....22

 B. Temperature, Weather, Wind Direction, Wind Velocity, Air Pressure,
 Location of Stoplights, Timing of Stoplights.....24

 C. Moisture.....31

 D. Amount of Vibration 35

 E. Traction.....44

I, David M. Bevly, declare as follows:

I. INTRODUCTION

1. I have been retained by iQar Inc. (“iQar”) as an independent expert consultant in this proceeding before the United States Patent and Trademark Office (“PTO”). I am not an employee of iQar or any affiliate or subsidiary of iQar.

2. I have been asked to consider whether certain references teach or suggest the features recited in certain claims of U.S. Patent No. 10,850,616, which I refer to herein as the “’616 patent.”

3. My opinions and the bases for my opinions are set forth below.

4. I am being compensated at my ordinary and customary rate of \$450 per hour for my work, plus reimbursement for any reasonable expenses. My compensation is based solely on the amount of time that I devote to activity related to this case and is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other financial interest in this proceeding.

II. EDUCATION BACKGROUND, PROFESSIONAL EXPERIENCE, AND OTHER QUALIFICATIONS

5. My curriculum vitae (“CV”) is attached hereto and provides an accurate identification of my background and experience.

6. I received a B.S. in Mechanical Engineering, Summa Cum Laude in 1995, from Texas A&M University, College Station, Texas. I received an M.S. in

Mechanical Engineering in 1997, from the Massachusetts Institute of Technology. My master's thesis focused on path planning and control algorithms of a climbing robot. I received my Ph.D. in Mechanical Engineering in 2001, from Stanford University. My Ph.D. dissertation developed GPS/INS algorithms for control of a farm tractor, models for high-speed control of tractors and methods to control the position of a towed farm implement using GPS. As a graduate researcher at Stanford, I also worked on methods of integrating inertial sensors with GPS for estimating critical vehicle states on passenger vehicles.

7. I am currently a Professor in the Department of Mechanical Engineering at Auburn University. I joined the faculty of Auburn University as an Assistant Professor in the Department of Mechanical Engineering after completing my Ph.D. I became an Associate Professor in 2007 and was elevated to Professor in 2010. I currently hold the McNair Endowed Professorship at Auburn University.

8. I have taught a number of graduate and undergraduate courses related to vehicle dynamics and control at Auburn University. In particular, I teach "System Dynamics and Control" (MECH 3140), "Vehicle Dynamics" (MECH 4420), "Fundamentals of the Global Positioning System (MECH5970/6970), "Feedback Control of Dynamic Systems" (MECH5970/6970). I have also taught classes in "Optimal Estimation and Control" (MECH 7710). In these courses, I emphasize the use of computational methods to simulate and analyze dynamic systems (including

vehicles), experimental measurements for the validation of the numerical models, as well as use of sensor measurements for controlling mechanical systems.

9. As a professor of mechanical engineering, my goal is to give students a practical yet theoretical foundation that will prepare them for jobs in industry or further work in academia. I believe practical examples are the best way to motivate students. I, therefore, combine theory and practice by incorporating examples from past work and research into my teaching curriculum. I also encourage my students to work on vehicle platforms in my GPS and Vehicle Dynamics Laboratory to collect data for use in my classes.

10. My research work focuses primarily on navigation and control of autonomous vehicles using GPS and Inertial Navigation System (INS) sensors. My research consists of three main thrusts: navigation using sensor fusion, on-line system identification, and adaptive control techniques and their application to vehicle dynamics and transportation. I secured over \$30M in externally funded research grants as Principle Investigator (PI) and over \$50M as both PI and Co-PI. Further, I have served as the major professor advisor for over 20 Ph.D. candidates and nearly 100 M.S. students. My work with these students has focused on research areas including navigation and control systems for unmanned vehicles, anti-roll control of unmanned vehicles, development and control of systems with integrated inertial and GPS sensors, GPS signal processing, vehicle dynamics, collision

detection systems, positioning of unmanned ground vehicles using ultrasonic sensors, and dynamic and adaptive control of farm tractors. I am currently serving as the professor advisor to an additional 4 Ph.D. candidates and 10 M.S. students focusing on vehicle dynamics and navigation systems, and GPS guidance and control of tractor implements.

11. I have received a number of awards during my tenure at Auburn University. In particular, I received the Auburn Alumni Engineering Council Junior Faculty Research Award in 2003 and the Auburn Alumni Engineering Council Outstanding Faculty Award in 2005. I have also received several teaching awards including the Auburn Alumni Engineering Council Outstanding Faculty Award in 2008 and 2010, the William Walker Teaching Award in 2010, and the Auburn University Graduate School Outstanding Faculty Member award in 2011. I also held the Philpott-Westpoint Stevens Professorship from 2008-2010 and the Albert Smith Professorship, 2010-2015.

12. I have authored more than 130 conference publications and over 40 peer reviewed archival journal papers. I have also co-authored a book titled “GNSS For Vehicle Control,” which was published in 2010. In addition, I have co-authored a number of book chapters. I have also presented more than 30 invited papers or lectures on various facets of vehicle dynamics and control systems. I have also served as a consultant for the following companies: IS4S (“Navigation

Algorithms”), Morgan Research Corporation (“Feedback control of a MEMS gyroscope”), Rockwell Scientific (“Control of a UGV for the DARPA Grand Challenge”), SAIC (“GPS/INS Requirements for Future Combat Systems (FCS)”), and Joe Gibbs Racing.

13. In addition, I have served as a proposal reviewer for National Science Foundation proposals related to sensor technologies. I have also been a reviewer of journal articles for a number of journals, including Journal of Vehicle System Dynamics, ASME Journal of Dynamic Systems Measurement and Control, International Journal of Field Robotics, International Journal of Vehicle Autonomous Systems, International, Journal of Vehicle System Modeling and Testing, Electronic Letters, Sensors, Transactions on Vehicular Technology to name a few. I have also served on the editorial board of International Journal of Autonomous Vehicle Systems.

14. I am a co-inventor on several U.S. patents (including U.S. Patent Nos. 6,434,462; 6,681,180; 6,732,024; and 9,403,415) and a patent application currently in review on optimization of energy to reduce fuel in heavy truck platoons.

15. I am familiar with the subject matter of this case, and consider myself an expert in, among other things, intelligent transportation systems, vehicle information and communications systems, automotive powertrains and energy systems, and navigation systems. I have led research projects in the area of vehicle

navigation systems as well as guidance and control of vehicles using GPS. I have also overseen research regarding powertrain optimization, including minimization of fuel economy of vehicles using terrain information as well as using cooperative adaptive cruise control for vehicle platoons.

III. ASSIGNMENT AND MATERIALS CONSIDERED

16. I have been asked to analyze and explain the subject matter of the '616 patent. I have been asked to consider, analyze, and explain whether certain limitations present in the independent claims of the '616 patent are supported by adequate written description in the applications to which the '616 patent claims priority.

17. The opinions expressed in this declaration are not exhaustive of opinions I may offer in the future regarding the claims of the '616 patent. Therefore, the fact that I do not address a particular point should not be understood to indicate an agreement on my part with any position taken by the Petitioner in this *inter partes* review proceeding.

18. I reserve the right to amend and supplement this declaration in light of additional evidence, arguments, or testimony presented during this proceeding or related proceedings on the '616 patent.

19. In forming the opinions set forth in this declaration, I have considered and relied upon my education, knowledge of the relevant field, knowledge of

scientific and engineering principles, and my experience. I have also reviewed and considered the '616 patent (Ex. 1001), the patent's prosecution history (Ex. 1002), the Board's institution decision (Paper 7) and the following additional materials to the extent relevant to the opinions expressed herein:

Exhibit	Description
Ex. 1003	Declaration and Curriculum Vitae of Dr. Vassilios Morellas
Ex. 1004	U.S. Pat. No. 8,712,650 ("Koebler650")
Ex. 1005	U.S. Pat. No. 11,065,977 ("Koebler977")
Ex. 1006	U.S. Pat. No. 9,682,624 ("Koebler624")
Ex. 1007	U.S. Pat. No. 8,972,162 ("Koebler162")
Ex. 1008	U.S. Pat. No. 7,925,426 ("Koebler426")
Ex. 1010	U.S. Pat. No. 7,516,011 ("Kabel")
Ex. 1011	U.S. Pat. No. 7,148,648 ("Okano")
Ex. 1012	U.S. Pat. No. 7,211,019 ("Kirkwood")
Ex. 1013	U.S. Pat. No. 7,983,836 ("Breed")
Ex. 1014	U.S. Pat. No. 7,752,188 ("Lagerstedt")
Ex. 1015	U.S. Pat. No. 7,650,956 ("Hirata")
Ex. 1016	U.S. Pat. No. 10,746,901 ("O'Brien")
Ex. 1017	U.S. Pat. No. 10,703,162 ("Kanda")
Ex. 1018	U.S. Pat. No. 5,848,378 ("Shelton")
Ex. 1019	E.P. Pat. No. 3,475,729 ("Elkebetz")
Ex. 1020	Wimmer A. & Schnessl E., "Effects of Humidity and Ambient

	Temperature on Engine Performance of Lean Burn Natural Gas Engines,” Proceedings of ICEF2006, ASME Combustion Engine Division 2006 Fall Technical Conference, Nov. 5-8, 2006, Sacramento, CA (“Wimmer”)
Ex. 1021	U.S. Pat. No. 6,505,123 (“Root”)
Ex. 2002	U.S. Pub. 2005/0065711 A1 (“Dahlgren”)
Ex. 2003	U.S. Patent No. 7,363,138 (“Scelers”)
Ex. 2004	U.S. Pub. 2008/0004783 A1 (“Mizon”)
Ex. 2005	Declaration of Dr. Vassilios Morellas from the <i>Ex Parte</i> Reexamination of U.S. Patent No. 10,850,616
Ex. 2006	U.S. Patent No. 4,595,866 (“Fukatsu”)
Ex. 2007	U.S. Patent No. 5,898,183 (“Teder”)
Ex. 2008	U.S. Patent No. 6,376,824 (“Michenfelder”)
Ex. 2009	U.S. Patent No. 12,104,981 (“Ziehl”)
Ex. 2010	Mukherjee, “Effect of Pavement Conditions on Rolling Resistance,” American Journal of Engineering Research, Vol. 3, Issue 7, pp. 141-148 (2014)
Ex. 2011	Jackson et al., “Synthesis of the Effect of Pavement Properties on Tire Rolling Resistance,” NCAT Report 11-05 (Aug. 2011)
Ex. 2012	U.S. Patent No. 9,315,078 (“Wang”)
Ex. 2013	Wang et al., “Dynamic Tire Pressure Sensor for Measuring Ground Vibration,” Sensors 2012
Ex. 2014	Excerpts from Mavrigian, M. (1998) <i>Brake System: OEM & Racing brake technology</i> .
Ex. 2015	U.S. Patent No. 6,741,926 (“Zhao”)

Ex. 2016	U.S. Patent Application Publication No. 2004/0225434 (“Gotfried”)
Ex. 2017	U.S. Patent No. 6,405,132 (“Breed’132”)
Ex. 2018	U.S. Patent Application Publication No. 2002/0188392 (“Breed’392”)
Ex. 2019	U.S. Patent No. 5,710,565 (“Shirai”)
Ex. 2020	U.S. Patent 6,596,978 (“Hochstein”)
Ex. 2021	U.S. Patent Application Publication No. 2004/0016870 (“Pawlicki”)
Ex. 2023	U.S. Patent No. 4,907,154 (“Yasuda”)
Ex. 2026	U.S. Patent No. 3,983,746 (“Phillips”)
Ex. 2027	U.S. Patent Application Publication No. 2005/0080543 (“Lu”)
Ex. 2029	WIPO Application No. WO 2008/138067 (“Rozyn”)
Ex. 2030	U.S. Patent No. 4,827,416 (“Kawagoe”)
Ex. 2031	Transcript of December 13, 2024 Deposition of Dr. Vassilios Morellas.

IV. UNDERSTANDING OF THE LAW

20. I am not an attorney, but I have been informed of certain legal principles which I have employed in forming my opinions in this declaration.

21. I understand and have been informed that for a patent to be entitled to the benefit of the earlier filing date of an application to which the patent claims priority, the patent’s claims must be supported by adequate written description in the earlier filed priority application.

22. I understand that to satisfy the written description requirement, an earlier filed application's specification must describe the later claimed invention in sufficient detail so that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought.

23. Expressed another way, I understand that the test for written description is whether the earlier filed disclosure relied upon reasonably conveys to a POSITA that the inventor had possession of the later claimed subject matter as of the filing date.

24. I understand that a patent's claims do not need to be recited verbatim in the specification for there to be written description support.

25. Instead, all that is required is that the specification reasonably convey to a POSITA that the named inventors had possession of the claimed subject matter.

26. I also understand that information and concepts that were well-known in the art do not need to be reproduced verbatim in the specification in encyclopedic fashion for there to be written description support. Instead, the specification is to be assessed based on the background knowledge and information possessed by a POSITA at the time of filing.

27. I provide my opinions in this declaration based on the guidelines set forth above.

V. LEVEL OF SKILL IN THE ART

28. I have been informed and understand that the level of ordinary skill in the relevant art at the time of the invention is relevant to inquiries such as the meaning of claim terms and the and meaning and scope of disclosures found in a patent specification

29. I have been informed and understand that factors that may be considered in determining the level of ordinary skill include: (1) the education of the inventor; (2) the type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) education level of active workers in the relevant field. I have been further informed and understand that a person of ordinary skill in the art (POSITA) is also a person of ordinary creativity.

30. In my opinion, a POSITA in the field of the '616 patent would have had a bachelor's degree in mechanical engineering, electrical engineering, computer science or an equivalent field, along with at least some professional experience working with automotive applications such as powertrains, energy systems, vehicle sensor systems, or vehicle navigation technology or an equivalent level of skill, knowledge, and experience.

31. Based on my education, training, and professional experience in the field of the claimed invention, as discussed in Section II, I was a person of more than the ordinary level of skill in the art as Kobeler⁶⁵⁰'s filing on April 8, 2011.

32. In forming my opinion, I have drawn on my academic background and professional experience, including experience hiring and managing engineers engaged in development, research, and consulting projects applying the technologies and applications described in the '616 patent, as well through teaching and managing graduate students working on the same. My opinions herein, however, were formed taking into account the perspective of an ordinarily skilled artisan.

33. I have also reviewed the definition of a POSITA provided by Dr. Morellas. *See* Ex. 1003, ¶ 28. This definition references educational fields—like general physics—that are relatively far afield from the subject matter of the '616 patent. I believe my definition is more representative of the appropriate level of skill possessed by a POSITA. Regardless, I have considered both my definition and that proposed by Dr. Morellas and would have arrived at the same conclusions regarding the claims of the '616 patent under either definition.

VI. THE '616 PATENT

34. The '616 patent relates generally to devices, systems, and methods for creating a route database that can be used to effectively manage the power consumption of a vehicle. Ex. 1001, Title, Abstract, 2:19-22.

35. According to the '616 patent, many parameters can impact the optimal power consumption of a vehicle. This includes external factors (*e.g.*, forces and conditions that act on the vehicle), internal conditions (*e.g.*, the status of the vehicle and component parts), operator commands (*e.g.*, control commands from the operator preparing to or driving the vehicle), and operational parameters (*e.g.*, performance / historical capabilities of the vehicle based on make and model). *Id.*, 1:54-63.

36. To account for this, the patent goes on to disclose and claim a system and method for determining certain conditions/factors from certain sensors and data measurements, associating those conditions with particular route segments, and storing the associated data in a database. *See, e.g.*, Claim 1 and 8:16-22 (“[T]he power management device communicates with one or more such databases to identify the location and surrounding features (*e.g.*, suggested speed limits, stop signs, traffic patterns, etc.).”); *id.* at 24:42-44 (“The power management system may also contribute to a database of information about route, road conditions, and the like, such as a database of historical route information.”).

37. For reference, independent claim 1 of the '616 patent is reproduced below:

1. An apparatus comprising:

an interface configured to (a) receive (i) sensor data samples during operation of a vehicle and (ii) data from a telemetry system and (b) connect to a remote database;

a memory configured to store (a) said sensor data samples for different points in time along a route segment travelled by said vehicle and (b) said data from said telemetry system; and

a processor configured to (i) analyze said sensor data samples stored in said memory to determine current conditions and (ii) associate said current conditions with said route segment, wherein (a) said route segment is identified according to said data from said telemetry system and (b) said current conditions associated with said route segment are uploaded to said remote database to create historical route information for a plurality of route segments;

wherein the sensor data samples are received from at least one of an optical sensor, a position sensor, a speed sensor, a gyroscopic sensor, a revolutions-per-minute sensor, an accelerator pedal position sensor, a brake pedal position sensor, a battery state sensor, a tire pressure sensor, a proximity sensor, a weight sensor, an airflow sensor, and a gas flow sensor; and

wherein said current conditions comprise at least one of: drag, wind resistance, tire resistance, a location relative to a destination, traffic patterns, an amount of light energy, a position of the sun, geographical information, an elevation of said vehicle, a grade of a road, a location of stoplights, a timing of stoplights, weather, a wind direction, a wind

velocity, a temperature, air pressure, moisture, visibility, an amount of vibration, and traction.

VII. CLAIM CONSTRUCTION

38. I am not a legal expert or an attorney and offer no opinions on the law. I understand that claim construction is a matter of law.

39. However, I have been informed by counsel of the legal standards that apply to claim construction in an *inter partes* review, and I have applied them in forming my opinions. I understand that during an *inter partes* review, the same claim construction standard used in federal district court is applied when addressing the meaning of claim terms.

40. I have been informed that the words of a claim are generally given the ordinary and customary meaning that the term or phrase would have to POSITA at the time of the invention in view of the surrounding claim language, the specification and the file history (collectively, the “intrinsic evidence” or “intrinsic record”).

41. I also understand that courts may consider extrinsic evidence, such as expert and inventor testimony, dictionaries, and learned treatises (collectively, the “extrinsic evidence” or the “extrinsic record”), but that such extrinsic evidence should be given less weight than the intrinsic evidence.

42. In my opinion, the terms of the '616 patent's claims do not require further construction and can be afforded their plain and ordinary meaning for purposes of the analysis of the prior art that I am conducting in this declaration.

43. Based on my review of both Dr. Morellas's declaration (Ex. 1003) and the Board's Institution Decision (Paper 7), a variety of construction issues that appear to have been raised.

44. Dr. Morellas's declaration includes a series of paragraphs discussing what he terms the "interface," "memory/storage," "processor," "monitoring," and "analyzing" elements of claims 1, 15, and 16 of the '616 patent. See Ex. 1003, ¶¶ 42-51.

45. Most of these paragraphs simply repeat the claim language itself and thus add very little.

46. Dr. Morellas does appear, however, to be misinterpreting the limitation in claim 1 requiring a processor that "analyze[s] said sensor data samples stored in said memory to determine current conditions" (and the similar limitations in claims 15 and 16).

47. While not entirely clear from Dr. Morellas's declaration, it appears that Dr. Morellas may be interpreting this language such that it requires each "current condition[]" identified by the claims to be determined using **only** "sensor data

samples” generated using the sensors specifically listed in the claims and no other sensors.

48. This is not how a POSITA would have interpreted the claims 1, 15, 16. While I agree that “sensor data samples” generated by the listed sensors are to be used when determining the claimed “current conditions,” there is nothing about either the claims or the specification that would require that data generated by the listed sensors be used exclusively by itself and without other input. All that the claims require is that “sensor data samples” generated by the listed sensors play a role in the determination of “current conditions.”

49. Consistent with this, the ’616 patent repeatedly explains that the “parameters” employed by its system can be either “directly measured” or “derived” from other information. Ex. 1001, 6:19-22; *see also* 7:36-41 (again noting that “information inputs” can be “directly measured” or “derived from other information inputs”).

50. Next, Dr. Morellas discusses what he calls “conjunctive” and “disjunctive” reads of the final “wherein” clauses of claims 1, 15, and 16. *See* Ex. 1003, ¶¶ 52-56.

51. Under Dr. Morellas’s “conjunctive” read, the claims would require simultaneously gathering all the listed types of “sensor data samples” and determining all the listed “current conditions.” *Id.*, ¶ 56.

52. Under Dr. Morellas’s “disjunctive” read, the claims are satisfied if one of the listed “sensor data samples” is collected and one listed “current condition” is determined. *Id.*, ¶ 55.

53. Based on my review of the Board’s Institution Decision (Paper 7), I see that the Board found that the claims of the ‘616 patent do not require simultaneously gathering all the different types of “sensor data samples” and determining all the listed “current conditions.” See Paper 7 at 10-14. Instead, the claims “only require[] one of the Enumerated Sensors to be present and one of the Enumerated Current Conditions to be determined.” *Id.*

54. I agree that this is how a POSITA would have interpreted claims 1, 15, and 16.

55. The claims state that the claimed “sensor data samples” be received from “at least one of” the listed types of sensors. Likewise, the claims state that the determined “current conditions comprise at least one of” the listed conditions. Interpreting the claim such that all the sensors and all the conditions must be present would read out the “at least one of” language. This claim language plainly requires that only one of the listed sensors and conditions is required.

56. Next, nothing about the specification requires the presence of all the sensors and conditions.

57. Like the claims, the specification repeatedly states that “one or more” sensors and “one or more” parameters can be employed. *See, e.g.*, Ex. 1001, 7:28-34, 8:23-35.

58. There are no specification passages stating that ***all*** sensors must be present or ***all*** conditions must be determined for the system to achieve its goals.

VIII. THE CLAIMS OF THE '616 PATENT ARE SUPPORTED BY KOEBLER 650

59. As I discuss below, it is my opinion that a POSITA would have considered the claims of the '616 patent to be supported by adequate written description in Koebler650 (Ex. 1004).

60. Based on my review of Dr. Morellas's declaration, I note that Dr. Morellas does not contest that the vast majority of the '616 patent's claim elements find written description support in Koebler650.

61. The only claim elements identified as purportedly lacking support are 10 of the “current conditions” identified by claims 1, 15, and 16 of the '616 patent. *See* Ex. 1003, ¶¶ 60-61, 79-90.

62. Because Dr. Morellas limited his analysis to just these conditions—and did not dispute that the remaining claim elements are all adequately supported—I have similarly focused my analysis on this part of the claims.

63. In my opinion, Koebler650 does provide adequate written support for the 10 “current conditions” identified by Dr. Morellas.

A. Koebler650 Disclosure of Various Sensors and Conditions

64. In my opinion, the disclosure of Koebler650 provides written description support for determining current conditions by analyzing sensor information even for conditions and sensors that are not expressly mentioned in Koebler650. In other words, a POSITA would have not concluded that the inventors of Koebler650 were only in possession of the invention only insofar as it extends to the conditions and sensors enumerated in Koebler650's specification. To the contrary, a POSITA would have understood that the invention encompassed other known conditions and known sensors for measuring those conditions. This is because Koebler650 broadly discloses the use of various known sensors to detect various known current conditions. *See, e.g.,* Koebler650 at 21:29-62 ("Any appropriate sensors, detectors or data inputs maybe used with the power management devices and systems disclosed herein. For example, sensors for detecting external environmental information may be used").

65. Koebler then provides numerous non-exhaustive examples of such sensors and the conditions that can be determined using those sensors. *See, e.g., id.*, 8:12-19 (listing "optical sensors" and "weather sensors"); *id.* at 8:63 ("weight sensors"); *id.* at 19:62-65 (listing "environmental sensors" and "operational status detectors"); *id.* at 21:29-62 (listing optical sensors, mechanical sensors, electrical sensors, magnetic sensors, position (GPS) sensors, speedometer, gyroscope, RPM

sensor, accelerator and brake pedal sensors, weather sensors, battery sensors, tire pressure sensors, weight sensors, airflow sensors, gas flow sensors, etc.); *id.* at 4:1-18 (listing as conditions, including speed, motor speed, vehicle orientation, RPM of motor, wheel rotations per minute, battery state, battery voltage, temperature of battery, tire pressure, drag force, vehicle weight, weight of driver, etc.); *id.* at 8:12-24 (listing as conditions visibility, distance from nearby vehicles, temperature, wind direction and velocity, air pressure, etc.); *id.* at 21:29-62 (listing as conditions location, elevation, terrain, destination, speed, motor speed, orientation, slope/grade, pressure applied and/or angle of petals, rain, sun, snow, etc.).

66. Koebler650 expressly does not limit the invention to such examples and, to the contrary, states that the invention may be applied using various types of sensors and input information. *See, e.g., id.*, 8:65-9:4 (“The examples of operational status information inputs are only intended to illustrate the kinds of operation status information that may be used by the power management devices and systems described herein. Any appropriate information about the operational state of the vehicle may be provided to the power management device or used by the power management device.”).

67. Given this disclosure a POSITA would have understood that the inventors of Koebler650 were in possession of the invention claimed in the ’616 Patent as applied to a wide range of known “current conditions” and sensors known

to help determine those conditions, even if those current conditions and sensors are not expressly enumerated in the specification of Koebler650.

68. As discussed in more detail herein, this would have included, for example, using optical sensors to determine moisture conditions, using wheel speed sensors to determine tractions conditions, and using inertial measurement units (including gyroscopic sensors and accelerometers) and certain types of position sensors (e.g., linear potentiometers and displacement sensors), to determine certain types of vibrations. As of the filing date of Koebler650, it was well known to use optical sensors to measure rain or other moisture conditions on windshields for purposes of, for example, triggering windshield wipers. As of the filing date of Koebler650, it was also well-known to use wheel speed sensors to determine traction for purposes of, for example, traction control systems and anti-lock brake systems. And, as of the filing date of Koebler650, it was well known and common to use position sensors to measure vibrations for purposes of, for example, detecting road conditions.

B. Temperature, Weather, Wind Direction, Wind Velocity, Air Pressure, Location of Stoplights, Timing of Stoplights

69. Dr. Morellas discusses 7 of the 10 “current conditions” identified in his declaration—temperature, weather, wind direction, wind velocity, air pressure, location of stoplights, and timing of stoplights—in a short two-paragraph section. See Ex. 1003, ¶¶ 90-91.

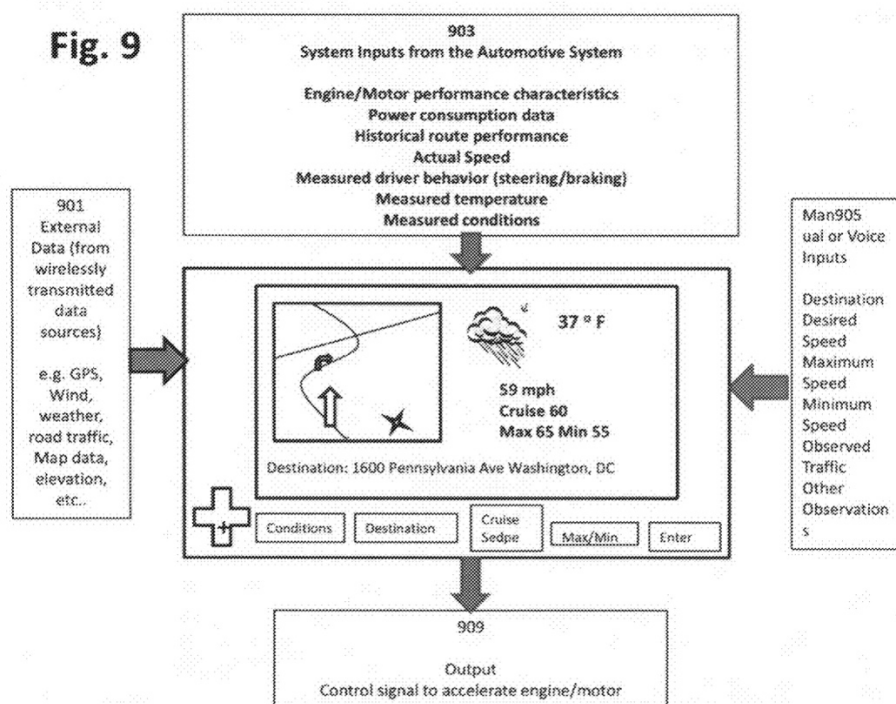
70. Koebler650 (Ex. 1004) explicitly references the determination of each of these conditions.

71. In particular, according to Koebler650, its system may determine “information about the external environment of the vehicle.” Koebler650, 3:30-36.

72. This determined external environment information includes, among other things, “the location of stoplights, the timing of stoplights, ... the weather around the vehicle, present wind direction, the predicted wind direction for upcoming route segments, present wind velocity, the predicted wind velocity for upcoming route segments, current temperature, the predicted temperature for upcoming route segments, current air pressure, [and] predicted air pressure for upcoming route segments....” *Id.*, 3:51-60.

73. Koebler650 similarly explains that its system considers “road conditions (e.g., traffic, weather, etc.)” *Id.*, 14:1; *see also id.*, 18:54-55 (similarly referencing “information about the current route (e.g., the driver, weather conditions, traffic, etc.)”); 19:59-65 (discussing the “polling” of data from “external environmental sensors (e.g., detecting location, direction, elevation, traffic, weather, etc.)”); 21:47-48 (discussing the collection of “weather (e.g., wind direction and velocity, rain, sun, snow, etc.)” information).

74. The determination of various traffic and weather conditions—including those required by the claims—is also depicted in Figure 9 of Koebler650:



Id., Fig. 9. As shown, “external data” 901 includes wind, weather, traffic, map, and other information is determined. *See id.*

75. Despite the straightforward disclosure of the claimed conditions in Koebler650, Dr. Morellas opines that “there is no teaching or suggestion in Koebler650 that data collected by the Enumerated Sensors are used to determine these current conditions.” Ex. 1003, ¶ 90.

76. In my opinion, this is incorrect. Koebler650 does teach that one of the claimed sensors—in particular, a “position sensor”—is used when determining temperature, weather, wind direction, wind velocity, air pressure, location of stoplights, and timing of stoplights.

77. According to Koebler650, its system determines the temperature, weather, wind direction, wind velocity, air pressure, location of stoplights, and timing of stoplights in the “**external environment of the vehicle.**” Koebler650, 3:41-44 (emphasis added).

78. Put another way, Koebler650 is not interested in the weather, wind direction, wind velocity, air pressure, location of stoplights, and timing of stoplights at some random location remote from the vehicle. Its system is interested in—and determines—these conditions **around** where the vehicle is currently located. See, e.g., *id.*, 3:50-61 (discussing traffic and road conditions “**surrounding the vehicle**” and weather “**around the vehicle**”) (emphasis added); 7:45-61 (similarly discussing “environmental information” “around” or “surrounding the vehicle”).

79. Further, as Dr. Morellas recognizes, Koebler650 extensively discusses use of position sensors for determining the vehicle’s current location or position. See Ex. 1003, ¶ 67 (citing Koebler650, 7:32-44, 11:20-23, 13:41-45, 13:59-63, 14:1-23, 17:52-56, 21:29-62).

80. Thus, a POSITA would have readily appreciated that in Koebler650, one way that weather information (such as temperature, wind, and air pressure) and traffic information (such as stoplight location and timing) is obtained is by using the determined vehicle location/position to query a “weather service, a map service, a traffic service, etc.” for location specific weather and traffic information. Koebler650,

8:22-24; *see also id.*, Fig. 9 (referencing the provision of weather and traffic information from an “external” source). As of the filing date of Koebler650, it was known that such services provided these conditions. Ex. 1010, 3:39-44 (explaining that “real-time weather information includes a variety of real-time weather characteristics” including “temperature,” “wind speed,” “wind direction,” “barometric pressure,” etc.); “rain,” “hail,” and “snow”), Fig. 19 (showing provided “rain” and “snow” information); Ex. 1011, 6:24-31 (similarly noting that information about the “environment surrounding the vehicle” routinely includes “weather conditions” such as “temperature,” “wind force,” “wind velocity,” etc.); Ex. 1014, 9:23-34 (noting that location-based weather information includes “temperatures,” “barometric pressure,” “sun,” “rain,” “cloudy,” etc.); Ex. 2015 (Zhao Patent issuing from 2001 Application), 4:49-5:7 (noting that traffic databases may include “for each traffic light, the number of traffic light cycles until a car can pass through the intersection”), 6:32-56 (noting that traffic databases may include “for each light... the timing cycle (e.g., the number of seconds that the light is ‘green’ and number of seconds that it is ‘red’) and the number of cycles required for a typical driver to pass through the intersection.”); Ex. 2016 (Publication of Application filed in 2003) at [0027] (noting that navigational databases may contain “latitudinal and longitudinal coordinates for each [stoplight].”), [0019] (noting that navigation system may determine “the amount of time remaining before the [stoplight] changes the flow of traffic.”).

81. In my opinion, these disclosures collectively provide adequate written description support for and show possession of a system that determines conditions such as temperature, weather, wind direction, wind velocity, air pressure, location of stoplights, and timing of stoplights.

82. Again, Koebler650 plainly explains that its system does in fact determine the claimed temperature, weather, wind direction, wind velocity, air pressure, location of stoplights, and timing of stoplights conditions.

83. Further, in Koeble650, each these conditions is determined for the vehicle's current location/position, not just any random location and position. And in Koebler650, location/position is determined via a position sensor.

84. It follows that one of the claimed types of sensors (a position sensor) is used when determining conditions such as temperature, weather, wind direction, wind velocity, air pressure, location of stoplights, and timing of stoplights.

85. While other input is also used in this condition determination—including that provided by a weather, map, or traffic service—as I explained in Section VII above, there is nothing about the claims that require that the conditions be determined using **only** the claimed sensors and no other input. So, by describing a system that uses position (along with other input provided by weather/traffic services) to determine temperature, weather, wind direction, wind velocity, air

pressure, location of stoplights, and timing of stoplights, Koebler650 describes what the '616 patent's claims require.

86. Koebler650 also discloses and claims optical sensors. Ex. 1004, 8:12-19, 21:29-33. As of the filing date of Koebler650, it was well known and common that such sensors were used to determine various weather conditions such as rain, fog, or snow and traffic conditions such as the location and timing of stoplights. This is noted in numerous prior art references. *See, e.g.*, Ex. 2018 (Publication of 2002 Patent Application) at [0045] (noting that an “environment sensor may be an optical or other image-obtaining sensor”); Ex. 2019 (Patent issued from 1996 Application) at 31:22-25 (noting that a “weather sensor” can be “a sensor which optically detects the amount of particles floating in the air”); Ex. 2020 (Patent issued from 2001 application) at 1:43-45 (describing prior art and noting that optical sensors are one of the “most common rain or moisture detectors.”); Ex. 2017 (Patent issued from 2000 application) at 70:45-50 (noting that “Cameras are used generally for interrogating environment nearby the host vehicle for . . . visual information”), 69:62-64 (noting that sensors can indicate “that an approaching stoplight is red, yellow or green”); Ex. 2021 (publication of 2003 application) at [0019] (disclosing that camera system can be used to detect stop lights and warn driver).

87. Given the wide use of such sensors to determine these conditions and the broad non-limiting disclosures of Koebler650, a POSITA would have understood

that the inventors were in possession of the invention claimed in the '616 Patent, including implementations that involve using position sensors or optical sensors to determine these weather-related and traffic-related conditions.

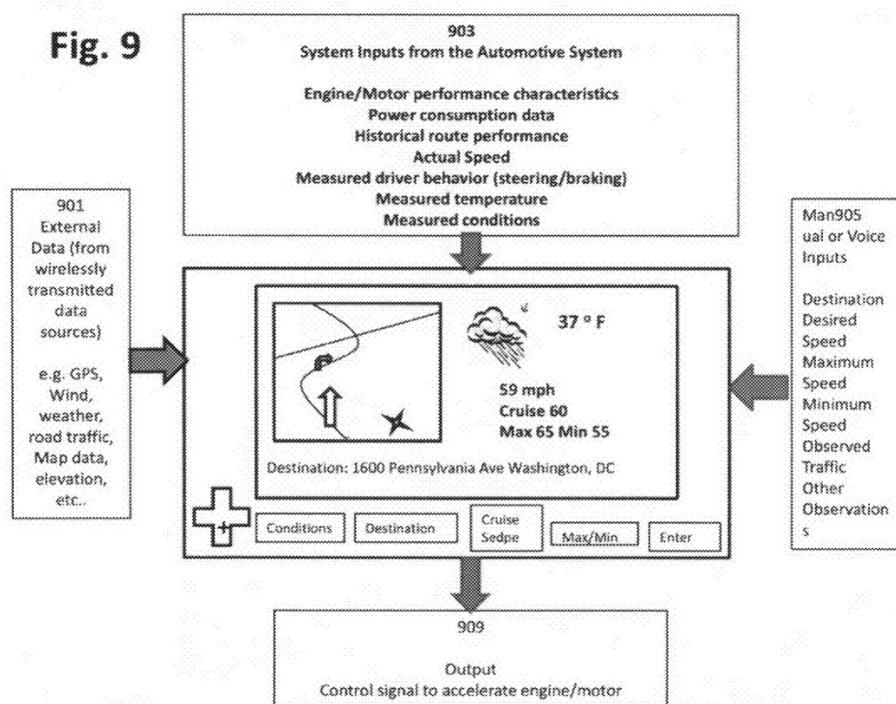
C. Moisture

88. Dr. Morellas also opines that, in his view, Koebler650 does not provide written description support for the determination of a “moisture” condition. *See* Ex. 1003, ¶¶ 79-83. Here, Dr. Morellas notes that he did not find the word “moisture” in Koebler650. *Id.*, ¶ 79. He also notes that a “moisture sensor” is not one of the sensors listed by claims 1, 15, and 16. *Id.*, ¶ 82.

89. In my opinion, Dr. Morellas’s opinion is premised on an overly narrow reading of Koebler650.

90. Koebler650 explains that its system is able to determine not just weather generally, but specific weather conditions such as “wind direction and velocity, rain, sun, snow, etc.” Koebler650, 21:47-48.

91. Figure 9 provides an example. As shown, “external data,” including “weather” information, has been transmitted to the vehicle. And, this data includes an indication that it is raining at the vehicle’s position:



Id., Fig. 9

92. A POSITA would have understood that by determining that it is precipitating (i.e., raining or snowing), Koebler650 is in fact making a “moisture” determination. When it is raining or snowing, the vehicle is of course subjected to moisture conditions that are not present when it is not raining or snowing. For instance, there will be more moisture on the road surface and the vehicle’s windshield. See Ex. 2020, 1:50-51 (describing various “moisture variants” including “water film, drops, mist, fog, snow, ice, etc.”)

93. So, by determining that it is raining or snowing (as part of its determination of the weather around the vehicle), a POSITA would have understood that Koebler650 does in fact make a moisture condition determination.

94. Not only does Koebler650 itself describe the determination of moisture conditions such as rain, but other prior art cited by Petitioner confirms that this type of condition information is routinely part of weather information provided to a vehicle from a remote source. *See, e.g.*, Ex. 1010, 3:39-44 (explaining that “real-time weather information includes a variety of real-time weather characteristics” including “rain,” “hail,” and “snow”), Fig 19 (showing provided “rain” and “snow” information); Ex. 1011, 6:24-31 (similarly noting that information about the “environment surrounding the vehicle” routinely includes “weather conditions” such as “whether it is raining or not”); Ex. 1014, 9:23-34 (noting that location-based weather information includes precipitation information such as “rain, showers, drizzle,” “snow, sleet, freezing rain, flurries,” and the like).

95. Moreover, as I explain above, Koebler650 describes making weather determinations for the area **around** the vehicle. As I explained, a pre-requisite to this is determining the vehicle’s position with a position sensor. *See* Section VIII.B. Determination of specific weather conditions—such as whether it is raining or snowing around the vehicle—occur in the same way. The vehicle’s position is determined via a position sensor, and then that position is used to query the same “weather service” that provides temperature, wind, and air pressure data. *See id.*; *see also* Koebler650, 8:22-24; Fig. 9.

96. So, in my opinion a POSITA would have understood Koebler650 to not only include written description of the claimed “moisture” condition (by referencing weather, including rain and snow), but it also provides support for determination of this condition via the analysis of data from one of the claimed sensors (a position sensor).

97. This is not the extent of Koebler650’s disclosure. Koebler650 also explains that its “information inputs” can not only be obtained from an external source, but may alternatively be provided by “one or more optical sensors” and/or “weather sensors.” Koebler650, 8:12-19.

98. In fact, Koebler650 explains that “[a]ny” of the “information” “input” into its system can come from a “sensor” like an “optical detector[.]” *Id.*, 3:63-67, 4:14-18, 4:25-30; *see also id.*, 2:27-29 (“The information provided to the power management logic may come from data inputs (e.g., sensors, telemetries, etc.)”), 7:26-31 (“[I]nformation inputs for each of these categories ... may be directly measured (e.g., by sensors or other inputs), communicated from an external source, or ... may be derived from other information inputs....”); 19:59-65 (referencing “external environmental sensors” detecting “weather”).

99. In other words, one of the things Koebler650’s inventors contemplated their invention to include was the use of “appropriate sensors, detectors or data

inputs[,]” like an “optical” sensor, “for detecting external environmental information” such as “weather” like “rain” and “snow.” *Id.*, 21:29-48.

100. When Koebler650 was filed, optical sensors (e.g., infrared sensors) were not only well-known in the automotive field, but were routinely used to detect whether or not it is raining at the vehicle’s location. *See, e.g.*, Ex. 2006, Abstract (1984 patent referencing the use of optical emitters and detectors to detect rain and control vehicle windshield wipers); Ex. 2007, 1:5-4:4 (discussing the use of “optical moisture sensor[s]” in detail) Ex. 2008, 1:8-21 (discussing prior art “optical rain sensor[s]” that control a “windshield wiper system”); Ex. 2020 at 1:23-26 (“The sensing of rain or moisture on the windshield of a vehicle for automatically controlling wiping systems has become a popular driving convenience item in the last several years.”)

101. In view of this, a POSITA would have understood Koebler650 to describe and provide written description support for the determination of a “moisture” condition using not only a “position” sensor, but also the claimed “optical” sensor.

D. Amount of Vibration

102. Dr. Morellas next discusses the claimed “amount of vibration” condition. Ex. 1003, ¶¶ 84-86.

103. Here, Dr. Morellas notes that he did not find the word “vibration” in Koebler650. He also notes that there is no discussion of a “vibration sensor and/or an accelerometer.” *Id.*, ¶¶ 84, 86.

104. Once again, in my opinion this does not adequately account for what a POSITA would have understood Koebler650 to reasonably describe.

105. As of the filing date of Koebler650 it was well known and common to measure the amount of vibrations in a vehicle for various reasons. It was, for example, known that determining the amount of vibrations in a vehicle traversing a road was a way to measure the condition of the road. *See, e.g.*, Ex. 2023, 1:11-23 (disclosing a vibration control apparatus for vehicle suspension, and noting that “conventional vibration control apparatuses include . . . a semiactive control apparatus for detecting a vibration state.”), 13:16-14:30 (disclosing system for detecting vibrations to determine a “road surface state”), 10:10-11 (noting that the system “discriminat[es] a smooth road from a rough road”); Ex. 2026, 1:21-32 (describing prior art systems for measuring “vibrations from the road surface” to determine road conditions).

106. Although Koebler650 doesn’t expressly disclose determining the amount of vibrations, it does discuss using information about the “terrain” and the “condition of the road,” and a POSITA would have known this can be assessed using vibration measurements. Specifically, Koebler650 repeatedly explains that its

system is intended to determine “information” regarding both the “external environment of the vehicle” and the “operational status of the vehicle.” Koebler650, 2:21-27; *see also id.*, 3:30-40 (similarly referencing “information about the external environment” and “operational status of the vehicle”); 6:7-11 (referencing both “environmental conditions” and “the current ... operational state of the vehicle”); 7:18-23 (similar)

107. This can entail a determination of “external factors (e.g., forces and conditions that act on the vehicle)” and “internal conditions (e.g., the current status of the vehicle and [its] component parts)[.]” *Id.*, 1:53-56; *see also id.*, 7:36-38 (similarly noting that “forces acting on the vehicle” are determined).

108. Koebler650 also includes numerous examples of the conditions that can be determined. This can include determining that the vehicle is moving “across different terrain (e.g., roads having different elevation).” *Id.*, 6:47-49. Similarly, the system can determine the “current slope/grade of road” (*id.*, 7:51) and “present road conditions” (*id.*, 7:60). Vehicle “operational status” information can include the “manner in which the vehicle is traveling (e.g., velocity, acceleration, etc.)” and other information such as “the vehicle’s current orientation,” “drag force due to rolling resistance,” and the perceived “weight of vehicle.” *Id.*, 8:32-51; *see also id.*, 7:1-4 (similarly noting that Koebler650 detects changes in conditions such as the “rolling resistance of the vehicle.”)

109. Vehicle “rolling resistance” is the force resisting the motion of a rolling body (*i.e.*, the vehicle’s wheel). *See, e.g.*, Ex. 2009, 1:14-15; Ex. 2010 at 141 (“rolling resistance” is “the force resisting ... motion when a body ... rolls on a surface”); Ex. 2011 at 7 (“rolling resistance is the force required to keep an object such as a wheel or tire moving”)

110. There are multiple factors that impact rolling resistance: (1) tire deformation (which results in energy loss) and (2) the interaction between the tire and the roadway (which impacts both the amount of deformation and the frictional forces imposed on the tire). *See* Ex. 2009, 1:23-31; Ex. 2010 at 141-142 (referencing the impact of hysteresis losses, plastic deformation, and slippage on rolling resistance); Ex. 1011 at 7 (similarly explaining that “hysteretic losses from deformation” as the tire flexes and strains and “comes in and out of contact” of the road, along with tire “deformation” resulting from the road surface, impacts rolling resistance).

111. Generally, “[s]moother roads create less rolling resistance than rougher roads.” Ex. 2009, 1:31-34; Ex. 2010 at 146-146 (“smooth surfaces produce lower rolling resistance than soft and rough surfaces”); Ex. 2011 at 8-11 (noting that “roughness of ... the road” impacts rolling resistance.)

112. In particular, road “[s]urface texture and unevenness create vibrations in the tires and suspension” of a vehicle resulting in a “energy loss” and increased rolling resistance. *Id.* at 9.

113. Per Koebler650, while “rolling resistance” coefficients employed in its system’s energy calculations can be “supplied by [a] tire manufacturer,” they may also be “measured values.” Koebler650, 16:25-36. Moreover, Koebler650 explains that in its system “rolling resistance” can “vary for different road surfaces.” *Id.* Koebler650 also discloses that the system may use “road conditions” as a current condition. *See* Ex. 1004, 7:45-62 (“Examples of environmental road inputs include . . . present road conditions”); *id.*, 3:41-67 (same); *id.*, 13:57 (discussing “the gradient or condition of a road”).

114. Taken together, a POSITA would have understood that one of the conditions Koebler650 intended its system to detect is whether the vehicle is traveling over a smooth road/terrain (and thus is not subject to substantial vibrations leading to lower rolling resistance) or traveling over a rough road/terrain (and thus is subject to substantial vibrations leading to increased rolling resistance).

115. The relative amount of rolling resistance is important because a higher rolling resistance will result in increased energy usage, while a lower rolling resistance will result in lower energy usage. And again, there is a correlation

between rolling resistance and vibration: increased vibration resulting from a rough road surface leads to increased rolling resistance.

116. According to Koebler650, its system employs “[a]ny appropriate sensors” to determine external and vehicle operating conditions. Koebler650, 21:29-31.

117. For example, when measuring “rolling resistance,” rather than simply employing values supplied by the tire manufacturer, “tire pressure” sensor measurements can be employed. *Id.*, 21:49-51. Tire pressure sensors are one of the types of sensors referenced by claims 1, 15, and 16.

118. Consistent with Koebler650’s own description of the use of tire pressure sensors when making rolling resistance determinations, when Koebler650 was filed, it was known that “tire pressure sensor[s]” can be employed to detect “[t]ire pressure changes caused by ground vibration excitation from the interaction between the tire and pavement.” Ex. 2012, Abstract; *see also id.*, 2:1-11 (noting that “[r]oadway surface vibrations, circumferential tire vibrations and air pressure vibrations are generated as the tire rolls over the surface of asphalt, concrete or other roadway surface”); *see also* Ex. 2013, pp. 2-3 (discussing the use of “dynamic pressure” measurements to detect vibrations).

119. Koebler650 also references the use of other sensors known to be able to detect road vibration (and thus assist in determining the relative amount of rolling resistance).

120. For example, Koebler650's system collects "gyroscope information (e.g., vehicle's current orientation, current slope/grade of road)." Koebler650, 21:42-43. "Gyroscopic sensors" are another of the types of sensors referenced by claims 1, 15, and 16.

121. When Koebler650 was filed, vehicle gyroscopes were typically packaged in an "inertial measurement unit." *See, e.g.*, Ex. 1013, 11:30-32. An "IMU" "typically has three accelerometers and three gyroscopes that are held together in a single housing." *Id.*, 11:33-36.

122. In my opinion, because Koebler650 references the collection of "gyroscope information," a POSITA would have understood Koebler650 to be describing—and its inventors to have contemplated use of—the types of gyroscopes commonly available at the time. This of course, included IMUs which were known to measure various type of vibrations using accelerometers and gyroscopic sensors. This would include, for example, using accelerometers to determine linear vibrations, using gyroscopic sensors to determine angular vibrations or pitch vibrations (pitching or pitch oscillations), and using both accelerometers and gyroscopic sensors together to determine heave, which is another type of vibration.

Given the wide use of such sensors to determine various types of vibrations, and the broad non-limiting disclosures of Koebler650, a POSITA would have understood that the inventors were in possession of the invention claimed in the '616 Patent, including implementations that involve using gyroscopic sensors to determine pitching, which is a type of vibration.

123. As of the filing date of Koebler650, it was also known that IMUs could be used to determine vibrations as a measurement of road conditions. It was known, for example, that accelerometers could be used to measure vibrations from relatively smooth roads characterized by minor vibrations. Ex. 2026, 1:31-42 (noting that accelerometer systems were “suitable primarily for smooth surfaces” but were not useful for uneven or unpaved roads). It was also known, however, that gyroscopes could be used to determine larger vibrations (i.e., fluctuations in angular movement) such as those a car would experience when traveling rougher and bumpier route segments, i.e., segments that may have a material effect on efficiency (e.g. unpaved roads, pot holes, speedbumps, etc.). Ex. 2026, 1:31-42 (noting that known accelerometer systems were not suitable for “more severe variations in the road surface” such as on “unpaved roads”) and 2:33-47 (disclosing a gyroscope-based system for measuring more severe roughness in road conditions).

124. As another example, a POSITA would have understood that position sensors could be used to determine certain types of vibrations. Specifically, as of

the filing date of Koebler650, it was known that such sensors could be used to measure movement and vibrations along a particular axis (e.g., vertical movement). Ex. 2023 (patent issued from 1987 application) at 13:16-26 and 16:46-47 (disclosing “vibration control apparatus” wherein “suspension displacement” is “detected by the linear potentiometer” and used to determine the “road surface state”). It was known, for example, that potentiometers and displacements sensors (which are types of positions sensors) could be used to measure suspension displacement, which can reflect vibrations depending on the terrain. *See, e.g.*, Ex. 2030, 5:65-6:2 (“The second sensor comprises a potentiometer monitoring relative displacement between the vehicle body and the road wheel and producing the second sensor signal indicative of the displacement between the vehicle body and the road wheel.”). 10:38-42 (“the road sensor 116 comprises a kind of potentiometer which produces an analog signal representative of the relative distance between the vehicle and the wheel axle.”). Given the wide use of these systems and the broad non-limiting disclosures of Koebler650, a POSITA would have understood that the inventors were in possession of the claimed invention, including implementations that determine the amount of certain types of vibrations in a vehicle using, for example, tire pressure sensors, gyroscopic sensors, or position sensors.

E. Traction

125. As he did when discussing the “moisture” and “amount of vibration” conditions above, Dr. Morellas notes that he did not find the word “traction” in Koebler650. *See* Ex. 1003, ¶¶ 87-89.

126. Koebler650 does, however, explain that its system is able to make various determinations regarding the operational status of vehicle. *See, e.g.,* Koebler650, 4:1-18, 6:7-11, 6:58-7:4, 8:32-40.

127. For instance, this vehicle “operational status” information can include information about the vehicle’s “tires.” *Id.*, 8:32-40. The system can also determine “[e]xternal environment information” including “forces acting on the vehicle” like “tire resistance.” *Id.* 7:36-38. And Koebler650 notes that its system determines information such as “rolling resistance of the vehicle.” *Id.*, 7:1-4; *see also id.*, 15:51-55 (noting that energy calculations can be performed using “rolling resistance[,]” “acceleration” and other information).

128. A POSITA would also recognize that Koebler650 collects “operational status information” such as the “wheel rotations per minute.” *Id.*, 4:1-7; *see also id.*, 8:41-51 (referencing various “information inputs” such as “wheel rotations per minute,” “tire pressure” and engine RPM); 21:29-51 (similarly discussing both “RPM (e.g., motor and wheel rotations per minute),” “tire pressure,” “rolling resistance” and various other parameters).

129. A POSITA would have understood that “traction” is a measure of the amount of power that is transferred from the engine to the road, which is a function of the friction between the vehicle’s drive wheels and the road surface. Thus, when a vehicle’s wheels have “traction,” the wheel rotation acts to propel the vehicle along the roadway. When the vehicle’s wheels lose “traction,” they spin and thus are no longer acting to propel the vehicle along the roadway.

130. Thus, by referencing the determination of frictional interactions between a vehicle’s tires and the roadway—including the determination of “tire resistance” and “rolling resistance”—a POSITA would have understood Koebler⁶⁵⁰ to also be describing the determination of “traction.” When “tire resistance” or “rolling resistance” is zero or low, the vehicle has lost traction. When “tire resistance” and “rolling resistance” are not zero, the vehicle has traction. *See, e.g.*, Ex. 2002, ¶ [0052] (noting that “traction control systems” “detect events relating to the frictional interaction between the tires and the roadway”).

131. When Koebler⁶⁵⁰ was filed, it was well-known and common to measure traction for purposes of, for example, anti-lock braking systems. Moreover, at that time, a POSITA would have recognized that wheel RPM sensors—one of the types of sensors not only employed by Koebler⁶⁵⁰ but listed by claims 1, 15, and 16 of the ’616 patent—were the key component of traction control and anti-lock braking systems.

132. The primary purpose of this type of sensor is to determine differences in wheel rotation indicative of losses of traction. *See, e.g.*, Ex. 1015, 8:24-42 (explaining that traction control systems use data from “wheel speed sensor[s]” to detect loss of wheel traction and the need for activating the control system); Ex. 2003, 1:12-24, 2:17-36 (noting that in known systems, “wheel speeds may be monitored to detect wheel spin” for purposes of determining if the vehicle’s “driven wheels ... lose ... grip on the road” such that “traction control” is required); Ex. 2004, ¶¶ [0002]-[0004], [0042] (explaining that “wheel speed differences” were routinely used to detect “when traction is lost at the driven wheels”)

133. Indeed, Dr. Morellas himself has explained that “data on wheel speed” in the form of “wheel ... revolutions per minute (RPM)” is “crucial” for a traction control system “to detect and correct wheel slip, ensuring optimal traction and vehicle stability.”

134. Koebler specifically references wheel speed sensors in its disclosure. Koebler650, 21:29-62 (listing RPM sensors for measuring, “e.g., motor and wheel rotations per minute.”); *see also id.* at 4:1-18 (noting that status information can include “RPM of the vehicle’s motor” and “wheel rotations per minute.”); 8:41-51 (referencing various “information inputs” such as “wheel rotations per minute,” “tire pressure” and engine RPM). In my opinion, Koebler650’s reference to and use of sensors that are intended to detect losses of traction (the wheel RPM sensors), would

have further confirmed to a POSITA that Koebler650 describes the determination of “traction” and that the inventors considered this to be part of the invention.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willfully false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1101 of Title 18 of the United States Code.

Date: 12/19/2024

Location: Auburn, AL

Signature: *David M. Bevly*
DAVID M. BEVLY