

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MARYLAND**

PAICE LLC
111 South Calvert Street, Suite 2310
Baltimore, Maryland 21202

and

THE ABELL FOUNDATION, INC.,
111 South Calvert Street, Suite 2300
Baltimore, Maryland 21202

Plaintiffs,

v.

VOLVO CAR CORPORATION
405 31 Göteborg
Sweden

and

VOLVO CARS OF NORTH AMERICA, LLC
1 Volvo Drive
Rockleigh, New Jersey, 07677

and

VOLVO CAR USA, LLC
1 Volvo Drive
Rockleigh, New Jersey, 07677

Defendants.

C.A. No. _____

JURY TRIAL DEMANDED

COMPLAINT

1. Plaintiffs Paice LLC (“Paice”) and The Abell Foundation, Inc. (“Abell”) (collectively referred to as the “Plaintiffs”) by and through their attorneys bring this Complaint

for patent infringement and demand for jury trial against Defendants Volvo Car Corporation, Volvo Cars of North America, LLC, and Volvo Car USA, LLC (collectively, “Volvo”) and allege as follows:

OVERVIEW

2. This is an action by Paice (Power Assisted Internal Combustion Engine), a small Maryland-based company that invented groundbreaking hybrid vehicle technology, and Abell, a Baltimore-based charitable organization dedicated to fighting urban poverty and finding solutions to intractable problems confronting Maryland residents. Consistent with its mission, Abell has invested millions of dollars to support Paice’s efforts to develop and promote its innovative hybrid electric technology that improves fuel efficiency and lowers emissions, while maintaining superior driving performance. Paice and Abell are co-owners of multiple foundational patents related to hybrid technology. Paice’s technology has now been licensed by many major automakers, including Toyota, Ford, Hyundai, Kia, Honda, Daimler, Mitsubishi, and others.

3. In the face of universal industry recognition for Paice and Abell’s patents, Volvo has continued to sell hybrid vehicles throughout the United States without compensating Paice and Abell for the very foundational hybrid technology that is critical to the success of so many hybrid vehicles on the road today, including Volvo’s. Volvo has refused to compensate Paice and Abell for Paice’s patented technology. To this day, Volvo continues to knowingly infringe Plaintiffs’ patents by selling hybrid vehicles without a license. As more and more automakers have licensed Paice and Abell’s patents over the last decade, Volvo now finds itself as one of the last few holdouts, continuing to sell hybrid vehicles that violate Plaintiffs’ patent rights.

4. Plaintiffs do not bring this lawsuit lightly. For more than a year before filing suit, Plaintiffs tried to engage Volvo in a meaningful licensing discussion. Plaintiffs sent numerous communications, offered to answer any technical concerns Volvo might have, invited Volvo to respond to the patents, and made Volvo a licensing offer.

5. Despite these efforts, Volvo has steadfastly refused to state its view on the appropriate terms of a license. Instead, Volvo took an aggressive position designed to box Paice and Abell into a Hobson's choice: Volvo would not negotiate with Paice and Abell unless Paice and Abell first disclosed to Volvo the prices paid for a license by Volvo's competitors in violation of the confidentiality terms of those license agreements. Volvo fully understands that Plaintiffs' licenses with most of the other major carmakers in the world are encumbered with strict confidentiality protections and used Paice and Abell's unwillingness to violate these agreements as an excuse to not negotiate in good faith. To this date, Volvo has never made any offer to license Paice and Abell's patents or even respond to Paice and Abell's overtures.

6. Given Volvo's refusal to license in good faith, Paice and Abell are forced to bring this action against Volvo to hold it accountable for its knowing and ongoing infringement of the Paice and Abell patents.

NATURE OF THE ACTION

7. This action for patent infringement arises under the laws of the United States, Title 35 of the United States Code, 35 U.S.C. § 1 *et seq.*

THE PARTIES

8. Paice LLC is a Delaware limited liability company with its principal place of business at 111 South Calvert Street, Suite 2310, Baltimore, Maryland. Originally established in 1992 by Paice inventor, Dr. Alex J. Severinsky, Paice develops and promotes innovative hybrid

electric vehicle technology that improves fuel efficiency and lowers emissions, while maintaining superior driving performance. That same year, Paice was accepted into the University of Maryland's incubator program, which was created to foster growth of promising start-up companies in the Maryland community.

9. The Abell Foundation, Inc. is a Maryland corporation located at 111 South Calvert Street, Suite 2300, Baltimore, Maryland. Abell is a non-profit charitable organization dedicated to fighting urban poverty and finding solutions to intractable problems confronting Maryland residents. Over the past 60 years, Abell has contributed more than \$300 million to support worthwhile causes across Maryland. It focuses on caring for the underserved and underprivileged through education, healthcare, and human services initiatives. In addition, Abell is dedicated to promoting national social objectives, such as increasing energy efficiency and producing alternative energy, and invests in companies with innovative technologies in these areas. Abell also invests in promising local companies—including those focused on environmental issues—with the goal of creating jobs and reinvesting any earnings back into the communities it serves. In 1998, Abell was introduced to Paice through former U.S. Senator Joseph Tydings and the University of Maryland's Technology Advancement Program. The University of Maryland's Technology Advancement Program was modeled after highly successful programs at Stanford University, Harvard University, MIT, Caltech and other highly regarded institutions of higher learning.

10. On information and belief, Volvo Car Corporation is a Swedish company with a principal place of business at 405 31 Göteborg, Sweden.

11. On information and belief, Volvo Cars of North America, LLC is a limited liability company organized and existing under the laws of the State of Delaware with a principal place of

business located at 1 Volvo Drive, Rockleigh, New Jersey, 07677. Defendant Volvo Cars of North America, LLC can be served with process through its registered agent, The Corporation Trust Company, Corporation Trust Center 1209 Orange St. Wilmington, DE 19801.

12. On information and belief, Volvo Car USA LLC is a limited liability company organized and existing under the laws of the State of Delaware with a principal place of business located at 1 Volvo Drive, Rockleigh, New Jersey, 07677. Defendant Volvo Car USA LLC can be served with process through its registered agent, The Corporation Trust Company, Corporation Trust Center 1209 Orange St. Wilmington, DE 19801.

JURISDICTION AND VENUE

13. This is a civil action for patent infringement arising under the Patent Laws of the United States, Title 35 of the United States Code. Subject matter jurisdiction over the asserted causes of actions before this Court is, therefore, proper and founded upon 28 U.S.C. §§ 1331 and 1338.

14. This Court has personal jurisdiction over Volvo because, among other things, Volvo has infringed and caused infringement of Plaintiffs' patents in Maryland and within this judicial district through a nationwide channel of distribution in the United States. Moreover, upon information and belief, Volvo has purposefully and voluntarily placed infringing devices in the stream of commerce with the knowledge and expectation that the same will end up in, and be marketed, sold, and purchased in, Maryland and within this judicial district. For example, upon information and belief, Volvo Car Corporation manufactures infringing devices specifically for import and sale in the United States, including this district. For example, Volvo Car Corporation contracts with its subsidiaries Volvo Cars of North America, LLC and Volvo Car USA, LLC to import and sell infringing devices to dealerships across the country, including this district. In addition, Volvo Cars of North America, LLC and Volvo Car USA, LLC has entered into a

business relationship with their dealers whereby Volvo Car Corporation manufactures infringing devices for these dealers to sell these infringing devices throughout the United States, including in Maryland.

15. Venue is proper in this Court under 28 U.S.C. §§ 1391(b), 1391(c), and 1400(b). Venue is proper in this judicial district for Volvo Cars of North America, LLC and Volvo Car USA, LLC pursuant to 28 U.S.C. § 1400(b) because they have committed acts of infringement in this judicial district as set forth above. In addition, Volvo Cars of North America, LLC and Volvo Car USA, LLC have regular and established places of business in this judicial district. For example, on information and belief, Volvo Cars of North America, LLC and Volvo Car USA, LLC regularly conduct business at a vehicle distribution center at the Port of Baltimore where these defendants have at least one employee. *See, e.g.*, Port of Baltimore Directory Online, <https://pobdirectory.com/directory/details/15558/?business-name=Volvo+Cars+of+North+America>. For example, on information and belief, the vehicle distribution center is a place of business because Volvo Cars of North America, LLC and Volvo Car USA, LLC use it for, among other things, customer service and sales support. And on information and belief, Volvo Cars of North America, LLC and Volvo Car USA, LLC own, lease, or otherwise exercise possession or control of at least a portion of the vehicle distribution center.

16. In addition and on information and belief, Volvo Cars of North America, LLC and Volvo Car USA, LLC either directly or through its agents operate dealerships in this judicial district such as Volvo Cars Owing Mills located at 9610 Reisterstown Rd., Owings Mills, MD 21117 and Bill Kidd's Volvo Cars 10630 York Road, Hunt Valley, MD 21030, both of which constitute regular and established places of business. For example and on information and belief,

Volvo Cars of North America, LLC and Volvo Car USA, LLC regularly, continuously, and systematically provide support to and control over the dealerships in this District such that the dealerships act as agents of Volvo Cars of North America, LLC and Volvo Car USA, LLC. In addition and on information and belief, employees of Volvo Cars of North America, LLC and Volvo Car USA, LLC travel to and conduct business from such dealerships in this District.

17. Venue is also proper in this judicial district for Volvo Car Corporation pursuant to 28 U.S.C. § 1391(c)(3) because it is not a resident in the United States, and therefore may be sued in any judicial district.

PATENTS IN SUIT

18. Paice and Abell are co-owners by assignment of all right, title, and interest in and to United States Patent No. 6,338,391 (“the ’391 patent”). The ’391 patent is entitled “Hybrid Vehicles Incorporating Turbochargers” and lists Alex J. Severinsky and Theodore Louckes as inventors. The U.S. Patent Office issued the ’391 patent on January 15, 2002.

19. Paice and Abell are co-owners by assignment of all right, title, and interest in and to United States Patent No. 7,455,134 (“the ’134 patent”). The ’134 patent is entitled “Hybrid Vehicles” and lists Alex J. Severinsky and Theodore Louckes as inventors. The U.S. Patent Office issued the ’134 patent on November 28, 2008.

20. Paice and Abell are co-owners by assignment of all right, title, and interest in and to United States Patent No. 6,209,672 (“the ’672 patent”). The ’672 patent is entitled “Hybrid Vehicle” and lists Alex J. Severinsky as the inventor. The U.S. Patent Office issued the ’672 patent on November April 3, 2001.

21. The ’391, ’134, and ’672 patents are referred to collectively as the “Paice patents.”

PAICE BACKGROUND

22. Paice is the creation of inventor Dr. Alex Severinsky, a well-respected and award-winning electrical engineer. Dr. Severinsky received a Ph.D. in electrical engineering in 1975 and left the Soviet Union for the United States in 1978, shortly before America struggled through the second oil embargo. Having escaped standing in long lines to buy food in the Soviet Union, Dr. Severinsky marveled that people in the U.S. were lining up for gasoline. He soon began looking for ways to reduce America's dependence on foreign oil. He studied a range of methods of vehicle propulsion and concluded that a powertrain utilizing both internal combustion engine and electric motor power had the greatest potential for reducing fuel consumption without sacrificing vehicle performance.

23. In 1992, Dr. Severinsky formed Paice (Power Assisted Internal Combustion Engine), and as a result of its inventive endeavors, Paice holds a number of foundational patents related to hybrid vehicles. Paice has been awarded a total of 30 U.S. and foreign patents. Paice's first patent, U.S. Patent No. 5,343,970 ("the '970 patent"), was issued in 1994, based on a filing date in 1992. The Asserted Patents are all in the family of patents related to the '672 patent, which contains over a dozen U.S. patents stemming from applications originally filed in 1998. They are directed to hybrid vehicle technologies including hybrid topologies and methods of control to optimize vehicle performance, fuel economy, and emissions efficiency.

24. In October 1999, Paice successfully demonstrated the benefits of its patented technology at Roush Industries, a U.S. engineering firm. Dynamometer testing of a Paice hybrid powertrain prototype showed that Paice's technology resulted in an improvement of 20 miles per gallon (MPG) over a vehicle using a conventional gasoline engine. In fact, Paice's prototype achieved a mileage that was 16.5 MPG greater than existing fuel economy standards (CAFE). Paice's prototype achieved this improvement in fuel economy without sacrificing vehicle

performance and while significantly reducing harmful emissions. Further, the levels of regulated emissions produced by Paice's prototype, such as nitrogen oxides (NO_x), hydrocarbons (HC), and carbon monoxide (CO), were so low that Paice had to acquire the most sensitive testing equipment available to detect the emissions. Paice's technology achieved regulated emissions levels 95 percent below existing standards.

PAICE'S WORK WITH LEADING AUTOMAKERS & INDUSTRY RECOGNITION

25. Between 1999 and 2004, Paice worked with and/or provided information to Ford, GM, VW, DaimlerChrysler and other major automakers and their suppliers to introduce the emissions and fuel economy advantages of using Paice's patented technology and to persuade them to license it. During this period, Paice presented its hybrid vehicle teachings at conferences where it appeared on panels with Toyota and Ford, and authored technical papers published by the Society of Automotive Engineers (SAE). In addition, Paice twice testified at Congressional hearings alongside major auto companies in 2001 and 2002 regarding the reform of the CAFE standards.

26. The immense potential of Paice's technology has been recognized by some of the most prominent automotive engineers and engineering societies. Among the first was Robert Templin, a U.S. auto industry icon famous for his work as chief engineer of Cadillac and technical director of General Motors Research Laboratory. Mr. Templin devoted the remainder of his life to Paice by serving as a member of the Paice Board of Directors for more than 15 years until his death in 2009. Additionally, Dr. Severinsky was assisted in inventing the Asserted Patents by the late Theodore Louckes, an automotive engineer who spent 40 years at General Motors and was Chief Engineer of Oldsmobile. Mr. Louckes served as Paice's Chief Operating Officer from 1998 through 2005. Dr. Severinsky was also awarded the prestigious

Thomas A. Edison Patent Award from the American Society of Mechanical Engineers in 2009, and inducted into the University of Maryland Clark School of Engineering's Innovation Hall of Fame in 2008 for his pioneering work in developing hybrid technology.

27. Moreover, Paice's hybrid patents have been recognized as the most important in the automotive industry. Griffith Hack, an Australian law firm specializing in intellectual property, conducted an independent analysis of 58,000 hybrid vehicle technology patents in 2009-2010 and identified the most dominant hybrid vehicle patents in the world. Acknowledging Paice's cutting-edge work, the Griffith Hack study concluded that Paice owns four of the world's ten most dominant hybrid vehicle patents—more than Toyota, Ford, and Honda combined. Paice's '672 patent (from which the '391 and '134 patents claim priority) was ranked #1, and three other Paice patents were ranked #2, #4 and #7. Before it was brought to Paice's attention by a media report, the Paice team had no knowledge of Griffith Hack, nor its patent ranking system.

PAICE FORCED INTO LITIGATION

28. Paice's technology has now been licensed by many major automakers, including Toyota, Ford, Hyundai, Kia, Honda, Daimler, Mitsubishi, and other licensees. *See* <http://www.paicehybrid.com/licensing-agreements/>. Paice and Abell's licensees include some of the world's largest automakers and together account for the majority of all hybrid vehicle sales in the U.S. Many of these companies spent years corresponding with Paice, scrutinizing Paice's patents, presenting on technical panels with Paice, or working closely with Paice's engineers to learn all they could about Paice's technology. Paice, a small company with limited resources, was forced to enter into successive litigation campaigns against most of them. Others, such as

Honda, Daimler, and Mitsubishi have agreed to license Paice's technology without litigation.

See <http://www.paicehybrid.com/licensing-agreements/>.

PAICE'S AND ABELL'S ATTEMPT TO LICENSE VOLVO IN GOOD FAITH

29. Despite Paice's and Abell's efforts to license Volvo in good faith, Volvo has repeatedly rebuffed Paice and Abell's attempts to reach a business resolution between the parties. On February 15, 2019, Paice and Abell contacted Volvo's Vice President and Chief IP Counsel, Raymond Millien, inviting Volvo to discuss licensing the Paice and Abell patents. In that communication, Paice indicated that Volvo's hybrid vehicles (*e.g.*, the XC60 PHEV, XC90 PHEV, and S90 PHEV) infringe, among other patents, at least one claim from Nos. U.S. Patent Nos. 6,338,391, 7,455,134, and 6,209,672. Paice and Abell received no response. Paice and Abell contacted Mr. Millien again on July 11, 2019, which finally triggered a response from Volvo on August 12, 2019. Over a six-month period, Paice and Abell explained to Volvo the value of its patent portfolio to Volvo's hybrid vehicle lineup and offered to license the Paice and Abell patents in good faith. Volvo, however, refused to provide a counteroffer on the basis that Paice and Abell had not shared its confidential licenses with Volvo—something that Volvo knows Paice and Abell are incapable of doing. Despite Volvo's position, Paice and Abell have repeatedly urged Volvo to come to the negotiation table in good faith. Given Volvo's steadfast refusal to do so, Paice and Abell bring this complaint.

COUNT I

Infringement of U.S. Patent No. 6,338,391

30. Plaintiffs reallege and incorporate herein by reference the allegations in paragraphs 1-29 above. As described below, Volvo has infringed and continues to infringe the '391 patent, for example, at least claim 7 of the '391 patent under 35 U.S.C. § 271(a), by making, using, offering for sale or selling within the United States, or importing into the United States hybrid

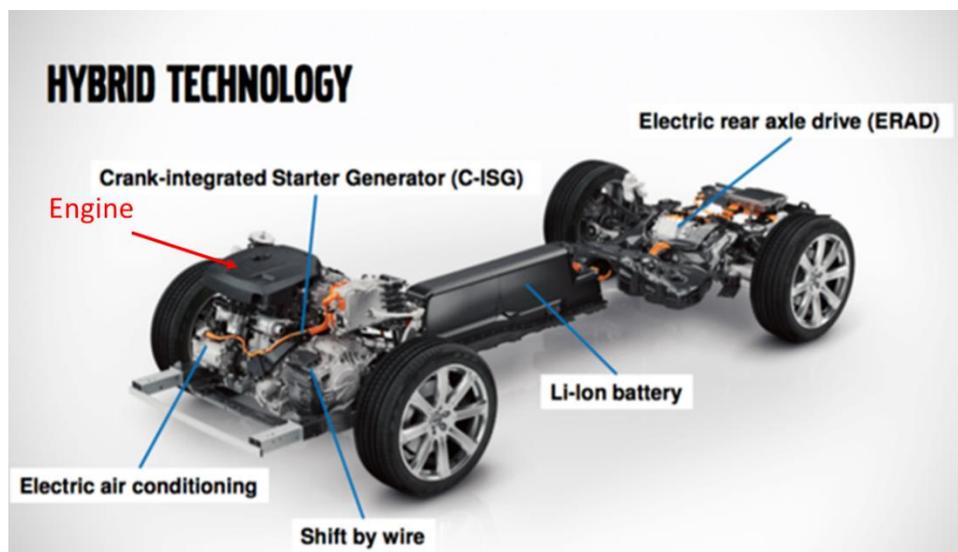
vehicles (including any cars, sport utility vehicles, or light duty trucks) such as the XC60 PHEV, XC90 PHEV, S60 PHEV, and S90 PHEV (collectively, the “’391 Accused Products”) that infringe the ’391 patent either literally or under the doctrine of equivalents.

31. Among the claims of the ’391 patent, claim 7 recites as follows:

7. A method for controlling the operation of a hybrid vehicle operable in a plurality of differing modes, said vehicle comprising an internal combustion engine for providing torque up to a maximum normally-aspirated torque output (MTO), said engine being controllably coupled to road wheels of said vehicle by a clutch, a turbocharger being operatively and controllably coupled to said engine for increasing the maximum torque output of said engine to more than MTO when desired, a traction motor being coupled to road wheels of said vehicle, a starting motor coupled to said engine, both said motors being operable as generators, a battery bank for providing electrical energy to and accepting energy from said motors, and a controller for controlling operation of said engine, clutch, turbocharger, and first and second motors, and controlling flow of electrical energy between said motors and said battery bank, wherein according to said method, said controller controls selection of the operational mode of said vehicle between a low-speed mode I, a cruising mode IV, an acceleration mode V, and a sustained high-power mode VI, wherein torque to propel said vehicle is provided by said traction motor, said engine, both said traction motor and said engine, and said engine with said turbocharger operating, respectively, in response to monitoring the instantaneous torque requirements (RL) of the vehicle.

32. For example, and without limitation, one or more of the ’391 Accused Products meets the limitations of claim 7 of the ’391 patent. For example, on information and belief, the ’391 Accused Products control hybrid vehicle operation in a plurality of differing modes,

including “EV drive,” “[c]ombustion engine drive and charging,” and “[p]ower boost & torque fill,” among others.¹ In addition, the ’391 Accused Products include an internal combustion engine for providing torque up to a maximum normally-aspirated torque output (MTO), said engine being controllably coupled to road wheels of said vehicle by a clutch. For example and on information and belief, as shown below, the ’391 Accused Products include an engine that provides torque up to a maximum normally-aspirated torque output that is controllably coupled to road wheels via an eight-speed transmission (Aisin AW TG-81SC) having multiple clutches.²



First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (annotated).³

33. In addition and on information and belief, the ’391 Accused Products have a turbocharger being operatively and controllably coupled to said engine for increasing the maximum torque output of said engine to more than MTO when desired. For example, the ’391

¹ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html>.

² First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The water-cooled C-ISG has three functions: the starter; a generator to keep charging the battery; and power boost under certain conditions.”).

³ See also The Volvo T8 Twin Engine: Efficient Power No Compromises, https://www.youtube.com/watch?time_continue=28&v=UwYV1i7Ejgo&feature=emb_title.

Accused Products include a turbocharger/supercharger combination controllably coupled to the engine by, among other things, a bypass, integrated clutch, and controllable wastegate.⁴

34. In addition and on information and belief, the '391 Accused Products include a traction motor being coupled to road wheels of said vehicle and a starting motor coupled to said engine, both said motors being operable as generators. For example and on information and belief, as shown above, the '391 Accused Products include a starter motor (C-ISG) coupled to the engine operable as a generator⁵ and a traction motor (ERAD) coupled to the wheels and operable as a generator.⁶

35. In addition and on information and belief, the '391 Accused Products have a battery bank for providing electrical energy to and accepting energy from said motors. For example, the '391 Accused Products have a battery (Li-ion battery) as shown above that provides and accepts current from both the C-ISG and ERAD. In addition and on information and belief, the '391 Accused Products also have a controller for controlling operation of said engine, clutch, turbocharger, and first and second motors, and controlling flow of electrical energy between said motors and said battery bank. For example and on information and belief, the '391 Accused Products have a controller for controlling the engine, C-ISG, ERAD, turbocharger, eight-speed

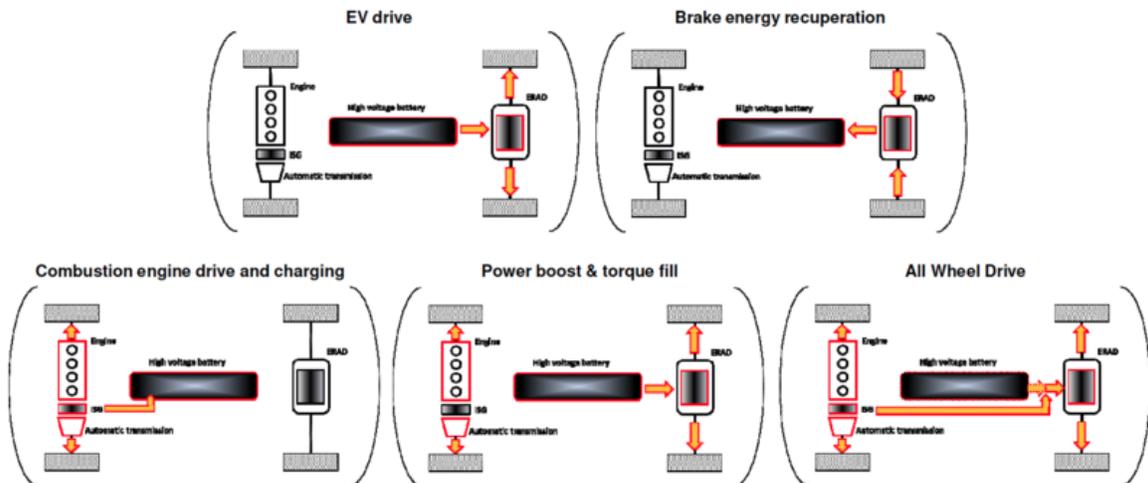
⁴ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“[T]he T6/T8 uses the combination of the supercharge and turbocharger.... The supercharger is used in steady-state operation at low engine speeds with high torque requirements while the turbo builds up; the supercharger then begins to hand off its boost duties to the turbo, and cuts off entirely at 3500 rpm. The engine management electronic control unit (ECU) can engage and disengage the supercharger on the engine using the integrated clutch.”).

⁵ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The water-cooled C-ISG has three functions: the starter; a generator to keep charging the battery; and power boost under certain conditions.”).

⁶ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The Electric Rear Axle Drive (ERAD) (from Siemens) also has three functions: a generator for charging the battery; electric traction drive; and power boost.”).

transmission, and controlling the flow of energy between the C-ISG/ERAD and Li-ion battery by, among other things, controlling the mode of operation.⁷

36. In addition and on information and belief, the controller of the '391 Accused Products controls selection of the operational mode of said vehicle between a low-speed mode I, a cruising mode IV, an acceleration mode V, and a sustained high-power mode VI, wherein torque to propel said vehicle is provided by said traction motor, said engine, both said traction motor and said engine, and said engine with said turbocharger operating, respectively, in response to monitoring the instantaneous torque requirements (RL) of the vehicle. For example and on information and belief, the controller of the '391 Accused Products controls the vehicle to operate in “EV drive,” “[c]ombustion engine drive and charging,” “[p]ower boost,” and engage in turbocharging responsive to monitoring the instantaneous torque requirements of the vehicle.



First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html>.⁸

⁷ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The XC90 T8 PHEV has five basic modes of operation. EV drive, in which the battery powers the ERAD... Combustion engine drive and charging. When the combustion engine is one [*sic*] and propelling the car, the C-ISG is charging the battery pack.”).

⁸ See also The Volvo T8 Twin Engine: Efficient Power No Compromises, https://www.youtube.com/watch?time_continue=28&v=UwYV1i7Ejgo&feature=emb_title.

37. In view of the facts alleged above, Volvo has knowledge of the asserted patents, including the '391 patent, and its products' infringement.

38. Volvo has actively induced and continues to induce the infringement by others, including its customers, of the '391 patent under 35 U.S.C. § 271(b) by, among other things, manufacturing, selling, offering for sale within the United States and/or importing into the United States the '391 Accused Products and providing materials and instructions for operation of the same, with the specific intent and knowledge that the hybrid vehicles, materials and instructions direct, teach, or assist others to infringe the '391 patent by using or operating the hybrid vehicles in a manner that directly infringes the '391 patent. For example, Volvo provides materials as well as user manuals that tout the hybrid vehicle technology and instructions on how to operate Volvo hybrid vehicles. Volvo's customers directly infringe the '391 patent by using (*e.g.*, driving) the '391 Accused Products.

39. Volvo has contributed and continues to contribute to the infringement by others, including its customers, of the '391 patent under 35 U.S.C. § 271(c) by, among other things, manufacturing, selling, offering for sale within the United States and/or importing into the United States hybrid the '391 Accused Products for use in practicing the patented inventions of the '391 patent, knowing that the hybrid vehicles and components are especially made or adapted for use in infringement of the '391 patent, embody a material part of the inventions claimed in the '391 patent, and are not staple articles of commerce suitable for substantial non-infringing use. Volvo's customers directly infringe the '391 patent by using (*e.g.*, driving) the '391 Accused Products.

40. As a result of Volvo's past unlawful infringement of the '391 patent, Plaintiffs have suffered and will continue to suffer damage. Plaintiffs are entitled to recover damages

adequate to compensate for that infringement in an amount that will be ascertained at trial, but in no event less than a reasonable royalty.

41. On information and belief, Volvo's acts of infringement have been willful and are made with knowledge of Plaintiffs' rights in the '391 patent. As stated and alleged above, Paice put Volvo on notice of its patents at least as early as February 15, 2019. Paice and Abell attempted to engage in good faith licensing negotiations concerning Volvo's infringement of the '391 patent. Volvo has refused to engage in good faith negotiations and has continued to infringe the '391 patent unabated by Paice's and Abell's request and with knowledge of the '391 patent and its infringement of the same. Such acts constitute willful and deliberate infringement, entitling Plaintiffs to enhanced damages and reasonable attorney fees.

COUNT II

Infringement of U.S. Patent No. 7,455,134

42. Plaintiffs reallege and incorporate herein by reference the allegations in paragraphs 1-41 above. As described below, Volvo has infringed and continues to infringe the '134 patent, for example, at least claim 55 of the '134 patent under 35 U.S.C. § 271(a), by making, using, offering for sale or selling within the United States, or importing into the United States hybrid vehicles (including any cars, sport utility vehicles, or light duty trucks) such as the XC60 PHEV, XC90 PHEV, S60 PHEV, and S90 PHEV (collectively, the "'134 Accused Products") that infringe the '134 patent either literally or under the doctrine of equivalents.

43. Among the claims of the '134 patent, claim 55 (and claims 41 and 53 from which it depends) recites as follows:

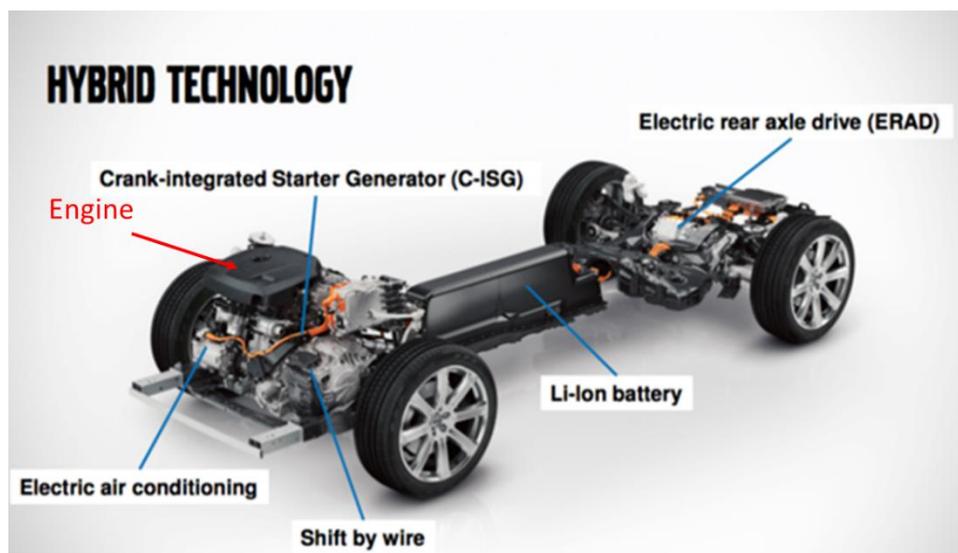
41. A method of control of a hybrid vehicle, said hybrid vehicle comprising: at least two wheels, operable to receive power to propel said hybrid vehicle; a first alternating current (AC) electric

motor, operable to provide power to said at least two wheels to propel said hybrid vehicle; a second AC electric motor; an engine coupled to said second electric motor, operable to provide power to said at least two wheels to propel the hybrid vehicle, and/or to said second electric motor to drive the second electric motor to generate electric power; a first alternating current-direct current (AC-DC) converter having an AC side coupled to said first electric motor, operable to accept AC or DC current and convert the current to DC or AC current respectively; a second AC-DC converter coupled to said second electric motor, at least operable to accept AC current and convert the current to DC; an electrical storage device coupled to a DC side of said AC-DC converters, wherein the electrical storage device is operable to store DC energy received from said AC-DC converters and provide DC energy to at least said first AC-DC converter for providing power to at least said first electric motor; and a controller, operable to start and stop the engine to minimize fuel consumption; said method comprising the step of controlling flow of DC current such that a ratio of maximum DC voltage on the DC side of at least said first AC-DC converter coupled to said first electric motor to current supplied from said electrical storage device to at least said first AC-DC converter, when maximum current is so supplied, is at least 2.5.

53. The method of claim 41, wherein a rate of change of torque output of said engine is limited to a threshold value, wherein when a rate of change of vehicle load exceeds said threshold value of the rate of change of torque output of the engine, said controller is operable to operate said first motor and/or said second motor to supply additional power to at least said two wheels to supply remaining required torque.

55. The method of claim 53, wherein said controller is operable to vary said threshold value with respect to a state of charge of said electrical storage device.

44. For example, and without limitation, one or more of the '134 Accused Products meets the limitations of claim 55 of the '134 patent. For example and on information and belief, the '134 Accused Products have at least two wheels, operable to receive power to propel said hybrid vehicle; a first alternating current (AC) electric motor, operable to provide power to said at least two wheels to propel said hybrid vehicle; a second AC electric motor; an engine coupled to said second electric motor, operable to provide power to said at least two wheels to propel the hybrid vehicle, and/or to said second electric motor to drive the second electric motor to generate electric power. For example and on information and belief, as shown below, the '134 Accused Products have four wheels to receive power to propel the vehicle, a first alternating current electric motor (C-ISG or ERAD) operable to provide power to the wheels to propel the vehicle; a second alternating current electric motor (C-ISG or ERAD), an engine coupled to the second alternating current motor operable to provide power to the wheels to propel the vehicle and/or to the second electric motor to drive the second electric motor to generate electric power.



First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (annotated).⁹

⁹ See also The Volvo T8 Twin Engine: Efficient Power No Compromises, https://www.youtube.com/watch?time_continue=28&v=UwYV1i7Ejgo&feature=emb_title.

45. In addition and on information and belief, the '134 Accused Products include a first alternating current-direct current (AC-DC) converter having an AC side coupled to said first electric motor, operable to accept AC or DC current and convert the current to DC or AC current respectively; a second AC-DC converter coupled to said second electric motor, at least operable to accept AC current and convert the current to DC, and an electrical storage device coupled to a DC side of said AC-DC converters, wherein the electrical storage device is operable to store DC energy received from said AC-DC converters and provide DC energy to at least said first AC-DC converter for providing power to at least said first electric motor. For example and on information and belief, both the C-ISG and ERAD have respective AC-DC converters for converting DC current to AC current and vice versa. In addition, the '134 Accused Products have an electrical storage device (Li-ion battery) as shown above that is operable to store DC energy received from the two AC-DC converters connected to the C-ISG and ERAD and provide DC energy to the two AC-DC converters connected to the C-ISG and ERAD.¹⁰

46. In addition and on information and belief, the '134 Accused Products also include a controller, operable to start and stop the engine to minimize fuel consumption; said method comprising the step of controlling flow of DC current such that a ratio of maximum DC voltage on the DC side of at least said first AC-DC converter coupled to said first electric motor to current supplied from said electrical storage device to at least said first AC-DC converter, when maximum current is so supplied, is at least 2.5. For example and on information and belief, the '134 Accused products have a controller operable to start and stop the engine to minimize

¹⁰ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The water-cooled C-ISG has three functions: the starter; a generator to keep charging the battery; and power boost under certain conditions.... The Electric Rear Axle Drive (ERAD) (from Siemens) also has three functions: a generator for charging the battery; electric traction drive; and power boost.”).

fuel consumption by, for example, transitioning from “EV drive” to “[c]ombustion engine drive and charging.”¹¹ In addition, the ratio of maximum DC voltage on the DC side of at least the first AC-DC converter coupled to the first electric motor to current supplied from the electrical storage device to at least the first AC-DC converter, when maximum current is so supplied, is at least 2.5 as demonstrated by the voltage of the Li-ion battery and available current to the first electric motor.¹²

47. In addition and on information and belief, the '134 Accused Products limit the rate of change of torque output of said engine to a threshold value, wherein when a rate of change of vehicle load exceeds said threshold value of the rate of change of torque output of the engine, said controller is operable to operate said first motor and/or said second motor to supply additional power to at least said two wheels to supply remaining required torque and wherein said controller is operable to vary said threshold value with respect to a state of charge of said electrical storage device. For example and on information and belief, the controller of the '134 Accused Products limit the rate of change of engine output torque to a threshold value and use the C-ISG and ERAD to perform “torque infill” to supply the remaining required torque.¹³ And

¹¹ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The XC90 T8 PHEV has five basic modes of operation. EV drive, in which the battery powers the ERAD.... Combustion engine drive and charging. When the combustion engine is one [*sic*] and propelling the car, the C-ISG is charging the battery pack.”).

¹² See Volvo XC90 Twin Engine Owner’s Manual at 623, https://volvornt.hartehanks.com/manuals/2018/17wk46/XC90_TWINENGINE_OwnersManual_MY18_en-US_TP24913.pdf (“Hybrid battery control module; high-voltage converter for combined high-voltage generator/ starter motor with 500 V–12 V voltage converter”); First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The water-cooled C-ISG has three functions.... The 34 kW unit (46 hp) delivers 150 N·m (103 lb-ft) of torque. The Electric Rear Axle Drive (ERAD) (from Siemens) also has three functions.... The 65 kW (87 hp) unit delivers 240 N·m (177 lb-ft) of torque.”).

¹³ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“Due to the sophisticated use of torque infill, the drive performance of the T8 PHEV is even more seamless and smoother than in the T6.”).

on information and belief, the threshold varies with respect to the state of charge of the Li-ion battery.

48. In view of the facts alleged above, Volvo has knowledge of the asserted patents, including the '134 patent, and its products' infringement.

49. Volvo has actively induced and continues to induce the infringement by others, including its customers, of the '134 patent under 35 U.S.C. § 271(b) by, among other things, manufacturing, selling, offering for sale within the United States and/or importing into the United States the '134 Accused Products and providing materials and instructions for operation of the same, with the specific intent and knowledge that the hybrid vehicles, materials and instructions direct, teach, or assist others to infringe the '134 patent by using or operating the hybrid vehicles in a manner that directly infringes the '134 patent. For example, Volvo provides materials as well as user manuals that tout the hybrid vehicle technology and instructions on how to operate Volvo hybrid vehicles. Volvo's customers directly infringe the '134 patent by using (*e.g.*, driving) the '134 Accused Products.

50. Volvo has contributed and continues to contribute to the infringement by others, including its customers, of the '134 patent under 35 U.S.C. § 271(c) by, among other things, manufacturing, selling, offering for sale within the United States and/or importing into the United States hybrid the '134 Accused Products for use in practicing the patented inventions of the '134 patent, knowing that the hybrid vehicles and components are especially made or adapted for use in infringement of the '134 patent, embody a material part of the inventions claimed in the '134 patent, and are not staple articles of commerce suitable for substantial non-infringing use. Volvo's customers directly infringe the '134 patent by using (*e.g.*, driving) the '134 Accused Products.

51. As a result of Volvo's past and continued unlawful infringement of the '134 patent, Plaintiffs have suffered and will continue to suffer damage. Plaintiffs are entitled to recover damages adequate to compensate for that infringement in an amount that will be ascertained at trial, but in no event less than a reasonable royalty.

52. On information and belief, Volvo's acts of infringement have been willful and are made with knowledge of Plaintiffs' rights in the '134 patent. As stated and alleged above, Paice put Volvo on notice of its patents at least as early as February 15, 2019. Paice and Abell attempted to engage in good faith licensing negotiations concerning Volvo's infringement of the '134 patent. Volvo has refused to engage in good faith negotiations and has continued to infringe the '134 patent unabated by Paice's and Abell's request and with knowledge of the '134 patent and its infringement of the same. Such acts constitute willful and deliberate infringement, entitling Plaintiffs to enhanced damages and reasonable attorney fees.

COUNT III

Infringement of U.S. Patent No. 76,209,672

53. Plaintiffs reallege and incorporate herein by reference the allegations in paragraphs 1-52 above. As described below, Volvo has infringed and continues to infringe claim 18 the '672 patent. Volvo has infringed and continues to infringe, for example, at least claim 18 of the '672 patent under 35 U.S.C. § 271(a), by making, using, offering for sale or selling within the United States, or importing into the United States hybrid vehicles (including any cars, sport utility vehicles, or light duty trucks) such as the XC60 PHEV, XC90 PHEV, S60 PHEV, and S90 PHEV (collectively, the "'672 Accused Products") that infringe the '672 patent either literally or under the doctrine of equivalents.

54. Among the claims of the '672 patent, claim 18 (dependent on claim 15) recites as follows:

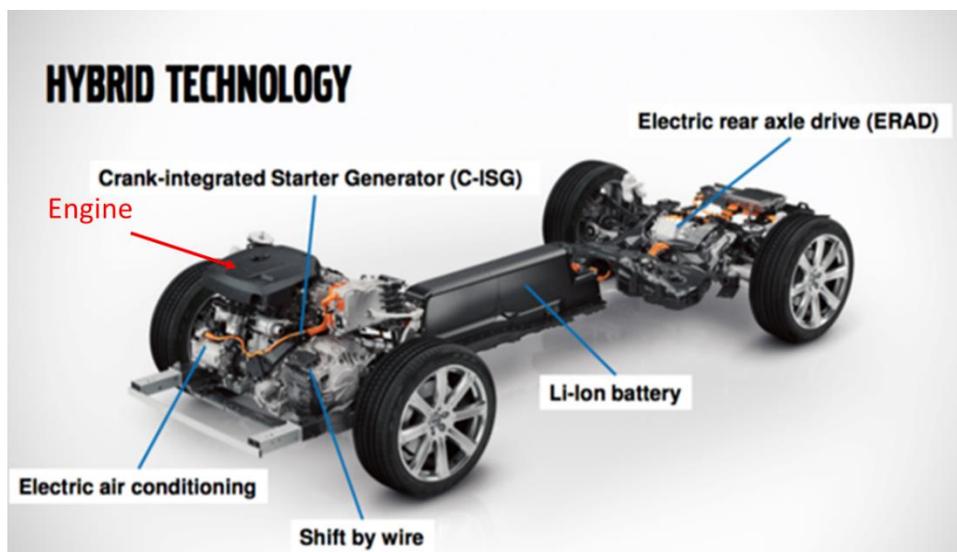
15. A method for controlling the operation of a hybrid vehicle operable in a plurality of differing modes, comprising the steps of: providing a hybrid vehicle comprising an internal combustion engine for providing torque up to a maximum torque output (MTO), said engine being controllably coupled to road wheels of said vehicle by a clutch, a traction motor being coupled to road wheels of said vehicle, a starting motor coupled to said engine, both said motors being operable as generators, a battery bank for providing electrical energy to and accepting energy from said motors, and a controller for controlling operation of said engine, clutch, and first and second motors, and controlling flow of electrical energy between said motors and said battery bank, and operating said controller to control selection of the operational mode of said vehicle between a low-speed mode I, a cruising mode IV, and an acceleration mode V, wherein torque to propel said vehicle is provided by said traction motor, said engine, and both, respectively, in response to monitoring the instantaneous torque requirements required for propulsion of the vehicle (RL).

18. The method of claim 16, wherein said controller further controls said vehicle to operate in a low-speed battery charging mode II, entered while $RL < SP$ and the state of charge of the battery bank is below a predetermined level, during which said vehicle is propelled by torque provided by said traction motor in response to energy supplied from said battery bank, and wherein said battery bank is simultaneously charged by supply of electrical energy from said starting motor, being driven by torque by said engine in response to supply of combustible fuel, said clutch being disengaged during operation in mode II.

55. For example, and without limitation, one or more of the '672 Accused Products meets the limitations of claim 18 (and independent claim 15 from which it depends) of the '672 patent. For example, on information and belief, the '672 Accused Products are hybrid electric vehicles comprising an internal combustion engine for providing torque up to a maximum torque output (MTO), said engine being controllably coupled to road wheels of said vehicle by a clutch, a traction motor being coupled to road wheels of said vehicle, a starting motor coupled to said engine, both said motors being operable as generators, a battery bank for providing electrical energy to and accepting energy from said motors, and a controller for controlling operation of said engine, clutch, and first and second motors. For example and on information and belief, as shown below, the '672 Accused Products include an engine controllably coupled to road wheels via an eight-speed transmission (Aisin AW TG-81SC) and an electric motor (C-ISG) connected to the engine and operable to start the engine.¹⁴ The engine of the '672 Accused Products provide torque up to a maximum normally-aspirated torque output that is controllably coupled to road wheels via an eight-speed transmission (Aisin AW TG-81SC) having multiple clutches.¹⁵

¹⁴ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The water-cooled C-ISG has three functions: the starter; a generator to keep charging the battery; and power boost under certain conditions.”).

¹⁵ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (“The water-cooled C-ISG has three functions: the starter; a generator to keep charging the battery; and power boost under certain conditions.”).



See First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> (annotated).¹⁶

56. As shown above, the '672 Accused Products also have a traction motor (ERAD) coupled to the wheels.¹⁷ The '672 Accused Products also have a battery (Li-ion battery) that provides and accepts current from both the C-ISG and ERAD. In addition, the '672 Accused Products have a controller that controls operation of said engine, clutch, and first and second motors and the flow of electrical energy between the motors and the battery bank.¹⁸

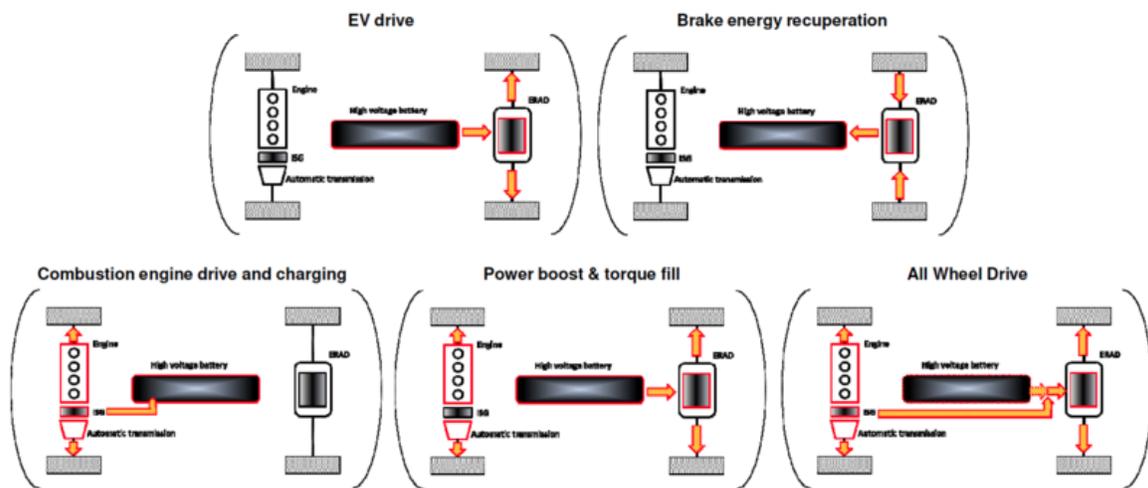
57. In addition and on information and belief, the '672 Accused Products operate said controller to control selection of the operational mode of said vehicle between a low-speed mode I, a cruising mode IV, and an acceleration mode V, wherein torque to propel said vehicle is provided by said traction motor, said engine, and both, respectively, in response to monitoring the instantaneous torque requirements required for propulsion of the vehicle (RL). For example

¹⁶ See also The Volvo T8 Twin Engine: Efficient Power No Compromises, https://www.youtube.com/watch?time_continue=28&v=UwYV1i7Ejgo&feature=emb_title.

¹⁷ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> ("The Electric Rear Axle Drive (ERAD) (from Siemens) also has three functions: a generator for charging the battery; electric traction drive; and power boost.")

¹⁸ First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html> ("A very sophisticated ECU sorts out what is required by the vehicle at a given time.").

and on information and belief, the controller of the '672 Accused Products controls the vehicle to operate in "EV drive," "[c]ombustion engine drive and charging," and "[p]ower boost" modes where the engine and/or ERAD provide torque to propel the vehicle responsive to monitoring the instantaneous torque required to propel the vehicle.

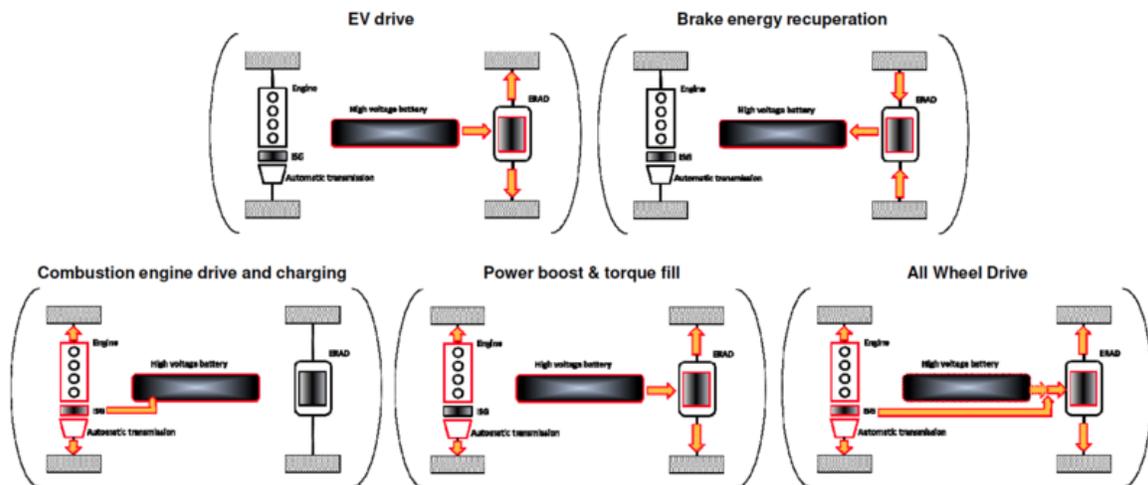


First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html>.¹⁹

58. In addition and on information and belief, the controller of the '672 Accused Products controls said vehicle to operate in a low-speed battery charging mode II, entered while $RL < SP$ and the state of charge of the battery bank is below a predetermined level, during which said vehicle is propelled by torque provided by said traction motor in response to energy supplied from said battery bank, and wherein said battery bank is simultaneously charged by supply of electrical energy from said starting motor, being driven by torque by said engine in response to supply of combustible fuel, said clutch being disengaged during operation in mode II. For example, and on information and belief, the controller of the '672 Accused Products operates the vehicle in a low-speed battery charging mode II, entered during the "[c]ombustion

¹⁹ See also The Volvo T8 Twin Engine: Efficient Power No Compromises, https://www.youtube.com/watch?time_continue=28&v=UwYV1i7Ejgo&feature=emb_title.

engine drive and charging” mode while road load is below a setpoint and the state of charge of the battery bank is below a predetermined level, during which the '672 Accused Products are propelled by torque provided by the traction motor (ERAD) in response to energy supplied from the battery bank (Li-ion battery). In addition, the battery bank is simultaneously charged by supply of electrical energy from the starting motor (C-ISG), being driven by torque by the engine in response to supply of combustibile fuel, one or more clutches being disengaged during operation in mode II.



First drive: Volvo XC90 T8 Drive-E Twin Engine PHEV sets a high bar for full-size luxury SUV plug-ins in US, <https://www.greencarcongress.com/2015/05/20150517-xc90.html>.²⁰

59. In view of the facts alleged above, Volvo has knowledge of the asserted patents, including the '672 patent, and its products' infringement. Volvo has actively induced and continues to induce the infringement by others, including its customers, of the '672 patent under 35 U.S.C. § 271(b) by, among other things, manufacturing, selling, offering for sale within the United States and/or importing into the United States the '672 Accused Products and providing materials and instructions for operation of the same, with the specific intent and knowledge that

²⁰ See also The Volvo T8 Twin Engine: Efficient Power No Compromises, https://www.youtube.com/watch?time_continue=28&v=UwYV1i7Ejgo&feature=emb_title.

the hybrid vehicles, materials and instructions direct, teach, or assist others to infringe the '672 patent by using or operating the hybrid vehicles in a manner that directly infringes the '672 patent. For example, Volvo provides materials as well as user manuals that tout the hybrid vehicle technology and instructions on how to operate Volvo hybrid vehicles. Volvo's customers directly infringe the '672 patent by using (*e.g.*, driving) the '672 Accused Products.

60. Volvo has contributed and continues to contribute to the infringement by others, including its customers, of the '672 patent under 35 U.S.C. § 271(c) by, among other things, manufacturing, selling, offering for sale within the United States and/or importing into the United the '672 Accused Products for use in practicing the patented inventions of the '672 patent, knowing that the hybrid vehicles and components are especially made or adapted for use in infringement of the '672 patent, embody a material part of the inventions claimed in the '672 patent, and are not staple articles of commerce suitable for substantial non-infringing use. Volvo's customers directly infringe the '672 patent by using (*e.g.*, driving) the '672 Accused Products.

61. As a result of Volvo's past unlawful infringement of the '672 patent, Plaintiffs have suffered and will continue to suffer damage. Plaintiffs are entitled to recover damages adequate to compensate for that infringement in an amount that will be ascertained at trial, but in no event less than a reasonable royalty.

62. On information and belief, Volvo's acts of infringement have been willful and are made with knowledge of Plaintiffs' rights in the '672 patent. As stated and alleged above, Paice put Volvo on notice of its patents at least as early as February 15, 2019. Paice and Abell attempted to engage in good faith licensing negotiations concerning Volvo's infringement of the '672 patent. Volvo has refused to engage in good faith negotiations and has continued to

infringe the '672 patent unabated by Paice's and Abell's request and with knowledge of the '672 patent and its infringement of the same. Such acts constitute willful and deliberate infringement, entitling Plaintiffs to enhanced damages and reasonable attorney fees.

JURY DEMAND

Pursuant to Federal Rule of Civil Procedure 38, Plaintiffs demand a trial by jury on all issues so triable.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs Paice and Abell respectfully request the following relief:

- 1) A judgment that the '391, '134, and '672 patents have been infringed by Volvo;
- 2) Awarding Paice and Abell damages adequate to compensate for Volvo's past, infringement, pre- and post-judgment interest as allowed by law, costs, and all other damages permitted by 35 U.S.C. § 284;
- 3) Declaring that this case is an exceptional one under 35 U.S.C. § 285, and awarding Paice and Abell their reasonable attorneys' fees;
- 4) Awarding Paice and Abell such further, necessary and proper relief as this Court may deem just and reasonable.

December 23, 2020

Respectfully submitted,

/s/ James P. Ulwick

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