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Paper 36
Entered: March 3, 2015

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORP.,
Petitioner,

v.

LEROY G. HAGENBUCH,
Patent Owner.

Case IPR2014-00124
Patent 8,532,867 B1

Before JAMESON LEE, MICHAEL W. KIM, and
JEREMY M. PLENZLER, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Toyota Motor Corp. (“Toyota”) filed a Petition to institute an *inter partes* review of claims 15–26 of U.S. Patent No. 8,532,867 B1 (Ex. 1101, “the ’867 patent”). Paper 2 (“Pet.”). Leroy G. Hagenbuch (“Hagenbuch”), as Patent Owner, filed a Preliminary Response. Paper 11 (“Prelim. Resp.”). We instituted trial as to claims 15–24 but not claims 25 and 26. Paper 14 (“Dec. Inst.”).

During trial, Hagenbuch filed a Patent Owner Response (Paper 18, “PO Resp.”), which was accompanied by an expert declaration from Michael Nranian (Ex. 2067). Toyota filed a Reply to the Patent Owner Response. Paper 26 (“Reply”). A consolidated oral argument for this proceeding and Case IPR2014-00123 was held on January 12, 2015. A transcript of the hearing has been entered into the record. Paper 35 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). This final written decision is issued pursuant to 35 U.S.C. § 318(a).

We determine that Toyota has shown by a preponderance of the evidence that claims 15–20, 23, and 24 of the ’867 patent are *unpatentable*. We also determine that Toyota has not shown, by a preponderance of the evidence, that claims 21 and 22 of the ’867 patent are *unpatentable*.

B. Related Proceedings

The ’867 patent has been asserted by Hagenbuch against a subsidiary of Toyota in *Hagenbuch v. Toyota Motor Sales, U.S.A., Inc.*, No.1:13-cv-6713 (N.D. Ill., filed Sept. 18, 2013). Pet. 1; Prelim. Resp. 1. The ’867 patent also is involved in *inter partes* review IPR2014-00123, the Final

Written Decision of which holds unpatentable claims 1–7 and 10–12 of the ’867 patent and is issued concurrently herewith.

C. The ’867 Patent

The ’867 patent generally relates to identifying anomalies in an operation of a vehicle, and more particularly, to collecting and analyzing data derived during vehicle operation, so as to diagnose a cause of operational anomalies. Ex. 1101, 1:25–29. At the time of the invention, it was known to include sensors for tracking the vital signs of the vehicle (i.e., indicators of the vehicle’s health). *Id.* at 1:33–34. Such sensors may include an oil pressure gauge, a water temperature gauge, an electrical system charging/discharging gauge, a brake system condition sensor, and a transmission shift indicator. *Id.* at 1:34–39. It was also known, at the time of invention, to employ sensors to monitor vehicle parameters related to a task being performed by the vehicle, so as to establish how effectively the vehicle is performing. *Id.* at 1:45–47. Task-related parameters could include load carried by the vehicle, grade of the road, loads hauled per hour, and tons hauled per hour. *Id.* at 1:54–57. In general, task-related parameters provide indicia of work done by the vehicle, where work is proportional to a weight of the vehicle multiplied by a distance it is carried. *Id.* at 1:57–60. Production performance of the vehicle generally is evaluated in an amount of work done in a unit of time—e.g., miles per hour, tons per hour, and the like. *Id.* at 1:60–63.

The disclosed invention of the ’867 patent integrates monitoring and recording of vehicle production data with vehicle vital sign data. *Id.* at 1:64–2:9. As depicted in Figure 2B, reproduced below, processor 41 receives both work-related data 67 and vital sign data 73.

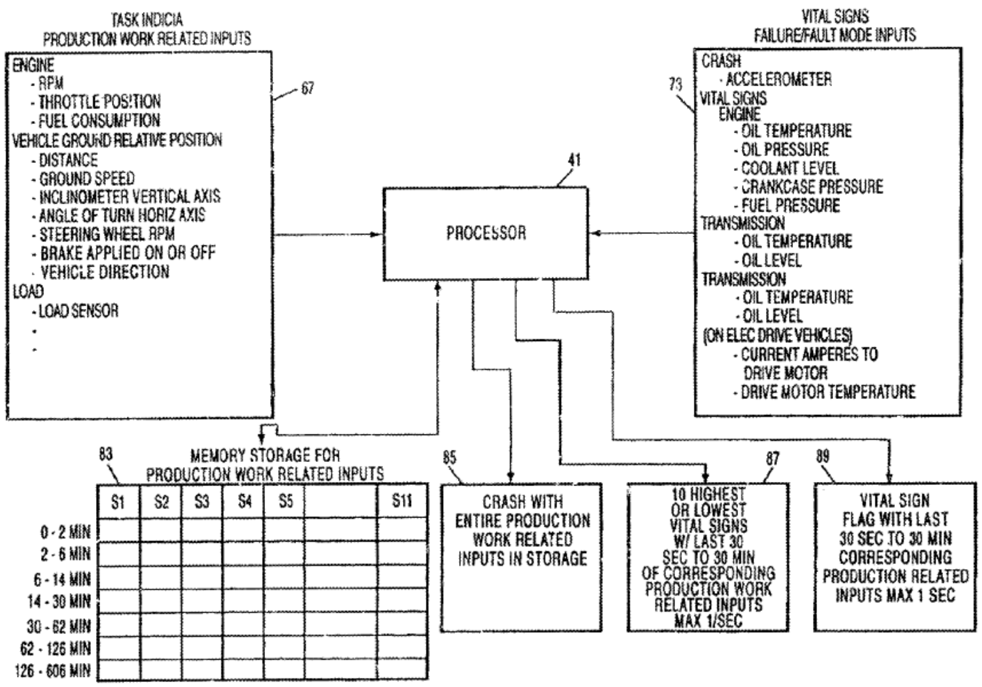


FIG. 2B

As shown in Figure 2B, processor 41 chronologically stores work-related data into memory 83 such that, once full, new data begin overwriting the oldest data (i.e., memory 83 is buffered). *Id.* at figs. 5A, 5B, 12:44–13:44. If processor 41 senses a vital sign that is one of the ten most extreme readings, it stores that extreme reading along with corresponding work-related data into memory 87, such that it will not be overwritten unless a more extreme reading is encountered (i.e., memory 87 is non-buffered). *Id.* at 13:30–56. Likewise, vital signs that reach a critical value are stored in memory 89 with their corresponding work-related data. *Id.* at 13:12-29. By utilizing vital signs to identify when a vehicle is in a poor state of health, one may be able to determine a cause of the poor health by examining work-related data pertaining to a recent use of the vehicle. *Id.* 2:22–3:29.

In the event of a crash, processor 41 copies data from memory 83 into memory 85, along with vehicle deceleration measurements, for preservation.

Id. at 11:66–12:3. In addition, data continue to be acquired and stored into memories 83 and 85. *Id.* at 3:22–27, 25:9–38. Additionally, in the event of a crash, a distress signal automatically is sent out to alert other personnel that aid may be required. *Id.* at 7:39–49.

D. Illustrative Claims

Among all challenged claims 15–24, claim 15 is the only independent claim and is reproduced below:

> 15. An apparatus for recording operation of a vehicle and facilitating emergency response in the event of a collision of the vehicle, the apparatus comprising:
>
> sensors for monitoring production-related parameters of the vehicle, where the parameters include ground speed of the vehicle, a position of a throttle for an engine of the vehicle, an on/off status of a braking system of the vehicle, and a status of a seat belt;
>
> one or more sensors for monitoring vital signs of the vehicle, where the vital signs include information indicative of a change in the velocity of the vehicle;
>
> a processor in communication with one or more of the sensors for monitoring vital signs of the vehicle and detecting whether the vehicle has been involved in a collision based on information obtained by monitoring one or more of the sign parameters;
>
> a first memory adapted to capture values of the production-related parameters;
>
> a second memory adapted to receive information from the first memory and information indicative of a change in the velocity of the vehicle;
>
> the processor, in response to detection of the collision, causing recording into the second memory values

> from the one or more sensors for monitoring vital signs of the vehicle over a finite period of time after detection of the collision and further causing transfer of data from the first memory to the second memory, the data comprising three or more of the production-related parameters of the vehicle captured in the first memory over a finite period of time before detection of the collision; and
>
> a transmitter for automatically sending a wireless distress signal from the vehicle in response to detecting the collision, the distress signal indicating that the vehicle has been in a collision.

Ex. 1101, 26:60–27:25.

E. Prior Art Relied Upon

Toyota relies upon the following prior art references:

Aoyanagi	Japanese. Pat. Pub. H03-085412 (Ex. 1102) (English Translation Ex. 1103)[1]	April 10, 2001
Vollmer	Int. Pat. Pub. WO 90/03899 (Ex. 1104) (English Translation Ex. 1105)[2]	April 19, 1990
Steiner	U.S. Patent No. 4,939,652 (Ex. 1106)	July 3, 1990
Fincham	W. Fincham et al., "DRACO. A Transient Recorder for Road Accidents," *Automotive Electronics*, 1991, *Eighth International Conference on Automotive Electronics*, pp. 135–39, Oct. 28–31, 1991 (Exhibit 1108)	

[1] Unless otherwise noted, citations are to the certified English translation that is Exhibit 1103.

[2] Unless otherwise noted, citations are to the certified English translation that is Exhibit 1105.

F. The Instituted Grounds of Unpatentability

Claims	Ground	Reference(s)
15–20, 23, and 24	§ 103	Aoyanagi, Vollmer, and Steiner
21 and 22	§ 103	Aoyanagi, Vollmer, Steiner, and Fincham

In support of the grounds identified above, Toyota presents a Declaration of David McNamara. Ex. 1110.

II. ANALYSIS

For the challenged claims, Petitioner must prove unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e).

A. Claim Construction

Claims of an *unexpired* patent are given their broadest reasonable interpretation in an *inter partes* review. 37 C.F.R. § 42.100(b). However, the ’867 patent is expired. Consequently, the Board’s review of the claims of the ’867 patent is similar to that of a district court’s review. *In re Rambus, Inc*., 694 F.3d 42, 46 (Fed. Cir. 2012). In this context, claim terms are given their ordinary and customary meanings, as understood by a person of ordinary skill in the art, at the time of the invention, having taken into consideration the language of the claims, the specification, and the prosecution history of record, because the expired claims are not subject to amendment. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). “In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words." *Id.* at 1314.

In the Decision on Institution, we provided the following constructions for these claim terms:

"monitoring" is construed as "*watching or keeping track of, or checking*" (Dec. Inst. 9);

"capturing" and "recording" are each construed as "*to store data into memory*" (Dec. Inst. 13);

"second memory" is construed as "*any set of memory addresses separate from a first set of memory addresses*" (Dec. Inst. 14).

We also determined that neither "*information indicating whether the vehicle has been involved in more than one collision*" nor "*information . . . includes the number of collisions*" requires the multiple collisions to occur during one crash or accident. Dec. Inst. 16.

After institution of trial, neither party disputed the above-noted claim construction. Upon review of the full record, we have no reason to deviate from them, except for the construction of the term "*second memory*." We did not intend to suggest that a memory address is the same as a memory. Accordingly, the construction of "second memory" is revised to: "*any memory space separate from a first memory space*."

B. Obviousness of Claims 15–20, 23, and 24 over Aoyanagi, Vollmer, and Steiner

We have reviewed the Petition, the Patent Owner Response, and Petitioner's Reply, as well as the relevant evidence discussed in those papers. We are persuaded, by a preponderance of the evidence, that claims

15–20, 23, and 24 would have been obvious over Aoyanagi, Vollmer, and Steiner under 35 U.S.C. § 103.

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). Obviousness is a legal determination based on underlying factual inquiries including (1) the scope and content of the prior art, (2) the differences between the prior art and the claimed invention, (3) the level of ordinary skill in the art, and (4) secondary considerations of nonobviousness, if any. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). The level of ordinary skill in the art need not always be expressly defined. It can be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

Aoyanagi

Aoyanagi describes an apparatus for recording vehicle running conditions, especially during and following an accident. Ex. 1103, 70. In that regard, Aoyanagi states: "[t]he recording apparatus uses sensors to record data of the running conditions of the vehicle from these sensors, and the recorded data are used to judge the circumstances of the accident." *Id.* at 71. Aoyanagi specifically identifies 15 items of recordable data, and refers to them as "*not always necessary but just illustrative*."[3] *Id*. The identified items of data include vehicle speed, vehicle acceleration and deceleration, engine speed, accelerator pedal position, brake pedal position, seat belt state, and more. *Id*.. For a specific embodiment, Aoyanagi states: "Data from respective sensors as described in Fig. 1 to Fig. 3 are input into the recording apparatus (step S1)." *Id.* at 72. Figures 1–3 of Aoyanagi are reproduced below.

FIG. 1

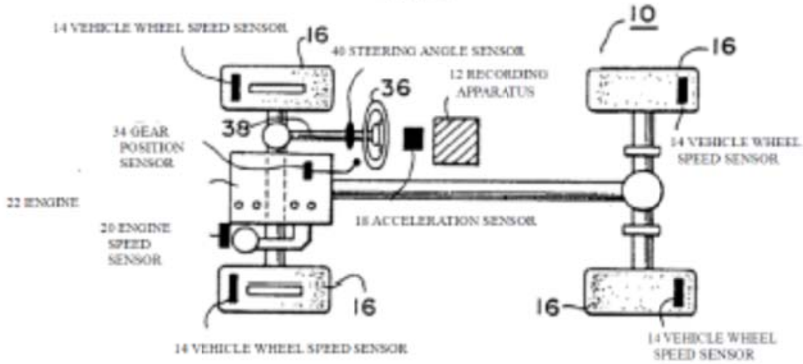


FIG. 2

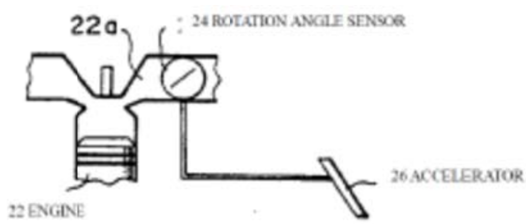
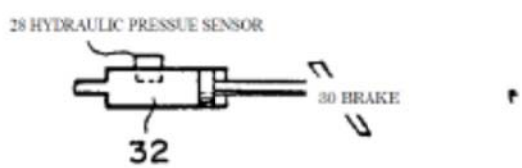


FIG. 3



[3] Aoyanagi includes an item number 16 but no item is identified by that number. Ex. 1103, 72. Consequently, we regard Aoyanagi as having described 15 vehicle parameters to monitor and record.

Figure 1 is a schematic plan view denoting a recording apparatus attached to a vehicle; Figure 2 illustrates a rotation angle sensor; and Figure 3 illustrates a hydraulic pressure sensor. Ex. 1103, 73. In the particular embodiment represented by Figures 1–3, the data being monitored include brake pedal position, accelerator pedal position, engine speed, vehicle speed, steering angle, among others. The brake pedal position is calculated from the output of the hydraulic pressure sensor. *Id.* at 71.

When it is determined that a crash or accident has occurred, such as when a shock occurs and the vehicle speed becomes zero in a short time, that constitutes a condition for stopping data input. *Id.* at 72. But, Aoyanagi describes that the system can be made such that when an accident occurs, recording can continue to take place for a specific period of time after receiving shocks and the like. *Id*. at 72.

Vollmer

Vollmer discloses a device, onboard a vehicle, that can automatically make a call in the event of an emergency, which call includes various information about the vehicle and the emergency situation. Ex. 1105, 6:10–25. The device includes control unit 3 and sensing elements that are constantly ready for operation. *Id*. at 6:10–12. Vollmer describes that data transmitted in the emergency call includes: reason for the emergency, car license number/owner, type of vehicle, color of the vehicle, position of the vehicle, hazard group identification, number of passengers, seat positions, speed and deceleration measurements, whether vehicle is speeding, whether vehicle is driving against traffic, and whether the emergency call was manually triggered. *Id*. at 6:22–25. Vollmer describes that an emergency call can be triggered by a manually operated key, independent of the automatically functioning sensing elements. *Id*. at 8:6–7.

Steiner

Steiner is titled "Trip Recorder." Ex. 1106, at [54]. It discloses an onboard system for monitoring, recording, and displaying vehicle operating parameters, in which detailed data are stored in the onboard system for subsequent processing by an off-line computer. Ex. 1106, at [57]. Examples of vehicle operating parameters monitored and recorded are the average speed of the vehicle and the distance travelled by the vehicle, both in fixed time intervals. *Id*. at 4:21–31.

In a preferred embodiment, Steiner discloses using a 60 byte area in memory, as a circular buffer, to record, at one second intervals, the average speed at which the vehicle is moving. Ex. 1106, 8:1–6. The average speed at each interval is stored at consecutive byte locations. *Id*. at 8:6–7. The buffer is accessed in a circular manner, such that it contains data on the vehicle's average speed only for each of the preceding 60 seconds. *Id*. at 8:17–21. For subsequent analysis of the recorded data, Steiner describes:

> Two switches 632, are provided to initiate transferring of the contents of the buffer to an area of data memory where it will be retained for subsequent analysis. One switch is an impact triggered switch that will activate if the vehicle is involved in an accident, and the other switch is a push button switch that may be manually activated by the driver of the vehicle. A separate area in data memory 506, is allocated for retaining the contents of the circular buffer, for each switch.
>
> The impact triggered switch may comprise a self-triggering device such as an accelerometer switch, or a level detector switch. Either the self-triggering device or the manual switch can be activated for any of a set of predetermined

> conditions, for example, emergency conditions or simply the desire of the driver to retain the information.
>
> Activation of either switch causes data from the circular buffer to be stored in the appropriate area of memory, after a delay of 15 seconds. The retained data therefore represents vehicle activity for a time period starting 45 seconds prior to activation of either switch, and ending 15 seconds after such activation.

Ex. 1106, 8:21–43.

1. Discussion of Obviousness

Toyota explains how each element of claim 1 is satisfied by Aoyanagi, except for (1) "a transmitter for automatically sending a wireless distress signal from the vehicle in response to detecting the collision, the distress signal indicating that the vehicle has been in a collision"; (2) "a second memory adapted to receive information from the first memory and information indicative of a change in the velocity of the vehicle"; and (3) "in response to detecting of the collision, causing recording into the second memory values from the one or more sensors for monitoring vital signs of the vehicle over a finite period of time after detection of the collision and further causing transfer of data from the first memory to the second memory, the data comprising three or more of the production-related parameters of the vehicle captured in the first memory over a finite period of time before detection of the collision." Pet. 9–16, 20–26.

Toyota contends that it would have been obvious to one with ordinary skill in the art, in light of Vollmer's disclosure of sending an automatic distress signal in case of an accident, also to cause Aoyanagi's system to send a wireless distress signal in response to detecting a collision. Pet. 15–16. Toyota also contends that in light of Steiner's disclosure of transferring stored data, in case of an accident, from the circular buffer to a separate area of the memory where they will be retained for subsequent analysis, to modify the system of Aoyanagi so as to transfer the stored data from a first memory to a second memory, in case of an accident. Pet. 12–16. That, according to Toyota, accounts for both claim limitations identified above and relating to the workings of the second memory. Toyota also explains that the first memory used in Aoyanagi is a "64-kilobyte C-MOS SRAM," which is a volatile memory. Pet. 12.

Hagenbuch disagrees with both of Toyota's contentions noted above. PO Resp. 33–43. In addition, Hagenbuch asserts that Toyota has not shown that one with ordinary skill in the art would have selected from all potential vehicle parameters to monitor, as disclosed in Aoyanagi, the precise combination of parameters required to be monitored by the challenged claims. PO Resp. 12–32. According to Hagenbuch, Petitioner relied on inappropriate hindsight and "cherry pick[ed]" the parameters to arrive at the combination of vehicle parameters required by the claims to be monitored and recorded. PO Resp. 15, 30. Hagenbuch also asserts that, contrary to the contention of Toyota, Aoyanagi does not disclose the monitoring and capturing of brake on/off status as is required by all claims. PO Resp. 44–47. Hagenbuch presents, as secondary consideration of nonobviousness, what it regards as evidence of commercial success. PO Resp. 50–56.

For reasons discussed below, we are persuaded by each of Toyota's contentions and not persuaded by any of Hagenbuch's arguments. We have considered the entirety of the arguments and evidence before us, including the contentions of Toyota that are not disputed by Hagenbuch. Toyota has established, by a preponderance of the evidence, that claims 15–20, 23, and

24 would have been obvious over Aoyanagi, Vollmer, and Steiner under 35 U.S.C. § 103.

a) The monitored and recorded vehicle parameters

As described above, Aoyanagi specifically identifies 15 vehicle parameters for monitoring and recording. Ex. 1103, 71. Although Aoyanagi states that these parameters "are not always necessary but just illustrative," (*id.* at 71) that statement does not take away from or diminish Aoyanagi's specific disclosure of the 15 vehicle parameters to monitor and record. What Aoyanagi illustrated, as an embodiment, is the monitoring and recording of all 15 vehicle parameters. That Aoyanagi also indicates that all 15 parameters "are not always necessary" merely adds to and expands its disclosure of an embodiment that monitors and records all 15 vehicle parameters.

Hagenbuch's argument is misplaced, that Toyota has not shown that one with ordinary skill in the art would have selected the particular combination of parameters to monitor and record, as required by claim 15, i.e., the ground speed of the vehicle, engine throttle position of the vehicle, braking system on/off status, seat belt status, and information indicative of a change in the velocity of the vehicle, such as acceleration and deceleration. The argument is misplaced, because claim 15 does not limit or restrict the monitoring and recording to only those parameters expressly recited in the claim or prohibit the monitoring and recording of other vehicle parameters. The claim feature relating to what vehicle parameters to monitor and record reads on prior art that monitors and records the identified parameters, whether or not additional vehicle parameters also are monitored and recorded. On the basis of its embodiment that monitors and records all 15 vehicle parameters, Aoyanagi is such prior art. No picking or choosing is involved or necessary.

In the alternative, even assuming that Aoyanagi does not disclose that all 15 vehicle parameters should be monitored and recorded, Aoyanagi discloses, as discussed above, another preferred embodiment, the one illustrated in its Figures 1–3. That embodiment monitors and records all of the vehicle parameters required by claim 15 and claims depending on claim 15 to be monitored and recorded, except for the parameter of seat belt status. In light of Aoyanagi's specific identification of 15 vehicle parameters that can be monitored and recorded, including seat belt status (Ex. 1103, 71), Aoyanagi reasonably would have suggested to one with ordinary skill in the art also to monitor seat belt status, in the embodiment of Figures 1–3. We do not regard that as selective picking and choosing with inappropriate hindsight in light of Hagenbuch's own disclosure. Rather, the suggestion stems directly from the teachings of Aoyanagi.

The argument of Hagenbuch alleging selective picking and choosing and cherry-picking of parameters from Aoyanagi also is misdirected because it is based on what combination would be the most practical from the perspective of making economic sense, if implemented on vehicles that are manufactured and sold in the market. For instance, Hagenbuch urges that a skilled artisan would have had reason "to modify Aoyanagi to make it simpler and reduce its memory requirements." PO Resp. 15. In that regard, Hagenbuch states:

> Petitioner cherry picks those claim elements out of the reference without the slightest explanation as to why the skilled artisan would decide to monitor those particular parameters

> *when otherwise modifying Aoyanagi to be simpler and have reduced memory requirements*.

PO Resp. 15 (emphasis added). Hagenbuch further notes:

> Even in 2006—**12 years after** the priority date of the invention—sophisticated companies such as General Motors, Ford and Toyota deemed storing a mere 1,100 data points to be excessive. In that regard, the NHTSA proposed rules that required recording 3 events and 18 data elements. . . . Automobile manufacturers, including Toyota, vehemently protested those extensive data collection requirements. *See, e.g.*, Ex. 2002, at p. 51006, 51011, 51019. Tellingly, as a result of the protestations by Toyota, the NHTSA modified its rules to require recording even fewer data elements, over a shorter period of time, and only for two crash events—rules requiring storing only 144 data points. Ex. 2003 at IV-5, Table IV-1.

PO Resp. 19. During oral argument, counsel for Hagenbuch acknowledged that NHTSA rule making regarding what data to record is influenced by cost considerations for memory requirements. Tr. 39:17.

According to Hagenbuch, relying on the testimony of Mr. Nranian, at the time of invention of the ’867 patent, one with ordinary skill in the art would not have implemented the teachings of Aoyanagi because recording all of the disclosed data elements at a resolution of 10 times per second over three minutes would have resulted in an undesirably large amount of data to be recorded. PO Resp. 24. Hagenbuch asserts, based on the testimony of Mr. Nranian, that the skilled artisan, aware of Aoyanagi and related data recording art, would have had to exercise judgment and balance tradeoffs, such as a tradeoff between “available memory and resolution.” *Id*. Those arguments are not that Aoyanagi constitutes nonenabling prior art or that one with ordinary skill in the art would not have known how to make or use the disclosed system. Rather, it is that one with ordinary skill in the art, for various practical considerations, would not have actually implemented in a real vehicle such as those for sale by car manufacturers. Actual implementation of an embodiment described in the prior art from a practical perspective is not the point. Commercial viability does not control the obviousness determination. In that connection, we note the following instruction from the Court of Appeals for the Federal Circuit:

> [T]he fact that the two [prior art disclosures] would not be combined by businessmen for economic reasons is not the same as saying that it could not be done because skilled persons in the art felt that there was some technological incompatibility that prevented their combination. Only the latter fact is telling on the issue of nonobviousness.

Orthopedic Equip. Co. v. United States, 702 F.2d 1005, 1013 (Fed. Cir. 1983). The cost of providing sufficient memory in each unit to store all the data Aoyanagi identifies for monitoring and recording does not nullify or otherwise undermine Aoyanagi's teaching to monitor and record such vehicle parameters. Similarly, the risk of having more potential data loss because more data is recorded does not nullify or undermine the teaching. In any event, as we discussed above, Aoyanagi discloses an embodiment that monitors and records far fewer than all 15 vehicle parameters, that still includes all of the vehicle parameters recited in Hagenbuch's claims, except for seat belt status. Hagenbuch does not contend that the cost associated with that embodiment, modified to include also recording the seat belt status, would be practically prohibitive. Hagenbuch further does not contend that one with ordinary skill in the art would not have known to decrease the data resolution, i.e., increase the time interval between successive data points sampled, to lower the demand on memory, if the memory cost is deemed excessive for a practical implementation.

Hagenbuch argues that Aoyanagi does not recognize any distinction between vehicle vital sign parameters and vehicle production-related parameters. PO Resp. 27. That may be so, but it is inconsequential. The prior art does not have to use the same "name" to refer to a class or group of vehicle parameters. It is only necessary that limitations regarding monitoring and recording of vehicle parameters are met, regardless of how the parameters are classified by a group name. Aoyanagi discloses the monitoring and recording of parameters that fit within the group names identified in the claims for vehicle parameters. In that regard, we note that counsel for Hagenbuch, when asked at oral argument whether vital sign vehicle parameters and production-related vehicle parameters can overlap, or are mutually exclusive, had no clear or satisfactory answer. Tr. 22:18–21.

b) the on/off status of a braking system

We disagree with Hagenbuch's contention that Aoyanagi does not disclose monitoring and recording the on/off status of a braking system of a vehicle. Toyota accounts for that limitation by pointing to Aoyanagi's identification of "brake pedal position" (Ex. 1103, 71) as a parameter to be monitored and recorded. Pet. 10–11, 22. Toyota relies on the following testimony of David McNamara.

> A person of ordinary skill in the art at the time of the '867 patent's priority date would have understood that when no pressure is applied to the brake pedal, the hydraulic pressure sensor would detect an amount of pressure that corresponds to an "off" state of the braking system, i.e., when no braking pressure is applied to the brake 30. On the other hand, when pressure is applied to the brake pedal, the hydraulic pressure

> sensor 28 would detect an increased amount of pressure that corresponds to an "on" state of the braking system.

Ex. 1110 ¶ 37. At page 22 of the Petition, Toyota specifically identifies "brake pedal position" as the on/off status indicator. Aoyanagi explicitly identifies "Brake Pedal Position" as a parameter to be monitored and recorded. Ex. 1103, 71. Aoyanagi specifically states that the brake pedal position is calculated from detecting the hydraulic pressure of a hydraulic pressure cylinder brake by use of a hydraulic pressure sensor. *Id*.

Hagenbuch asserts that Aoyanagi's disclosed brake pressure sensor is incapable of reliably indicating brake on/off status. PO Resp. 45. Specifically, Hagenbuch states:

> For example, after the brake pedal has been pressed and released, brake pressure does not simultaneously return to the same pressure level existing before the brake pedal was pressed. Ex. 2067 at ¶ 94. Additionally, hydraulic brake systems can fail for any number of reasons, such as low brake fluid level, pressure loss due to hose or hose assembly rupture, or loose or broken fittings. Id. at ¶ 95. In that event, a collision may result despite the operator's application of pressure to the brake pedal, however, the brake pressure sensor of Aoyanagi would not indicate the important fact that the driver had attempted to apply the brakes. *Id*. at ¶ 95. Thus, merely measuring brake pressure will not inform the on/off status of the brake as required by the claims because it will lead to false positives. *Id*. at ¶¶ 94, 95.

PO Resp. 45–46.

Hagenbuch raises concerns about the reliability of using hydraulic pressure sensor to detect brake pedal position, as is disclosed in Aoyanagi, but falls short of asserting that Aoyanagi is beyond the skill of a person of ordinary skill with respect to disclosing how to detect brake pedal position. Also, Hagenbuch fails to acknowledge the fact that no system is absolutely free from breakdown. As far as "reliability" is concerned, we note that the term is relative and subjective, and Hagenbuch has not articulated an objective standard with which to evaluate the issue. On this record, it is sufficient to note simply that Hagenbuch has not made an assertion that Aoyanagi constitutes prior art beyond the skill of an ordinary artisan with regard to detecting the brake pedal position of the vehicle, and that a prior art reference need not disclose the best way to implement a disclosed functionality. It cannot be reasonably disputed that Aoyanagi describes monitoring and recording the brake pedal position of a vehicle. If the described manner of detecting brake pedal position is not satisfactory, for any reason, nothing precludes one with ordinary skill in the art from employing other means or methods within his or her skill to detect brake pedal position. The challenged claims do not require any particular method of detecting the on/off status a vehicle braking system.

Hagenbuch further argues that detecting brake pressure and detecting whether brake system is on/off are different and reflect different species of the status of a braking system. PO Resp. 46. Supposedly, detecting brake pressure allows for detection of the degree of braking, as opposed to just the on/off status of the braking system. It is unclear how that distinction comes to the assistance of Hagenbuch in the circumstances of this case. As we discussed above, it cannot be reasonably disputed that Aoyanagi describes monitoring and recording the brake pedal position of a vehicle. Because on/off status is a binary indicator, the brake pedal position reveals the on/off status of the braking system. Whatever is the detected brake pedal position, it indicates that the brake system is on or off. There is no intermediate status between on and off. Whether the degree of braking also is revealed does not matter.

c) Combining the Teachings of Aoyanagi and Vollmer

We have considered Toyota's rationale for combining the teachings of Vollmer with that of Aoyanagi, and are persuaded thereby, notwithstanding the arguments of Hagenbuch. In light of the teachings of Aoyanagi and Vollmer, one with ordinary skill would have known to incorporate in a data monitoring and recording system such as that of Aoyanagi, which takes certain action with data in case of a crash or accident, an additional step of sending a wireless distress signal in response to detecting a collision, notwithstanding Hagenbuch's contrary arguments.

Hagenbuch notes that Aoyanagi and Vollmer have different functions in that although the purpose of Aoyanagi is to store data to facilitate the investigation of the cause of an accident, the purpose of Vollmer is to automatically transmit a signal in the event of an accident. PO Resp. 40. The argument is misplaced because there is no per se rule in an obviousness analysis that two prior art references which have a different overall purpose or objective cannot, by definition, have teachings which are combinable with each other. It all depends on whether a rationale exists to support a proper combination of the respective teachings.

For a proper rationale to combine teachings to exist, there also is no per se rule that all of the functionalities of the two references must be the same or comparable. Again, it all depends on whether there is a sufficient rationale to support a proper combination of the respective teachings. Consequently, Hagenbuch's noting that Vollmer is not designed to preserve data for collision diagnostics in a manner comparable to Aoyanagi is also misplaced. The focus should be, instead, on the reasonableness of a rationale to combine the teachings.

In an obviousness analysis, it is not necessary to find precise teachings in the prior art directed to the specific subject matter claimed because inferences and creative steps that a person of ordinary skill in the art would employ can be taken into account. *KSR*, 550 U.S. at 418. A basis to combine teachings need not be stated expressly in any prior art reference. *In re Kahn*, 441 F.3d 977, 987-88 (Fed. Cir. 2006). There need only be an articulated reasoning with rational underpinnings to support a motivation to combine teachings. *Id.* at 988.

Toyota's stated rationale does have rational underpinnings and are straightforwardly logical. Vollmer teaches that in case of a crash or accident, sending a wireless distress signal to summon help decreases the time before emergency services are notified, and that automatically sending a distress signal avoids the difficulties a person may have, in case of a crash or accident, in manually making a call. Pet. 13. That purpose and objective, as a motivation to incorporate automatically sending a distress signal in response to detection of a collision, is applicable to any onboard device that detects a collision, such as Aoyanagi's system, regardless of what other functions are performed by the onboard device. In any event, the data monitoring and recording function of Aoyanagi are not unlike those performed by the system of Vollmer. As we have discussed above, Vollmer's distress signal includes monitored information such as the vehicle's position, the number of passengers in the vehicle, the seat positions, speed and deceleration measurements, and whether the vehicle was proceeding against traffic.

d) Combining the Teachings of Aoyanagi and Steiner

We have considered Toyota's rationale for combining the teachings of Steiner with that of Aoyanagi, and are persuaded thereby, notwithstanding the arguments of Hagenbuch. In light of the teachings of Aoyanagi and Steiner, one with ordinary skill would have known to use, in a data monitoring and recording system such as that disclosed in Aoyanagi, a dual memory system for recording data, where the contents of a first overwritable memory are transferred to a second memory in response to detection of a collision.

As discussed above, like Aoyanagi, Steiner discloses a vehicle data monitoring and recording system, which retains monitored vehicle data for subsequent analysis after the occurrence of a collision. Both Aoyanagi and Steiner use a first memory of a certain size, that is continuously overwritable when full, to record vehicle data. Ex. 1103, 72; Ex. 1106, 8:1–9. To prevent overwriting important data that are needed for analysis of an accident, both Aoyanagi and Steiner disclose that in case of an accident, further recording is stopped and the already recorded data is preserved based on predetermined stop conditions. Ex. 1103, 72; Ex. 1106, 5:22–25.

As is pointed out by Toyota (Pet. 13) and not disputed by Hagenbuch (PO Resp. 37), Steiner describes an alternative manner to retain the data already written into the overwritable memory, i.e., copying the contents of the overwritable memory to a separate memory where it would not be overwritten. Ex. 1106, 8:21–30. Hagenbuch argues that Toyota has not shown that the alternative manner of retaining recorded data for subsequent analysis is more preferred than the manner already disclosed in Aoyanagi.

PO Resp. 37–38. Specifically, Hagenbuch argues that copying data from a first memory to a second memory doubles the need for memory and, thus, Toyota has not shown that such doubling of memory requirement would be a preferred way of retaining data relative to the manner of retaining data already disclosed in Aoyanagi. *Id*.

Hagenbuch's arguments are misplaced, as there is no per se rule in an obviousness analysis that an alternative manner of accomplishing an objective must be more preferred in every respect before it has teaching value for consideration. Furthermore, Steiner itself discloses two ways of retaining the recorded data, and, thus, from that perspective, both ways are preferred by Steiner, depending on the circumstance. For instance, stopping further data recording has the advantage of not needing a second memory, but also has the disadvantage that further recording must be stopped. On the other hand, transferring recorded data to a second memory has the disadvantage of requiring a second memory, but also the advantage of not needing to stop further recording into the first memory.

This is not a situation of making a modification solely on the basis that the modification can be made. The prior art specifically calls for transferring content from the first memory as a way, alternative to stopping further recording, to retain the already recorded data in the first memory. For the same reasons that the alternative manner of retaining data is of value in the context of Steiner, it would be of value in the context of Aoyanagi. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. *KSR*, 550 U.S. at 416. In the proposed combination, copying data from the first memory to a permanent memory in response to detection of a collision reflects just such an application of the teachings of Aoyanagi and Steiner. Toyota's contention that transferring recorded data to a second memory was a known and predictable alternative to Aoyanagi's technique of preserving recorded data in the same memory by not overwriting it is supported by the disclosure of Steiner and also by the testimony of David McNamara. Ex. 1110 ¶ 50.

e) Dependent Claim 16

Hagenbuch advances a separate argument for claim 16. Claim 16 depends from claim 15, and further recites: "following detection of a first collision, the production-related parameters are monitored and values of the production-related parameters following detection of a first collision are captured in the first memory." In that connection, Hagenbuch argues:

> Because there is no evidence that the skilled artisan would have implemented the elements required by the dependent claims, in view of additional memory burdens, Petitioner has failed to establish a legitimate reason for the skilled artisan to have designed an EDR/ACN system having such features. *See Winner*, 202 F.3d at 1349.

PO Resp. 49.

The argument is unpersuasive. Steiner specifically describes monitoring and recording vehicle data for a 15 second period after automatic detection of an accident. Ex. 1106, 8:38–43. The feature does not have to be conceived of or designed by one with ordinary skill in the art. It already is described by Steiner. To argue that one with ordinary skill in the art would not have implemented that design because it imposes additional memory requirements also misses the mark. As we discussed above, actual implementation of an embodiment described in the prior art from a practical perspective is not the point, and commercial viability does not control the obviousness determination. *Orthopedic Equip. Co.*, 702 F.2d at 1013. Even if the feature requires usage of additional memory to implement, Steiner discloses the feature. In any event, it appears that no additional memory is required to continue recording after detection of an accident, because both Aoyanagi and Steiner, as described above, use an overwritable first memory for recording, which deletes old data in case there is no more space to write.

f) Secondary Considerations of Nonobviousness

Hagenbuch presents certain evidence of alleged commercial success to be considered along with Petitioner's evidence of obviousness. PO Resp. 50–55. Patent Owner alleges that "the commercial success of the claimed inventions is demonstrated by Toyota's own infringement of at least independent claims 1 and 15 of the '867 Patent." *Id.* at 50. We are not persuaded by Patent Owner's arguments.

At the outset, we note that claim 1 is not involved in this trial, and that even as to claim 15, Hagenbuch has not identified a determination by any judicial tribunal that Toyota has infringed claim 15 of the '867 patent. Toyota also disputes the alleged infringement. Reply 9. On this record, we cannot proceed as though Toyota infringes claim 15 of the '867 patent. In any event, whether or not Toyota infringes claim 15 of the '867 patent, evidence of commercial success and other secondary considerations of nonobviousness are significant only if there is a nexus between them and the claimed invention. *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311–12 (Fed. Cir. 2006).

To show commercial success as an indicator of nonobviousness, Hagenbuch must prove that the sales were a direct result of the unique characteristics of the claimed invention, as opposed to other economic and commercial factors unrelated to the quality of the patented subject matter. *In re Applied Materials, Inc*., 692 F.3d 1289, 1299–1300 (Fed. Cir. 2012). Commercial success is relevant to obviousness only if there is a nexus between the sales and the merits of the claimed invention. *Id*. at 1299. In other words, commercial success is relevant only if it flows from the merits of the claimed invention. *Sjolund v. Muslund*, 847 F.2d 1573, 1582 (Fed. Cir. 1988). Hagenbuch, however, has not provided sufficient proof of such nexus between any alleged sales and the merits of the claimed invention.

For example, any alleged commercial success could be due to the automatic collision notification feature (Toyota's "Safety Connect" system), rather than the other limitations recited in the claims. Hagenbuch does not dispute that automatic collision notification systems were known in the art. PO Resp. 9. If the feature that created the commercial success was known in the prior art, the success is not pertinent to the issue of obviousness. *Galderma Labs., L.P. v. Tolmar, Inc.*, 737 F.3d 731, 740 (Fed. Cir. 2013). In addition, according to Hagenbuch, Toyota's "Safety Connect" system provides "24/7" response in case of an airbag deployment or a severe rear-end collision. PO Resp. 53. Hagenbuch has not accounted for the possibility that the alleged commercial success was based on the provision of "24/7" service from a response center. None of the claims involved in this trial requires "24/7" service from a response center. Objective evidence of nonobviousness must be commensurate in scope with the claims with which the evidence is offered to support. *In re Kulling*, 897 F.2d 1147, 1149

(Fed. Cir. 1990); *In re Lintner*, 458 F.2d 1013, 1015 (CCPA 1972); *In re Tiffin*, 448 F.2d 791, 792 (CCPA 1971) (Evidence directed to cups is not commensurate in scope with claims drawn to containers.). Hagenbuch itself states that it may be that part of Toyota's commercial success is attributable to features that are not claimed by Hagenbuch. PO Resp. 54.

Hagenbuch asserts that it need not negate any possible attribution to unclaimed features, and that commercial success evidence must be considered so long as what was sold is within the scope of the claims. PO Resp. 54. In that regard, it is noted that consideration of evidence does not guarantee a favorable result. We have considered the commercial success evidence presented by Hagenbuch. The evidence provided to show commercial success is weak, not only because of issues relating to nexus but also because of lack of information on sales volume and market share.

Hagenbuch relies on the annual subscription price of Toyota's "Safety Connect" system, $ 139.95, as commercial success. PO Resp. 53. Hagenbuch, however, provides no sales volume information or market share data. In that connection, Hagenbuch makes merely a general assertion: "EDRs have been installed on many (if not all) Toyota vehicles sold in the United States for a substantial period of time." PO Resp. 53. No meaningful information is provided in such a statement. An important component of the commercial success inquiry is determining market share associated with the alleged success, relative to all competing products. *Applied Materials*, 692 F.3d at 1300. Even sales volume, if provided without market share information, is only weak evidence, if any, of commercial success. *Id.* at 1299.

Information based solely on numbers of units sold is insufficient to establish commercial success. *In re Baxter Travenol Labs*, 952 F.2d 388, 392 (Fed. Cir. 1991). Absent comparative sales data such as market share, absolute numbers are not meaningful. *See Vandenberg v. Dairy Equip. Co.*, 740 F.2d 1560, 1567 (Fed. Cir. 1984); *In re Noznick*, 478 F.2d 1260, 1264 (CCPA 1973) ("These crude figures do not indicate whether the sales came at the expense of existing products. They are not related in any way to the total market of dried sour cream or sour cream itself.").

2. Conclusion

We have considered the entirety of the evidence before us, including the evidence of obviousness and the evidence of commercial success submitted by Hagenbuch as an indicia of nonobviousness. On balance, the evidence of obviousness outweighs the evidence of nonobviousness, with respect to each of claims 15–20, 23, and 24. The evidence of obviousness is strong and the evidence of nonobviousness is weak, for the reasons discussed above. All arguments of Hagenbuch have been considered. Toyota has proved, by a preponderance of the evidence, that claims 15–20, 23, and 24 are unpatentable over Aoyanagi, Vollmer, and Steiner.

C. Obviousness of Claims 21 and 22 over Aoyanagi, Vollmer, Steiner, and Fincham

For reasons discussed below, Toyota has not proved, by a preponderance of the evidence, that either claim 21 or claim 22 is unpatentable under 35 U.S.C. § 103, for obviousness over Aoyanagi, Vollmer, Steiner, and Fincham.

Claim 21 depends from claim 17, and claim 17 depends from claim 15. Claim 22 depends from claim 21. Claim 17 adds that the distress signal includes additional information indicating whether aid may be required. Claim 21 recites that the additional information "includes information indicating whether the vehicle has been involved in more than one collision." Claim 22 requires that additional information to include "the number of collisions."

According to Toyota, the acceleration and deceleration data collected by Aoyanagi after an initial collision "would indicate whether the vehicle has been involved in more than one collision." Pet. 45. That assertion is supported by the testimony of David McNamara. Ex. 1110 ¶ 107. We agree with that assertion. With regard to Fincham, which discloses an accident recorder that monitors and records data of accelerometers and other vehicle parameters, Toyota notes that it records data for 30 seconds after an accident, and that that "would be sufficient time for the acceleration and deceleration data to indicate whether the vehicle had been involved in subsequent collisions." Pet. 45. That assertion is supported by the testimony of David McNamara. Ex. 1010 ¶ 107. We agree with that contention. Nevertheless, we are unpersuaded by Toyota's reasoning, reproduced below, as to why it would have been obvious to one with ordinary skill in the art to include such acceleration and deceleration data in the wireless distress signal from the vehicle, to meet the requirement of claim 21.

> It would have been obvious to one of ordinary skill in the art, at the time of the '867 patent's priority date, to further modify Aoyanagi to include in the distress signal information indicating whether the vehicle has been involved in more than one collision, *as taught by Fincham*, in order to inform the authorities that multiple ambulances, tow trucks, police units, etc. will be needed. (Ex. 1110 ¶ 108–11.) This is also

> consistent with Vollmer's stated purpose of including "all important data with respect to the emergency situation." (Ex. 1105, 7:21; Ex. 1110 ¶ 111.) Further, Fincham organizes data for separate accidents separately in memory (Ex. 1108, 137:1:40–42), which advantageously permits the data for different accidents to be analyzed separately. (Ex. 1110 ¶ 111.)

Pet. 46 (emphasis added).

Although the above-quoted text suggests that Fincham describes sending from the vehicle a distress signal that includes acceleration and deceleration information, no citation is provided. Also, although Toyota cites to the testimony of David McNamara for support, paragraphs 108–111 of Mr. McNamara's declaration contain no testimony to the effect that Fincham discloses sending vehicle acceleration and deceleration data in a distress signal. Nor do paragraphs 108–111 of Mr. McNamara's Declaration cite to any portion of Fincham that contains such disclosure. Toyota has not shown that acceleration and deceleration data, either in Aoyanagi or Fincham, is handled in a manner other than stored in memory for later access.

Furthermore, sending acceleration and deceleration data, in an emergency situation, which needs to be further processed and decoded, to arrive at the recognition of whether more than one collision is involved, in order to gauge what type and how much emergency service to send to the scene of the emergency, is illogical. In an emergency situation, the response has to be immediate. It is not rational to send recorded data which has to be analyzed to arrive at the determination of what emergency assistance to send. It is unexplained why rescue facilities would be expected to have the necessary computer resources to decode the acceleration and deceleration data in advance of sending an emergency response. Toyota's explanation does not constitute the articulated reasoning with rational underpinnings required for an obviousness determination. *See In re Kahn*, 441 F.3d at 988.

Toyota's analysis with regard to claim 22 not only does not cure the deficiencies discussed above with regard to claim 21, but adds to the deficiency, because claim 22 is more specific than claim 21 by requiring information on "the number of collisions." All of the issues already discussed with regard to claim 21 still apply. In addition, Toyota relies on the fact that Fincham's accident recorder has the capacity for 5 accident events over a period of 4 weeks to support its position of sending "the number of collisions" for the purpose of obtaining help in an emergency situation. Pet. 46–47. The logic is incongruent, because a multi-collision emergency situation typically does not span 4 weeks, and emergency services would need to have been sent as soon as possible after the first collision, even if there are other collisions later in the 4-week period. Also, none of the references has been shown by Toyota as disclosing specifically calculating or registering "the number of collisions." Vollmer does not disclose sending complex information in a distress signal, such as acceleration and deceleration data that need to be decoded. On this record, Toyota's contention that it would have been obvious for one with ordinary skill in the art to send, specifically, "the number of collisions," is based on inappropriate hindsight in light of the disclosure of the '867 patent.

We have reviewed the Petition, the Patent Owner Response, and Petitioner's Reply, as well as the relevant evidence discussed in those papers. We are not persuaded, by a preponderance of the evidence, that claims 21 and 22 would have been obvious over Aoyanagi, Vollmer, Steiner, and Fincham under 35 U.S.C. § 103.

III. CONCLUSION

Toyota has proved, by a preponderance of the evidence, that claims 15–20, 23, and 24 are unpatentable as obvious over Aoyanagi, Vollmer, and Steiner. Toyota has not, however, proved by a preponderance of the evidence that claims 21 and 22 are unpatentable as obvious over Aoyanagi, Vollmer, Steiner, and Fincham.

This is a final written decision under 35 U.S.C. § 318(a).

IV. ORDER

It is

ORDERED that claims 15–20, 23, and 24 of the '867 patent are *unpatentable*; and

FURTHER ORDERED that parties to the proceeding seeking judicial review of this final written decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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