NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

CARRUM TECHNOLOGIES, LLC,
Appellant

v.

UNIFIED PATENTS, LLC,
Appellee

2020-2204

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2019-00481.

Decided: August 13, 2021

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O'DELL, Dallas, TX; ANGELA OLIVER, Washington, DC; CLINT S. WILKINS, Plano, TX.

Before PROST, SCHALL, and O'MALLEY, *Circuit Judges*.

O'MALLEY, *Circuit Judge*.

Carrum Technologies, LLC ("Carrum") appeals from a final written decision of the Patent Trial and Appeal Board ("Board") holding claims 10 and 11 of U.S. Patent No. 7,925,416 ("the '416 patent") unpatentable over the prior art. *Unified Pats. Inc. v. Carrum Techs., LLC*, No. IPR2019-00481, 2020 WL 4004893 (P.T.A.B. July 15, 2020). For the reasons explained below, we *reverse*.

I. BACKGROUND

The '416 patent is entitled "Automatic Lateral Acceleration Limiting and Non Threat Target Rejection." '416 patent, at [54]. It relates to an adaptive cruise control system that (1) reduces vehicle speed in a turn according to the vehicle's position within the turn and (2) ignores objects detected during the turn that are not in the vehicle's path.[1] *Id.* at [57]. The specification explains that these two features address problems with prior art adaptive cruise control systems. *Id.* at col. 1, l. 64–col. 2, l. 47. Specifically, prior art systems maintain their set speed when the vehicle is in a turn, causing excessive lateral acceleration—i.e., the feeling of being jerked to the outside edge of a car as it is turning—and possible loss of control of the vehicle. *See id.* When the vehicle is in a turn, these prior art systems also

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[1] Basic cruise control systems permit a driver of a vehicle to maintain the vehicle's speed until the driver applies the brakes or turns off the system. '416 patent, col. 1, ll. 18–22. Adaptive cruise control systems incorporate object sensing technology to detect other vehicles and to adjust vehicle speed accordingly. *Id.* at col. 1, ll. 23–33.

respond to objects—e.g., a traffic light, stopped vehicle, or person—outside of the vehicle's path, causing unnecessary braking or speed reduction. *Id.*

The specification describes a relationship between lateral acceleration, a vehicle's speed, and the vehicle's position in a turn. The specification also breaks the curve of a turn into three sections: the entry, middle, and exit sections. *Id.* at col. 5, ll. 33–40. In the entry section, a vehicle's lateral acceleration begins at zero Gs and increases at a steady rate.[2] *Id.* at col. 5, ll. 47–49. In the middle section, the lateral acceleration increases less over time and reaches its maximum. *Id.* at col. 5, ll. 49–53. And in the exit section, the lateral acceleration becomes constant before decreasing back to zero as the vehicle completes the turn. *Id.* at col. 5, ll. 53–55.

Based on these known characteristics, the microprocessor-based controller of the '416 patent's adaptive cruise control system can predict not only whether a vehicle is in a turn but also "the position in which [the vehicle] is located in the turn, e.g., in the entry of a turn, in the middle of a turn, or in the exit of a turn." *Id.* at col. 5, ll. 41–45; *see also id.* at col. 5, ll. 56–67; *id.* at col. 6, ll. 16–24. Once the controller determines (a) that the vehicle is in a turn and (b) where in the turn the vehicle is positioned, it instructs the braking system of the vehicle to reduce preemptively the vehicle's speed. *Id.* at col. 6, ll. 24–27. Preemptively doing so reduces the vehicle's lateral acceleration to a predetermined maximum limit according to the vehicle's position in the turn. *Id.* at col. 6, ll. 27–29.

To ignore detected objects outside a vehicle's path, the '416 patent's system uses the vehicle's lateral acceleration,

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[2] A vehicle experiences a lateral acceleration of zero Gs when it travels, for example, in its lane on a straight highway.

speed, and other data to estimate a path in the vehicle's turn. *Id.* at col. 6, ll. 44–47. The system then marks the path's boundaries and does not brake or reduce speed when a detected object is outside the path's boundaries. *See id.* at col. 6, ll. 47–61.

There are two claims at issue on appeal. Independent claim 10 of the '416 patent recites:

> A system for use in controlling a vehicle at a vehicle speed, said system including:
>
> an adaptive cruise control system;
>
> **a controller** in communication with said adaptive cruise control system and **capable of determining when the vehicle is in a turn, said controller operative to reduce the vehicle speed according to a vehicle position in the turn**;
>
> at least one lateral acceleration sensor for generating a signal corresponding to a vehicle lateral acceleration, said lateral acceleration sensor in electrical communication with said controller and operative to detect a change in the vehicle lateral acceleration;
>
> at least one object detection sensor for detecting an object in a vehicle path of the vehicle during the turn, said object detection sensor in electrical communication with said controller, wherein said controller includes control logic operative to determine whether the object is in the vehicle path during the turn and ignoring the object for braking purposes when the object is not determined to be in the vehicle path.

Id. at col. 8, l. 63–col. 9, l. 15 (emphases added). Claim 11 depends from claim 10 and recites additional limitations not at issue on appeal. As the parties do, we refer to the controller's claimed capability to determine when the

vehicle is in a turn and its claimed operativity to reduce the vehicle speed according to a vehicle position in the turn, emphasized above, as the controller limitation.

Independent claim 1 is not at issue on appeal, but the parties rely on it in their arguments on appeal. It recites "[a] method of controlling a vehicle having an adaptive cruise control system" comprising "determining when the vehicle is in a turn," "determining a vehicle path during the turn," "detecting an object," "determining whether the object is in the vehicle path during the turn," and reducing vehicle speed only if the object is in the vehicle path. *See id.* at col. 8, ll. 7–19.

Only one prior art reference is relevant to this appeal: U.S. Patent No. 5,508,929 ("Harada"). Harada describes a vehicle control apparatus that controls a vehicle's running conditions so that the vehicle reaches the position intended by its driver. J.A. 546 (col. 1, ll. 59–62). Specifically, Harada's electronic control unit ("ECU") determines the vehicle's intended position based on either the angle of the vehicle's steering wheel or front wheels. *Id.* (col. 2, ll. 16–26, 55–58). Harada's ECU also determines the position that the vehicle is estimated to reach based on the running state of the vehicle. *Id.* (col 2, ll. 26–31). If there is a difference between the intended and estimated positions—e.g., the vehicle is slipping in the lateral direction because of an external disturbance like a sudden side wind or an abrupt change of the friction coefficient of the road—Harada's ECU controls a rear-wheel steering actuator or a vehicle-speed changing actuator to reduce the difference to zero. J.A. 546, 548 (col. 2, ll. 44–53; col. 5, ll. 53–58). In this way, Harada enables a driver to more accurately run the vehicle as intended. J.A. 546 (col. 2, ll. 41–44).

According to Harada, its ECU responds in one of three ways based on (a) the magnitude of the difference between the intended lateral displacement, y_1, and the estimated lateral displacement, y_2, and (b) the signs of the lateral

displacements. If the difference is less than a predetermined reference value, like the width of a traffic lane, the ECU takes no action. J.A. 549–50 (col. 8, l. 58–col. 9, l. 2). This is because a driver may find vehicle condition control in these scenarios to be excessive. J.A. 547 (col. 3, ll. 8–11). If the difference is larger than the reference value and the signs of the lateral displacements are the same, the ECU controls the rear wheels of the vehicle. J.A. 550 (col. 9, ll. 3–29). Only if the difference is larger than the reference value and the signs of the lateral displacements are different from each other does Harada's ECU lower vehicle speed. *Id.* (col. 9, ll. 41–51). Harada's ECU lowers vehicle speed in these scenarios to improve driving safety because it estimates the running state of the vehicle to be unstable. *Id.* An example scenario includes when "the vehicle is running in a direction opposite to a direction in which the steering wheel is operated or rotated by the driver, for example, on a snowy or icy road surface." J.A. 551 (col. 11, ll. 42–48).

Unified Patents, LLC ("Unified") petitioned for inter partes review of the '416 patent, and the Board instituted review. In its final written decision, the Board first rejected Carrum's proposed construction that the controller limitation requires a controller that *detects* when a vehicle is in a turn. *Unified*, 2020 WL 4004893, at *5. The Board explained that Carrum's argument conflated "determining" when a vehicle is in a turn, as claimed, with "detecting" when the vehicle is in a turn. *Id.* The Board held that "determining" was broader than "detecting." *See id.*

The Board then held that claims 10 and 11 were obvious over the combination of Harada and two other prior art references. *Id.* at *28. The Board relied on Harada to disclose the controller limitation. *Id.* at *13–17. The Board rejected Carrum's argument that Harada does not disclose determining a vehicle position in a turn or reducing vehicle speed on that basis. *Id.* at *14–16. The Board explained that Carrum misrepresented the controller limitation,

which does not require determining a vehicle position in a turn. *Id.* at *16. The Board further explained that Harada's system detects when a vehicle is in a turn and that Harada discloses reducing vehicle speed. *Id.* The Board finally found that Harada suggests only a preferred alternative but does not criticize, discredit, or otherwise discourage reducing vehicle speed according to a vehicle position in the turn. *Id.* at *17.

Carrum timely appealed to this court. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4)(A).

II. DISCUSSION

We review the Board's legal conclusions *de novo* and its factual findings for substantial evidence. *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355, 1360 (Fed. Cir. 2016). Substantial evidence is such relevant evidence as a reasonable mind might accept as adequate to support a conclusion. *Id.*

Claim construction is a question of law with underlying questions of fact. *Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.*, 853 F.3d 1272, 1278 (Fed. Cir. 2017). Where the intrinsic record fully governs the proper construction of a term, we review the Board's claim construction *de novo*. *Id.*

Obviousness is a question of law based on underlying factual findings. *Donner Tech., LLC v. Pro Stage Gear, LLC*, 979 F.3d 1353, 1359 (Fed. Cir. 2020). These factual inquiries include the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the pertinent art. *Id.*

On appeal, Carrum argues that the Board disregarded the claim element of reducing vehicle speed "according to a vehicle position in the turn." Relatedly, Carrum contends that substantial evidence does not support the Board's

obviousness findings because Harada does not disclose this claim element. We agree on both points.[3]

A. "A Vehicle Position in the Turn"

The controller limitation of claim 10 of the '416 patent requires the controller be "operative to reduce the vehicle speed according to a vehicle position in the turn." '416 patent, col. 9, ll. 1–2. The intrinsic evidence makes clear that the plain and ordinary meaning of "a vehicle position in the turn" is the position of the vehicle along the curve of the turn (and not the position of a vehicle that is turning).

For petitions filed on or after November 13, 2018, like Unified's here, the Board applies the claim construction standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,340–41 (Oct. 11, 2018). Under the *Phillips* standard, claim terms are generally given their ordinary and customary meaning as understood by a skilled artisan when read in the context of the specification and prosecution history. *See Phillips*, 415 F.3d at 1313–14.

The specification is consistent in its disclosure of an adaptive cruise control system that reduces a vehicle's speed in a turn based on where the vehicle is along the curve of the turn. The abstract states that the claimed system and method enable a vehicle with an adaptive cruise control "to reduce its speed in a turn *according to the*

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[3] Because Harada does not teach reducing vehicle speed according to a vehicle position in the turn, when properly construed, we do not need to reach Carrum's other claim construction argument that the controller limitation requires determining a vehicle position in the turn.

vehicle's position within the turn."[4] '416 patent, at [57]. The specification expounds this feature, which purports to address the problem of excessive lateral acceleration in prior art adaptive cruise control systems that maintained their set speed while turning. *See* '416 patent, col. 2, ll. 36–40. The specification describes embodiments of the claimed system and method, which can use known characteristics of a vehicle's lateral acceleration in a curve "to determine the position in which [the vehicle] is located in the turn, e.g., in the entry of a turn, in the middle of a turn, or in the exit of a turn." *Id.* at col. 5, ll. 41–45; *accord id.* at col. 6, ll. 17–29 (describing a preemptive reduction in speed after determining a vehicle's position in the turn by recognizing "patterns exhibited in lateral acceleration data when a vehicle is in the entry of a turn, in the middle of a turn, or exiting a turn"). Indeed, the patent explains in detail the relationship between a vehicle's lateral acceleration and the vehicle's position along a curve.[5] *Id.* at col. 5, ll. 46–64.

Given this intrinsic evidence, we conclude that "a vehicle position in the turn" refers to the position of a vehicle along the curve of the turn. We are unpersuaded by Unified's arguments to the contrary.

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[4] "[I]n determining the scope of a claim, the abstract of a patent is a potentially useful source of intrinsic evidence as to the meaning of a disputed claim term." *Tate Access Floors, Inc. v. Maxcess Techs., Inc.*, 222 F.3d 958, 965 n.2 (Fed. Cir. 2000).

[5] We reject Unified's contention that Carrum's reliance on the "e.g." portion of the specification constitutes an improper attempt to import a limitation of only those three positions into the claim. The Latin abbreviations "e.g." and "i.e." have very different meanings and should not be equated when construing claims.

First, Unified argues that Carrum forfeited and waived its right to seek a construction of "a vehicle position in the turn." According to Unified, Carrum forfeited its new proposed construction on appeal because it presented a different construction—that "determining when the vehicle is in a turn" requires detecting—to the Board. Unified also argues that Carrum waived its new proposed construction on appeal because Carrum purportedly stated in its sur-reply to the Board that the controller limitation required no further construction.

Under the doctrine of forfeiture, we generally do not consider arguments that a party failed to present to the Board. *See In re Watts*, 354 F.3d 1362, 1367–68 (Fed. Cir. 2004); *In re Google Tech. Holdings LLC*, 980 F.3d 858, 862 (Fed. Cir. 2020) ("[F]orfeiture is the failure to make the timely assertion of a right." (quoting *United States v. Olano*, 507 U.S. 725, 733 (1993)). Waiver is the intentional relinquishment or abandonment of a known right. *In re Google Tech.*, 980 F.3d at 862.

We conclude that Carrum did not forfeit or waive its arguments on the proper construction of "a vehicle position in the turn." Unified wrongly compares Carrum's present arguments on "a vehicle position in the turn" to the dispute over the construction of "determining when the vehicle is in a turn" that is not on appeal. Carrum raised its present arguments in connection with the obviousness section of its Patent Owner Response. J.A. 1011, 1014–16. For example, Carrum argues that a skilled artisan would understand Harada to compare intended and estimated lateral displacements at a single point in time during a turn, "*without regard to the vehicle's position (i.e., entry, vertex, or exit) within the turn*." J.A. 1016. In its Reply, Unified characterized this argument as "attempt[ing] to implicitly construe 'position' as limited to a turn's 'entry, vertex, or exit.'" J.A. 1141 (quoting J.A. 1016). Unified argued that claim 10 of the '416 patent "is not so narrow and only requires determining when the vehicle is in a turn and reducing a

vehicle speed." *Id.* The Board agreed with Unified, finding that "Harada discloses reducing vehicle speed" and does not preclude "reducing vehicle speed during a turn." *Unified*, 2020 WL 4004893, at *16. In sum, Carrum presented its arguments about the proper construction of "a vehicle position in the turn," Unified availed itself of the opportunity to respond to those arguments, and the Board agreed with Unified. In doing so, the Board implicitly adopted a construction of the phrase at issue that is inconsistent with the phrase's plain and ordinary meaning when read in light of the specification.

Carrum's sur-reply to the Board is not a waiver of its arguments on the construction of "a vehicle position in the turn." Unified reads Carrum's sur-reply too broadly. Carrum stated only that there was no need for further construction of "a controller . . . capable of determining when the vehicle is in a turn" after (a) Unified admitted that the controller must "have knowledge that the vehicle is turning" and (b) Unified's expert admitted that claim 10 of the '416 patent requires determining when the vehicle is in a turn and operativity to reduce vehicle speed according to the vehicle's position in the turn. J.A. 1288–89. Carrum's statement did not extend to its present arguments on the construction of "a vehicle position in the turn."

Second, Unified argues that the plain meaning of "a vehicle position in the turn" includes "whether a vehicle is in an intended position or not in the turn or a particular location on the path or curve such as the curve's entry or exit." Appellee's Br. 29. According to Unified, claim 10's recitation of "a vehicle path" demonstrates that Carrum knew how to "be specific about the particular path the vehicle is traveling while turning." *Id.* at 30. Unified adds that claim 1 of the '416 patent confirms Carrum knew how to refer to the vehicle's path while turning because the claim recites "determining a vehicle path during the turn," "determining whether the object is in the vehicle path during the turn," "if the object is determined to be in the vehicle path during

the turn," and "if the object is determined not to be in the vehicle path during the turn." *Id.*

Unified's broad reading of the claim phrase is untethered to the specification. As noted, the specification—from the abstract through the description of the invention—uniformly discusses reducing vehicle speed based on the position of the vehicle along the curve of the turn. Unified's reliance on the claims' use of "a vehicle path" is misplaced. Both claim 10 and claim 1 recite "a vehicle path" in the context of solving a different problem with prior art adaptive cruise control systems—the unnecessary braking or speed reduction in response to objects outside of the vehicle's turn path. *See* '416 patent, col. 1, l. 6–col. 2, l. 47. The claimed features of determining a vehicle's path and reducing speed if an object is in that path do not demand a different construction of the controller's operativity to reduce vehicle speed according to a vehicle position in the turn.

Finally, Unified argues that the '416 patent's disclosures are "mere examples" that are not sufficient to redefine the meaning of "position." Appellee's Br. 31. Unified correctly states our law—non-limiting examples are not sufficient to redefine a term to have anything other than its plain and ordinary meaning. *See Ancora Techs., Inc. v. Apple, Inc.*, 744 F.3d 732, 735 (Fed. Cir. 2014). But we reject Unified's premise that Carrum seeks to redefine the phrase at issue. Our construction is the phrase's ordinary and customary meaning, as understood by a skilled artisan when read in the context of the specification. *Phillips*, 415 F.3d at 1313. For these reasons, the Board erred in its implicit interpretation of "a vehicle position in the turn."

B. Obviousness

In view of the proper construction of "a vehicle position in the turn," substantial evidence does not support the Board's finding that Harada teaches the controller limitation. As noted, the controller limitation requires reducing vehicle speed according to the vehicle's position in the turn,

i.e., the position of the vehicle along the curve of the turn. Harada does not disclose this claim element.

Harada teaches reducing vehicle speed based on the "difference between the intended and estimated target positions." J.A. 548 (col. 5, ll. 54–59). Specifically, if the intended and estimated lateral displacements of a vehicle have opposite signs and the magnitude of their difference exceeds a preset reference value, Harada's ECU estimates that the running state of the vehicle is unstable and consequently reduces vehicle speed. J.A. 550 (col. 9, ll. 41–51). These preconditions for reducing vehicle speed may occur on a snowy or icy road surface, when "the vehicle is running in a direction opposite to a direction in which the steering wheel is operated or rotated by the driver." J.A. 551 (col. 11, ll. 42–48). These disclosures do not teach reducing vehicle speed based on where a vehicle is along the curve of a turn—e.g., the beginning, middle, or end of the turn or elsewhere along that curve.

Unified's expert testimony also does not provide the necessary support for the Board's finding that Harada teaches reducing speed according to a vehicle's position in a turn. Instead, Unified's expert asserts, in conclusory fashion, that (a) Harada's comparison of the intended target position and the estimated target position is the claimed vehicle position in the turn and (b) Harada reduces vehicle speed based on this comparison. J.A. 718. This expert opinion is also contrary to our construction of "a vehicle position in the turn" because a comparison of a vehicle's intended position (where a driver wants the vehicle to be) and its estimated position (where the vehicle will be) is not the vehicle's position in a turn (where along the curve the vehicle is).

The Board erred by overlooking this shortcoming in Harada. Indeed, it found only that "Harada discloses reducing vehicle speed" and that Harada does not preclude reducing vehicle speed during a turn. *Unified*, 2020 WL

4004893, at *16. Neither of these findings corresponds to the language of the controller limitation. Harada's disclosure of a system that reduces vehicle speed fails to describe reducing vehicle speed according to a vehicle's position in a turn, as claimed. And the fact that Harada teaches reducing speed even during a turn does not mean that the reference teaches reducing speed because of where the vehicle is along the curve.

We are also unpersuaded by Unified's additional arguments. First, Unified argues that Harada's operation closely corresponds to Carrum's interpretation of its claims in its district court infringement allegations. While it is axiomatic that claims are construed the same way for both invalidity and infringement, *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1330 (Fed. Cir. 2003), a patentee's infringement contentions do not bind our construction of claim terms. Second, Unified argues that Harada does not discourage reducing vehicle speed in a turn. This argument misapprehends the problem with Harada, namely, that the reference fails to teach reducing speed according to a vehicle's position in a turn.

III. CONCLUSION

Reversal is appropriate here because the only permissible factual finding is that Harada does not teach the controller limitation, as properly construed. *See Corning v. Fast Felt Corp.*, 873 F.3d 896, 903 (Fed. Cir. 2017) (reversing where, "[b]ased on the record before us, there is only one permissible factual finding"). Further, while a paucity of analysis in the Board's final written decision commonly results in another opportunity for the Board to explain its decision, we find that the Board's lack of reasoning here on how Harada discloses the reduction of vehicle speed according to a vehicle's position in the turn instead confirms Harada's failure to disclose that element. For the reasons discussed above, we *reverse*.

REVERSED