NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

CARRUM TECHNOLOGIES, LLC,
Plaintiff-Appellant

v.

FORD MOTOR COMPANY, BMW OF NORTH AMERICA, LLC, BMW MANUFACTURING CO., LLC, BAYERISCHE MOTOREN WERKE AG,
Defendants-Appellees

2024-1183, 2024-1480

Appeals from the United States District Court for the District of Delaware in Nos. 1:18-cv-01645-RGA, 1:18-cv-01647-RGA-SRF, Judge Richard G. Andrews.

Decided: October 15, 2025

TAYLOR JAMES KELSON, Bartlit Beck LLP, Denver, CO, argued for plaintiff-appellant. Also represented by ANDREW BAAK, JOHN HUGHES; REBECCA HORWITZ, MARK LESLIE LEVINE, Chicago, IL.

JUSTIN WEINER, Bush Seyferth PLLC, Troy, MI, argued for defendant-appellee Ford Motor Company. Also represented by FRANK C. CIMINO, JR., JONATHAN L. FALKLER,

CHARLES J. MONTERIO, MEGAN S. WOODWORTH, Venable LLP, Washington, DC.

LIONEL M. LAVENUE, Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, Reston, VA, argued for defendants-appellees BMW of North America, LLC, BMW Manufacturing Co., LLC, Bayerische Motoren Werke AG. Also represented by DAVID LEFCOWITZ, BRADFORD C. SCHULZ, DEANNA SMILEY; FORREST ALEXANDER JONES, JOSEPH M. MYLES, Washington, DC; BENJAMIN AARON SAIDMAN, KARA ALLYSE SPECHT, Atlanta, GA.

Before LOURIE, TARANTO, and CUNNINGHAM, *Circuit Judges*.

LOURIE, *Circuit Judge*.

Carrum Technologies, LLC ("Carrum") appeals from two final judgments of the United States District Court for the District of Delaware, which have been consolidated for our review.[1] *See Carrum Techs., LLC v. Ford Motor Co.*, No. 18-cv-1647, 2023 WL 7407778 (D. Del. Nov. 9, 2023) ("*Ford Decision*" or "*Ford*") (granting summary judgment of noninfringement in favor of the Ford Motor Company ("Ford")); *Carrum Techs., LLC v. BMW of N. Am., LLC*, No. C.A. No. 18-cv-1645, 2023 WL 9744835 (D. Del. Dec. 12, 2023) ("*BMW Decision*" or "*BMW*") (ordering claim constructions consistent with the *Ford Decision*). For the following reasons, we *affirm*.

BACKGROUND

At issue on appeal are U.S. Patents 7,512,475 ("the '475 patent") and 7,925,416 ("the '416 patent"). Carrum owns

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[1] *See* ECF No. 16 (consolidating the appeals because the sole issue on appeal from the *BMW Decision* overlaps entirely with one of the two issues from the *Ford Decision*).

both patents, which share a common specification and are generally directed to improving adaptive cruise control ("ACC") performance when a vehicle is in a curve. *See* '475 patent, Abstract; '416 patent, Abstract.

In October 2018, Carrum brought suit against Ford asserting infringement of the '475 and '416 patents. The parties disputed the construction of "a controller" and "said controller" in claims 10, 11, and 12 of the '416 patent. *Ford Decision*, at *3. The parties also disputed the construction of "change in . . . vehicle lateral acceleration" in claim 5 of the '475 patent and claim 6 of the '416 patent, which each depend from independent claims 1 of their respective patents.[2] *Id.* The exemplary claims are as follows:

> 1. A method of controlling a vehicle having an adaptive cruise control system capable of controlling a vehicle speed and obtaining a vehicle lateral acceleration, said method comprising the steps of:

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[2] For the "change" limitation, only claims 5 of the '475 patent and 6 of the '416 patent are at issue on appeal. The Patent Trial and Appeal Board ("PTAB") determined that claim 1 of the '416 patent and claim 1 of the '475 patent are unpatentable during inter partes review. *Unified Pats. Inc. v. Carrum Techs., LLC*, No. IPR2019-00481, 2020 WL 4004893, at *27 (P.T.A.B. July 15, 2020); *BMW of N. Am. v. Carrum Techs., LLC*, No. IPR2019-00903, 2020 WL 6141354, at *9 (P.T.A.B. October 19, 2020). We affirmed the PTAB's Final Written Decision on claim 1 of the '475 patent. *See BMW of N. Am., LLC v. Carrum Techs., LLC*, No. 2021-1435, 2022 WL 378667 (Fed. Cir. Feb. 8, 2022). The Final Written Decision on claim 1 of the '416 patent was not appealed. *See Carrum Techs., LLC v. Unified Pats., LLC*, No. 2020-2204, 2021 WL 3574209, at *2 (Fed. Cir. Aug. 13, 2021) (stating that claim 1 was not at issue in the appeal).

> measuring a lateral acceleration from a lateral acceleration sensor;
>
> detecting a *change in a vehicle lateral acceleration* based on a change in the measured lateral acceleration;
>
> determining when the vehicle is in a turn based on the detected *change in the vehicle lateral acceleration*; and
>
> if a vehicle is in a turn, reducing the vehicle speed according to the determination that the vehicle is in the turn and the detected *change in the vehicle lateral acceleration***.**

'475 patent col. 8 ll. 7–19 (disputed terms emphasized).

> 5. The method of claim 1 wherein said step of reducing the vehicle speed includes a step of reducing the speed if the vehicle lateral acceleration exceeds a predetermined limit.

Id. at col. 8 ll. 32–34.

> 1. A method of controlling a vehicle having an adaptive cruise control system capable of obtaining a vehicle lateral acceleration, said method comprising the steps of:
>
> determining when the vehicle is in a turn based on a detected *change in the vehicle lateral acceleration*;
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> determining a vehicle path during the turn;
>
> detecting an object;
>
> determining whether the object is in the vehicle path during the turn;
>
> reducing the vehicle speed if the object is determined to be in the vehicle path during the turn; and

> ignoring the object for braking purposes if the object is determined not to be in the vehicle path during the turn.

'416 patent col. 8 ll. 7–19 (disputed terms emphasized).

> 6. The method of claim 1, wherein said step of reducing the vehicle speed includes a step of reducing the speed when the vehicle lateral acceleration exceeds a predetermined limit.

Id. at col. 8 ll. 40–42.

> 10. 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; and
>
> 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. 16 (disputed terms emphasized).

In *Ford*, the district court granted summary judgment of noninfringement based on its constructions of the disputed terms. First, applying our reasoning in *Salazar* and *Finjan*, the district court construed "a controller" and "said controller" to "require[] that at least one controller be capable of performing each of the 'said controller' limitations," rejecting an argument that the controller functionality could be distributed among one or more controllers. *Ford Decision*, 2023 WL 7407778 at *5 (citing *Salazar v. AT&T Mobility LLC*, 64 F.4th 1311, 1317 (Fed. Cir. 2023); *Finjan LLC v. SonicWall, Inc.*, 84 F.4th 963, 974 (Fed. Cir. 2023)). In view of its construction, the district court determined that there was "no genuine dispute of material fact on the 'controller' issue" because Ford's accused vehicles do not utilize a single controller that performs all of the claimed functions. *Id.* Accordingly, the district court granted summary judgment of noninfringement of claims 10, 11, and 12 of the '416 patent. *Id.*

Second, relying primarily on intrinsic evidence, the district court construed "change in . . . vehicle lateral acceleration" as "a vehicle lateral acceleration that is different [from] a previous vehicle lateral acceleration." *Id.* at *10 (cleaned up). Based on that construction, the district court determined that there was "no genuine dispute of material fact on the 'change' issue" because Ford's accused vehicles act on a "magnitude" system and thus "do not use a formula that compares one lateral acceleration value with another." *Id.* Accordingly, the district court granted summary judgment of noninfringement of claim 5 of the '475 patent and claim 6 of the '416 patent.[3] *Id.*

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[3] The district court did not grant summary judgment of noninfringement of claims 10–12 of the '416 patent based on its construction of the "change" limitation. *See Ford Decision*, 2023 WL 7407778 at *10. Rather, it did so based

After filing suit against Ford, Carrum brought suit against BMW alleging infringement of the same patents. In *BMW*, the parties agreed that the term "said controller" meant "the same controller as previously referred to in the claim," and the district court adopted that construction. *BMW Decision*, 2023 WL 9744835 at *1. However, the parties disputed four other terms, including the term "change in . . . vehicle lateral acceleration" of claims 1 and 6 of the '416 patent. *Id.* The district court construed that term, consistent with its construction in *Ford*, to mean "a vehicle lateral acceleration that is different [from] a previous vehicle lateral acceleration." *Id.* (cleaned up). Following the district court's claim construction, the parties stipulated to noninfringement of the only remaining asserted claim against BMW, *i.e.*, claim 6 of the '416 patent.[4] J.A. 104–

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only on the "controller" limitation, *see id.* at *5, likely because Ford's summary judgment arguments for claims 10–12 were limited to that "controller" issue, *see* J.A. 1179–82. Post-appellate argument, the parties now dispute via letter whether we can nonetheless affirm the district court's summary judgment of noninfringement of claims 10–12 based on the "change" limitation. *See* ECF No. 73; ECF No. 74. We may not. As noted, the district court did not reach its judgment on that basis, and, in any event, the structure of the "change" term in method claim 6 is different from that of the "change" term in system claims 10–12 of the '416 patent. *Compare* '416 patent col. 8 ll. 10–11 ("determining when the vehicle is in a turn based on a *detected* change in the vehicle lateral acceleration" (emphasis added)), *with id.* at col. 9 ll. 3–7 ("one lateral acceleration sensor . . . *operative to detect* a change in the vehicle lateral acceleration" (emphasis added)).

[4] Carrum reserved the right to challenge the construction of "change in . . . lateral acceleration" on appeal. *BMW Decision*, 2023 WL 9744835 at *1.

110. The district court then granted summary judgment of noninfringement of claim 6 in favor of BMW. J.A. 111.

Carrum timely appealed from the *Ford* and *BMW* decisions. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

DISCUSSION

Carrum challenges the district court's claim constructions. First, Carrum argues that the district court erred by construing "a controller" to require that there be at least one controller that performs each recited function. Carrum Op. Br. 29–39. Second, Carrum contends that the district court erred by construing the "change" term to exclude a change identified by a comparison to a predetermined threshold. *Id.* at 20–29. We discuss each issue in turn.

I

"We review claim construction based on intrinsic evidence de novo and review any findings of fact regarding extrinsic evidence for clear error." *Regeneron Pharms., Inc. v. Mylan Pharms. Inc.*, 130 F.4th 1372, 1378 (Fed. Cir. 2025) (citation omitted). "Claim terms are generally given their plain and ordinary meaning, which is the meaning that one of ordinary skill in the art would ascribe to a term when read in the context of the claims, specification, and prosecution history." *Id.* at 1378–79 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313–17 (Fed. Cir. 2005)).

A

We begin with the construction of "a" and "said" "controller," which only pertains to Ford on appeal. "We have explained that the indefinite article 'a' means 'one or more' in open-ended claims containing the transitional phrase 'comprising.'" *See Salazar*, 64 F.4th at 1315 (cleaned up). We have also explained that "[t]he subsequent use of definite articles 'the' or 'said' in a claim to refer back to the same claim term does not change the general plural rule [of 'a'], but simply reinvokes that non-singular meaning."

Id. (quoting *Baldwin Graphic Sys., Inc. v. Siebert, Inc.*, 512 F.3d 1338, 1342 (Fed. Cir. 2008) (cleaned up)).

While the general rule that "a" means "one or more" leaves open the numerical scope of the limitation, it does not relax the substantive requirement that at least one instantiation of "a" must embody all of its recited functions when the remaining context of the claim so requires. *See In re Varma*, 816 F.3d 1352, 1362 (Fed. Cir. 2016) ("[W]hile 'a' sometimes is non-restrictive as to number, permitting the presence of more than one of the objects following that indefinite article, context matters even as to whether the word has that meaning." (citation omitted)); *see, e.g.*, *Salazar*, 64 F.4th at 1317 (holding that "while the claim term 'a microprocessor' does not require there be only one microprocessor, the subsequent limitations referring back to 'said microprocessor' require that at least one microprocessor be capable of performing each of the claimed functions" due, at least in part, to the structural relationship between the subject "processer" and other structural limitations of the claim).

Thus, "the question is not whether there can be more than one [controller] . . . : there can. Rather, the question is whether 'a' can serve to negate what is required by the language following 'a.'" *In re Varma*, 816 F.3d at 1362–63. Here, the claimed "a controller" is followed by language that operatively ties "said controller" to the claimed "adaptive cruise control system" to perform its multiple recited functions. *See* '416 patent col. 8 l. 66–col. 9 l. 16. Specifically, claim 10 requires a "controller" that is "in communication with" the "adaptive control system" and is (1) "capable of determining when the vehicle is in a turn" and "operative to reduce the vehicle speed," *id.* at col. col. 8 l. 66–col. 9 l. 2, and (2) "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. 9 ll. 12–15.

The "a" before "controller" therefore cannot negate claim 10's other requirements. Rather, because the claim language ties the "controller" to the claimed ACC system, at least one of the one or more controllers must perform each of its recited functions. *See, e.g.*, *Convolve, Inc. v. Compaq Comput. Corp.*, 812 F.3d 1313, 1321 (Fed. Cir. 2016) (holding that at least one claimed "processor" must perform all recited steps, when the claim language required "a processor *associated with* the user interface to issue the shaped commands of the claims," and the user interface was therefore "operatively working with" the same processor to perform all steps (internal quotation omitted and emphasis added)). In short, the required functions of the "controller" follow its tie to the ACC system and become attributes of that controller-ACC combination, not of the system in the abstract.

The specification is consistent with the plain meaning of the claims. In relevant part, it provides:

> Controller 222 may be a portion of a main control unit such as vehicle's 200 main controller, or controller 222 may be a stand-alone controller. Controller 222 contains logic for enabling vehicle 200 to reduce its speed in a turn *as well as* to ignore objects positioned outside of a specific safety zone area.

'416 patent col. 5 ll. 2–7 (emphasis added). In other words, the specification discloses that controller 222 is capable of performing both functions recited by claim 10—reducing vehicle speed in a turn and avoiding objects in the road. *See id.* at col. 9 ll. 1–2, 11–15.[5]

Carrum's arguments to the contrary are misplaced. Carrum misapplies the effect of "said" on the construction

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[5] Figures 3 and 4 illustrate how that process works. *See id.* at col. 5. ll. 9–28.

of "a controller" and overreads the specification to contend that "a" requires that the "controller" functionality is distributed across one or more controllers. *See* Carrum Op. Br. 31–36. Specifically, Carrum argues that the use of "said" merely reinforces the non-singular meaning of "a controller" irrespective of other claim language. *Id.* at 31. But we have rejected a similar argument, explaining that while the use of "'said' . . . reinvokes th[e] non-singular meaning[,]" it "does not negate what is required by the language [that] follows 'said.'" *Salazar*, 64 F.4th at 1318 (citation omitted) (cleaned up). Likewise, here, the use of "said" does not negate the language in claim 10 that follows the use of "said." *See* '416 patent col. 8 l. 66–col. 9 l. 16. That language, as discussed above, operatively ties the "controller" to the ACC system such that the same controller performs its recited functions. *See id.*

Carrum appears to ignore that other claim language accompanying "said," and instead relies on a flawed reading of the specification. That the specification indicates that "controller 222" may be part of "main control unit" does not suggest, let alone require, that claim 10's "controller" functionality is "distributed" across multiple controllers as Carrum contends. *See* Carrum Op. Br. 32–34; '416 patent col. 5 ll. 2–8. Rather, the specification merely discloses a "main control unit" that contains controllers, one of which may be controller 222. '416 patent col. 5 ll. 2–4. Even if controller 222 is part of the "main control unit," that does not mean that controller 222's functionality is distributed among other controllers that are part of the "main control unit" or even that controller 222's functionality is shared among multiple controller 222s.

At most, the specification discloses that multiple controllers may assist in performing the methods of '416 patent. That reading does not conflict with claim 10's plain requirement that at least one of "said controller[(s)]" perform all of its recited functions. Nor can the specification be used to read that plain limitation out of claim 10. *See*

Texas Instruments v. U.S. Int'l Trade Comm'n, 988 F.2d 1165, 1171 (Fed. Cir. 1993) (rejecting a claim construction argument that "would read an express limitation out of the claims . . . because courts can neither broaden nor narrow claims to give the patentee something different than what he has set forth" (cleaned up)).

Finally, Carrum heavily relies on our decision in *01 Communique Lab'y, Inc. v. LogMeIn, Inc.*, 687 F.3d 1292 (Fed. Cir. 2012) to argue "that 'a controller' must mean 'one or more controllers[]' because controllers may be combined or subdivided." Carrum Op. Br. 35–36. But that case is inapposite. Indeed, in *01 Communique* "we concluded that 'a location facility' could 'be distributed among multiple locator server computers.'" *Finjan*, 84 F.4th at 973 (quoting *01 Communique*, 687 F.3d at 1296). But "*01 Communique*" does not answer the relevant question here: "whether the *same* [controller] must perform each of several subsequent claim limitations referring to that [controller]." *Finjan*, 84 F.4th at 975 (emphasis added).

In sum, we agree that the plain language of the claims requires that at least one of the one or more controllers performs all of the controller's recited functions. Accordingly, we also affirm the district court's judgment of noninfringement of the '416 patent in *Ford*.

B

We turn next to the construction of the term "change in . . . vehicle lateral acceleration." Carrum "does not dispute that a 'change in a vehicle lateral acceleration' means 'a vehicle lateral acceleration that is different [from] a previous vehicle lateral acceleration'" as construed by the district court. Carrum Op. Br. 22 (quoting *Ford Decision*, 2023 WL 7407778 at *10) (cleaned up). Rather, Carrum disagrees with the scope that the district court afforded to that construction. It contends that the district court erred by excluding from that construction a particular type of change: "a change identified by comparison to a

predetermined threshold." *Id.* at 20 (cleaned up). Specifically, it argues that "[d]etermining that a value was previously below a predetermined threshold, and is now above that threshold, is simply one way to determine that the value 'is different [from] a previous' value." *Id.* at 22–23 (cleaned up). We disagree.

Step two of exemplary method claim 1 of the '475 patent recites: "detecting a change in a vehicle lateral acceleration based on a change in the measured lateral acceleration." col. 8 ll. 13–14. "Change" as a noun means "the act, process, or result of changing," and the verb "to change" means "to become different." *See change*, Merriam-Webster Dictionary, https://www.merriam-webster.com/dictionary/change (last visited Sept. 30, 2025). Thus, as the district court put it, "in the context of the patents, 'change' indicates that the system detects that a particular lateral acceleration value has *become different* [from] a previous lateral acceleration value." *Ford Decision*, 2023 WL 7407778 at *8 (emphasis added) (cleaned up). The plain meaning of that term, therefore, presumes the obvious: one lateral acceleration cannot "become different" in a vacuum; it must be different from another.

The specification reinforces that plain meaning and further demonstrates that comparing a particular lateral acceleration value to a magnitude (*i.e.*, a predetermined threshold) is not "one way to determine that the value 'is different [from] a previous' value," as Carrum contends. Carrum Op. Br. 22–23 (cleaned up). "The only meaning that matters in claim construction is the meaning in the context of the patent." *Trs. of Columbia Univ. in City of N. Y. v. Symantec Corp.*, 811 F.3d 1359, 1363 (Fed. Cir. 2016) (citations omitted). Here, the specification consistently describes the step of "detecting a change" as comparing two measured acceleration values. The specification does so by repeatedly describing claim 1's requirement of "determining when the vehicle is in a turn based on the detected change in the vehicle lateral acceleration." *See* '475 patent

col. 5 ll. 57–67 (explaining claim 1's requirements in detail); *id.* at col. 8 ll. 15–16 (claim 1 in part). Specifically, the specification describes how to "deduce when *a vehicle is in a turn*" by deriving "*a vehicle's lateral acceleration* in a turn" as follows:

> [T]he following characteristics of a vehicle's lateral acceleration in a turn may be derived: 1) in the entry of a turn, the lateral acceleration of a vehicle is likely to rapidly increase from zero (0) Gs over time; 2) in the middle of a turn, the lateral acceleration of a vehicle is likely to show a constant increase before reaching a maximum value; and 3) in the exit of a turn, the lateral acceleration of a vehicle is likely to remain steady for a short period of time before decreasing. These characteristics may be used to program controller 222 both to deduce when a vehicle is in a turning situation and to determine at what position the vehicle is in within the turn.

'475 patent col. 5 ll. 57–67. The specification therefore "indicates that the 'change' used to determine whether a vehicle is in a turn involves comparing a particular lateral acceleration value to a previous lateral acceleration value," as the district court identified. *Ford Decision*, 2023 WL 7407778 at *9.

Moreover, the only time that the specification mentions comparing a lateral acceleration to a magnitude, or "a predetermined maximum limit," is after the steps described above regarding how to deduce when a vehicle is in a turn and in what position it is in. '475 patent col. 6 ll. 28–29. To be clear, the specification first describes that "controller 222 determines vehicle's 302 position within the turn by using programmed instructions that recognize *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." '475 patent col. 6 ll. 20–24 (emphasis added). The next

sentence of the specification then describes that "*[a]fter* controller 222 determines at step 410 where in turn 306 vehicle 302 is positioned, controller 222 *then* instructs braking system 212 at step 412 to preemptively reduce vehicle's 302 speed so that vehicle's 302 *lateral acceleration* speed is reduced [t]o a *predetermined maximum limit* according to vehicle's 302 position in the turn." *Id.* at col. 6 ll. 24–29 (emphases added).

The specification's description—adjusting a lateral acceleration to a magnitude only after the other steps of detecting when, and where, a vehicle is in a turn based on patterns of lateral acceleration data—is consistent with the language and structure of the claims. Claim 1 requires (1) detecting changes in measured lateral accelerations, (2) determining whether the vehicle is in a turn based on any detected change in lateral acceleration, and (3) reducing the speed if a vehicle is in a turn. *See id.* at col. 8 ll. 11–19. Only once those steps are performed, does dependent claim 5 further require "reducing the speed if the vehicle lateral acceleration exceeds a predetermined limit." *Id.* at col. 8 ll. 33–34. Thus, claim 5's magnitude comparison is not itself a type of "change" in lateral acceleration, but an additional step that governs how the speed-reduction function is carried out.

Because the specification, consistent with the claims, uniformly describes "detecting a change in . . . vehicle lateral acceleration" as a direct comparison of two vehicle lateral accelerations, *see* '475 patent col. 5 ll. 57–67, such description informs the meaning of the claims and excludes a magnitude-based comparison even without any clear disavowal. *See, e.g.*, *Regeneron*, 130 F.4th at 1383 (affirming a narrower construction of a term, despite no clear disavowal, because the claim "arose from a specification that clearly and repeatedly describes [that term]" in a particular manner "and does not explain or suggest" the broader construction argued for (cleaned up)); *see also Sound View Innovations, LLC v. Hulu, LLC*, 33 F.4th 1326, 1333 (Fed.

Cir. 2022) (affirming a construction, at least in part, because "the specification nowhere says that the invention includes use of separate buffers . . ., and it nowhere illustrates or describes such an embodiment"). As such, the claims and specification distinguish a magnitude-based system that merely detects whether a lateral acceleration is above or below a threshold from the claimed system that detects changes from one lateral acceleration to the next.

It is against this backdrop that we consider the prosecution history. During prosecution, the patentee stated that "a change in a variable is not at all the same thing as the magnitude of a variable." J.A. 4038. While this does not resolve the claim construction issue before the court—because the patentee was only arguing that a "magnitude" itself is not a type of "change," not that the scope of the term "change" could not include a comparison of some value to a predetermined magnitude—it nevertheless is consistent with the district court's construction because, as the district court explained, it "supports distinguishing 'change' from 'magnitude.'" *Ford Decision*, 2023 WL 7407778 at *9.

We therefore agree with the district that a "change in . . . vehicle lateral acceleration" means "a vehicle lateral acceleration that is different [from] a previous vehicle lateral acceleration," which excludes a magnitude-based system. *Id.* at *10 (cleaned up). Accordingly, we also affirm the district court's judgments of noninfringement of the '475 and '416 patents in *Ford* and of the '416 patent in *BMW*.

CONCLUSION

We have considered Carrum's remaining arguments and find them unpersuasive. For the foregoing reasons, we *affirm*.

AFFIRMED