

Case IPR2024-00850
U.S. Patent No. 11,472,632

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Exotec Product France SAS,
Exotec North America Inc., and
Exotec Product USA Inc.,
Petitioner

v.

OPEX Corporation,
Patent Owner

Case IPR2024-00850
U.S. Patent No. 11,472,632

OPEX CORPORATION'S
PATENT OWNER SUR-REPLY

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Patent Trial and Appeal Board
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PATENT OWNER'S EXHIBIT LIST

OPEX Exhibit No.	DESCRIPTION
2001	Declaration of Dr. William E. Singhose
2002	Declaration of Goutam Patnaik In Support Of Motion For Admission <i>Pro Hac Vice</i>
2003	Matthew Spenk, Ph.D. <i>Curriculum Vitae</i>
2004	Nagai et al, "Fault-Free Integrity of Urban Driverless Vehicle Navigation with Multi-Sensor Integration: A Case Study in Downtown Chicago" October 2023
2005	Annotated Figure 1 from U.S. Patent Publication No. 2017/0158430 (Raizer)
2006	Deposition Transcript of Matthew Spenko, Ph.D., dated January 23, 2025
2007	Declaration of Dr. William E. Singhose Accompanying POR
2008	Hong et al, "Semi-automated approach to indoor mapping for 3D asbuilt building information modeling" May 2015
2009	Whyte, "Multipath Interference in Indirect Time-of-Flight Depth Sensors" March 2021

All emphasis has been added unless noted otherwise.

I. INTRODUCTION

Petitioner's Reply cites primarily pages 6-9 of their Petition ("Petition") and ¶¶100-116 of Dr. Stephen Derby's declaration in an effort to prove that sufficient motivation to combine *Raizer* and *Hangzhou* was provided. *See generally* Petitioner's Reply to Patent Owner Response, Paper 25 ("Reply"). Petitioner references the same passages in attempting to show that a reasonable expectation of success in making its proffered combination was also provided. *Id.* However, review of the referenced paragraphs reveals Petitioner's showing is insufficient. Petitioner opted to forego the opportunity to submit a supplemental expert report with their reply, instead repeating conclusory statements which the Board should not give any weight. Most significantly, Petitioner fails to provide any evidence supporting their sole motivation to combine the two references, and maintains that they are not required to preserve features essential to *Raizer*'s function in their combination.

A. Petitioner Fails to Provide Sufficient Motivation to Combine

Petitioner still offers no compelling motivations to combine *Raizer* and *Hangzhou*. In Reply, Petitioner relies on the Board's recognition that "Petitioner *contends* that there are various reasons why a skilled artisan would have sought to combine the teachings of *Raizer* and *Hangzhou*." Decision Granting Institution of *Inter Partes* Review, Paper 11 ("Decision"), 27. However, it is well established that

“the obviousness inquiry does not merely ask whether a skilled artisan could combine the references, but instead asks whether ‘they would have been motivated to do so.’” *Adidas AG v. Nike, Inc.*, 963 F.3d 1355, 1359 (Fed. Cir. 2020). Petitioner conflates their assertions that a POSITA would have been **capable** of making a modification with the **reasons why** a POSITA would be motivated to combine *Raizer* and *Hangzhou*. Reply, 1–2.

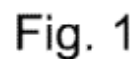
For example, Petitioner asserts that it was well known to elevate shelving units for the purpose of more flexible route planning; this still does not supply a POSITA with a reason to elevate shelving units. Reply, 2. Knowledge of a particular practice does not supply a reason to implement said practice in and of itself. Similarly, Petitioner’s reference to the Decision merely reflects the Board’s acknowledgement of known arrangements, rather than the required motivations to combine. Reply, 4; Decision, 19–20, 27.

Petitioner recites the general objectives of decreasing congestion, avoiding robot collisions, and maximizing space utilization as background design needs that would motivate a POSITA to implement *Hangzhou*’s travel pathways. Reply, 2. Petitioner uses this rationale to justify *Raizer*’s combination with *Hangzhou*, claiming “additional travel pathways are needed as more autonomous robots are added to take advantage of **taller shelving units** due to increased available storage space.” *Id.* However, as OPEX identified in its response, this motivation is

completely absent from Petitioner’s primary reference, *Raizer*. OPEX Corporation’s Patent Owner Response, Paper 16 (“POR”), 32.

In particular, nothing in *Raizer* indicates that the need for additional travel paths would arise in applying its system to tall shelving structures. POR, 32–33. To the contrary, *Raizer*’s system “is designed to ‘plug and play’ in *any warehouse*, integrating with an already in-use facility, shelving system and infrastructure resources of a conventional warehouse.” EX1005 ¶81. As Dr. Singhose explained, “[g]iven that Hangzhou’s trolleys never leave the floor surface to move vertically up the storage shelves, the trolleys clutter up the floor space and suffer from congestion problems *that do not arise in Raizer*.” EX2007, ¶77. Petitioner does not challenge Dr. Singhose’s testimony, nor does Petitioner provide any other evidence indicating taller shelving units were well-known to require additional travel pathways when implemented in conjunction with systems such as *Raizer* and its focus on retrofitting existing systems. *See generally* Petition.

Second, Petitioner has still failed to substantiate their assertions that adding travel pathways beneath racks in *Raizer* would have actually reduced congestion. Dr. Derby’s initial analysis as to additional travel pathways was conclusory at best. EX1003 ¶106. When OPEX asked Dr. Spenko to clarify potential travel pathways in Exotec’s combined system, he produced a figure which indicates that the



EX2005, Figure 1. Finally, Dr. Singhose rebutted Dr. Derby's analysis in subsequent briefing, where he explained that adding travel pathways under racks creates additional congestion problems, as evidenced by the restrictions *Hangzhou*

places on the travel pathways its auto-guided trolleys are permitted to follow. EX2007 ¶¶113-120, EX1006, ¶¶48, 59 (explaining how *Hangzhou* limits its trolleys' paths to avoid collisions). Petitioner has elected to forego submitting subsequent expert declarations, and thus give no substantive response to this analysis, offering only conclusory attorney argument to the contrary. Reply, 3.

Third, Petitioner's arguments as to criticality of choice and design choice are similarly unavailing. Reply, 4–5. The decision in *In re Kuhle* was premised on the fact that the use of spring-loaded contacts was well known in the art. 526 F.2d 553, 555 (C.C.P.A. 1975). As discussed further below, Dr. Singhose provides uncontroverted evidence that accurate automated mapping under low hanging obstacles remains technically challenging to this day. *See infra* Section 3b. Accordingly, the '632 claims' requirement that the vehicles travel under racks cannot be reduced to a mere design choice.

B. Petitioner Fails to Demonstrate a Reasonable Expectation of Success

Petitioner's attempt at clarifying the combination highlights a fundamental oversight left unaddressed in both their original Petition and their Reply.

The straightforward nature of the proposed combination is the epitome of reasonableness—Raizer's robots, which Raizer discloses as being able to navigate anywhere along the floor of a warehouse, with *Hangzhou's* teaching of routing *such robots* under the shelves of the warehouse and across aisles.

Reply, 5–6. This statement takes for granted *Hangzhou*’s applicability to *Raizer*’s robots; a question at the core of the present dispute.¹ OPEX identified several key differences between *Hangzhou*’s trolleys and *Raizer*’s robots that dissuade a POSITA from attempting to combine the references, or that would make this proposed substitution unsuccessful, including cost, complexity, chassis profile, grabbing mechanism, symmetry, sensing capabilities, and path finding algorithms. POR, 40–55. Petitioner does not account for these differences, and consequently, their proposed combination is insufficient to sustain a claim of obviousness.

Nor is it clear how eliminating a fundamental aspect of *Hangzhou*’s two-robot design makes the combination “even more useful,” as Petitioner repeatedly claims. Reply, 6; Petition, 7. To the contrary, this indicates *Hangzhou* teaches *away* from single robot systems, and that a POSITA would *not* have been motivated to combine

¹ Petitioner’s assertion that *Raizer*’s robot could navigate anywhere along the floor of the warehouse is also misleading. *Raizer*’s teaching that its robot “can be steered by its control system to any location on the floor of the warehouse...” is made in the context of *Raizer*’s discussion of its independently operable wheels. EX1005 ¶104. This passage does not relate to OPEX’s argument that *Raizer*’s robots would not have operated beneath shelves because, among other reasons, of the associated *mapping* challenges. See *infra* Section II.C.2.

it with *Raizer*. As Hangzhou itself explains, there are drawbacks to single robot systems it seeks to avoid with its approach. EX1006, ¶¶4–6. This is why *Hangzhou* employs stacking towers and trolleys in the first place; it claims multi-robot systems take advantage of different robots’ individual strengths. EX1006 ¶5. Accordingly, Exotec’s reasoning is unsupported and should not be afforded consideration.

Petitioner’s citation to *KSR Int’l Co. v. Teleflex Inc.* is similarly misplaced. Petitioner claims the combination of *Raizer* and *Hangzhou* would have been obvious to try given the design needs or market pressures in the art and finite number of identified, predictable solutions. Reply, 7–8. But Petitioner fails to present any evidence of design needs, market pressure, or a range of identified solutions, instead offering the same conclusory statements. *Id.* This is the same unsubstantiated motivation repackaged as “obvious to try” support. It fails for the same reasons.

“‘Rejections on obviousness grounds,’ in particular, ‘cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’” *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1359 (Fed. Cir. 2019) quoting *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418. Review of the excerpts that Petitioner references reveals nothing but conclusory statements that Petitioner has failed to substantiate. Petition 6–9; EX1003. As OPEX stated in the POR, the statements

Petitioner relies upon in their Petition and accompanying declaration are the exact hindsight biased conclusory statements *KSR* warns against.

II. PETITIONER FAILS TO REBUT OPEX’S CHALLENGES TO THE COMBINATION

Petitioner does not substantively respond to the majority of OPEX’s arguments regarding *Raizer*’s incompatibility with *Hangzhou*.² Reply, 9–11. OPEX explained in its POR that *Raizer*’s main objective is cost effective retrofitting, and that the potential requirement to install new shelving was simply one of multiple factors that would have dissuaded a POSITA from attempting to combine the references. EX2007, ¶113; POR, 26–28. OPEX acknowledges the Board’s comment that in some cases, “lower shelf elevation is possible.” Decision, 28. OPEX’s point is different, but related. Specifically, as Dr. Singhose explained, elevating existing shelving would have resulted in downtime and decreased warehouse storage density in every instance, running contrary to Petitioner’s claim that the combination would “make more efficient use of space.” EX2007, ¶¶106–109; Petition, 9. Despite its purported focus on the allegedly improved efficiency of

² Petitioner also asserts for the first time in Reply that “elevating the lower shelves would allow more robots to travel vertically to [*sic*] increase warehouse efficiency.” Reply, 9. Petitioner provides no evidence supporting this claim, nor is it readily apparent why this would be the case.

the proposed combination, Petitioner fails to acknowledge or address these drawbacks. Thus, Petitioner fails to show that the proposed combination actually increases the overall efficiency of any particular implementation or installation, because Petitioner fails to balance the purported efficiency improvements of the proposed combination against these and the other efficiency drawbacks inherent in the proposed combination, as described by Dr. Singhose.

Additional factors, including engineering conflicts between the robots, differences in loading mechanisms, and incompatibilities with a lower channel guiding support frame are also left completely unaddressed by Petitioner. POR, 29–39.

A. Petitioner Mistakenly Fixates on Shelf Elevation

OPEX does not claim that including an additional step of elevating shelving to *Raizer*’s system is physically impossible—rather, it is an additional step that would inflate costs, contrary to the express goals of the reference. POR, 31–32. The question of motivation asks whether running robots under shelves *detracts* from *Raizer*’s primary purpose of retrofitting and would thus dissuade a POSITA from making the modification. As noted by Dr. Singhose, *Raizer*’s system is particularly sensitive to expensive or time-consuming modifications because it is designed with retrofitting primarily in mind. EX2007, ¶¶107–111. Petitioner misrepresents Dr. Singhose’s testimony, claiming he recognized shelf height as “freely modified”

during questioning. Reply, 10. Dr. Singhose, however, was asked specifically about designing a warehouse from the *ground up*, and how shelf heights would be determined from the *beginning* of that process. EX1009, 53:14–17. In the context of retrofitting, the shelves already exist, and their heights are pre-established. This does not present a problem for *Raizer* alone, which was designed with this reality in mind, but Exotec’s modified system would require a POSITA installing *Raizer* to additionally check shelf clearances, and potentially halt warehouse operations to modify shelving structure to account for under-shelf transit – again, all contrary to its express goals. EX2007, ¶¶105–112.

The same is true of including *Raizer*’s system in a new warehouse, which *Raizer* notes is possible, but not the “main idea behind” its invention. EX1005, ¶112. Significant to the question of motivation is not whether a reference *could* be modified in some manner, but whether the proposed combination would *interfere* with the reference’s *intended purpose*. *Medtronic, Inc. v. Teleflex Innovations SA RL*, 69 F.4th 1341, 1349–50 (Fed. Cir.2023). Petitioner does not address this central point in Reply.

B. *Hangzhou* Teaches Away From Combinations With Single-Robot Systems

“A prior art reference is said to teach away from the claimed invention if a skilled artisan upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path

that was taken in the claim.” *AstraZeneca AB v. Mylan Pharm. Inc.*, 19 F.4th 1325, 1337 (Fed. Cir. 2021). Here, as Dr. Singhose identified in his declaration, *Hangzhou* leads a POSITA in a direction towards a two-robot combination (one for on the ground, one to climb vertically) rather than the single-robot approach in the ’632 Patent. EX2007 ¶102.

Petitioner, in their eagerness to accuse OPEX of misleading the Board, misreads the fourth paragraph of *Hangzhou*, claiming that “*Hangzhou* identifies drawbacks that are specific to two distinct single-type mobile robot systems and does not criticize single-type mobile robot systems as a class.” Reply, 12 (emphasis in original). This is simply not the case. For clarity, the relevant portion of *Hangzhou* is reproduced below.

The solution adopting single-type mobile robots is advantaged by easy modularization and standardization, so that a faulty device unit can be replaced quickly. Amazon’s Kiva robot system is a **typical example**.

Ex. 1006, ¶4.

Petitioner then tallies the various numbers of multi-robot examples that *Hangzhou* criticizes, claiming that it offers more critique towards two-robot systems than single robot systems, and therefore does not teach away from single-robot references. Reply, 12. However, *Hangzhou* does not identify a multi-type robot solution as a representative example as it does with the single-robot Amazon Kiva

system. More importantly, *Hangzhou* implements a multi-robot system approach after explicitly categorizing the solutions available in the art as “a single type mobile solution and a multiple type robot collaboration solution”; therefore, *Hangzhou* expresses a preference for and teaches towards a multi-robot solution over a single-type solution. EX1006, ¶3.³

C. Purported Shared Goals of *Raizer* and *Hangzhou* Are Not Based On Evidence

Despite generic recitations of “efficiency,” Petitioner still fails to show sufficient common goals in the art that would have motivated a POSITA to combine *Raizer* and *Hangzhou*. In an effort to show a commonality between the references, Petitioner misquotes the text of the prior art as well as the Board’s institution decision.

First, Petitioner cites a paragraph of *Raizer*’s specification which mentions congestion in the context of integration between *Raizer*’s robots and other, non-

³ *Hangzhou* also identifies US9550624, a patent that teaches a single robot system that makes use of a robotic arm. Contrary to Petitioner’s accusations of cherry-picking, *Raizer*’s attachment arms create the same design issues as in US6550624 (*i.e.*, limited pickup range, low load capacity, and high cost). Reply, 11; EX1006, ¶5; POR, 38, 40. Again, *Hangzhou* chooses not to use a robot system with such a robotic arm, and its identified issues.

Raizer, IoT enabled devices, a concept wholly unrelated to Petitioner’s proposed combination. Reply, 13 *citing* EX1005 ¶98. Second, Petitioner cites a paragraph of *Hangzhou*’s discussion of its dispatch algorithm, attempting to show similarities in objectives with *Raizer*. Reply, 13 *citing* EX1006, ¶76. Neither of these citations demonstrates that either reference has identified “reducing congestion” and “avoiding traffic jams” as express objectives. Indeed, these goals have been inserted by Petitioner.

Finally, Petitioner argues that the Board has already recognized that *Raizer* and *Hangzhou* share goals—this is not the case. Reply, 13. The Board’s institution decision simply rejected the characterization of *Raizer* and *Hangzhou* as “fundamentally different” based on the fact that both are autonomous, robot-based warehousing technologies. Decision, 23. However, this does not translate into a “shared goal,” as Petitioner now suggests. Reply, 13. The congestion and traffic jam issues identified by Petitioner have no basis in either *Raizer* or *Hangzhou*, nor has the Board recognized such “goals” as common to the two references. To be clear: OPEX’s challenge to Petitioner’s articulated motivation to combine does not rely on a fundamental difference between the references, but a failure on Petitioner’s part to sufficiently justify the references’ combination for the suggested purpose, including a failure to overcome *Hangzhou*’s teaching away from the system Petitioner is attempting to create.

1. Proprietary Software Would Have Dissuaded Combination

Petitioner's rebuttal to OPEX's arguments as to proprietary components are unavailing. First, OPEX does not contend that basic movement code would have been beyond the capacity of a POSITA at the time. Rather, essential functions in *Raizer* that Petitioner relies upon to meet the '632 Patent's claim limitations (*e.g.*, driving or picking up boxes), are contingent upon successful execution of **complex** behavior (*e.g.*, mapping or the specified anchor point navigation), which explicitly requires proprietary software. EX1005, ¶¶32, 77, 84, 89, 137. Dr. Singhose noted that recreating such software would be beyond the skill of a POSITA. EX1009, 70:10–72:2. Petitioner does not advocate for a combination that replaces this proprietary software; as such the combination must rise and fall with the grounds presented by Petitioner. *SAS Inst., Inc. v. Iancu*, 584 U.S. 357, 365 (2018) (finding that Petitioner's contentions define the scope of the litigation from institution to conclusion).

Contrary to Petitioner's assertions, there is record evidence to support that 'proprietary' means 'secret' in the context of the art. Specifically, in Dr. Singhose's deposition, he testified:

Q: So – so what does proprietary software entail to you?

A: Well, proprietary software would be software that a company develops essentially in secret and puts in some useful or unusual

operations that nobody else has, so they can ... sell it for money because you've done something that nobody else has done...

Q: So – so a piece of software has to be both secret and not changeable to be proprietary?

A: Yeah. I mean, it's not changeable

EX1009, 65:5–11, 68:9–11. Additionally, OPEX is not advocating that “prior art descriptions of software *considered by its owner* as proprietary” ought to be exempt from obviousness determinations, as Petitioner asserts. Reply, 17. Rather, because of *Raizer*’s explicit (and unique) disclosure in its specification that the functions of initial mapping and subsequent “Fine Positioning” is performed via proprietary software, a POSITA would be unable to modify that software to direct the robot to map under shelves or engage in “Fine Positioning,” as Petitioner’s combined system would require since it is using *Raizer*’s robots. EX1005, ¶¶84; EX2007, ¶¶142–143. Petitioner underestimates or downplays the level of difficulty inherent in its combined system, oversimplifying what would be needed to make it work as intended, and overlooking the reality of combining the references.

Petitioner takes issue with OPEX’s citation to *N. Telecom, Inc. v. Datapoint Corp.* 908 F.2d 931, 936 (Fed. Cir. 1990) based on the fact that the Court there held that classified confidential information does not qualify as a prior printed publication. The parallel drawn by OPEX in its POR was specifically to demonstrate

that proprietary code would, like confidential documents, not be deemed “generally available,” and would thus impede a POSITA attempting to modify the teachings of *Raizer* and its proprietary software. POR, 47.

By contrast, *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1570 (Fed. Cir. 1997), is less applicable in the instant case. In *Lockwood*, the Federal Circuit determined that a ***publicly used system*** sufficiently disclosed the claimed limitations of the invalidated patent in combination with other paper art. No system art can be submitted before the Board; in order to even contend with such an argument, evidence of public use and knowledge of system art would be required. “American’s public use of the high-level aspects of the SABRE system was enough to place the *claimed* features of the ’359 patent in the public’s possession.” *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1570 (Fed. Cir. 1997) (emphasis in original). Importantly, because *Raizer*’s robot routing is proprietary-software-dependent, Petitioner’s suggested combination would not only require practicing the proprietary software-dependent functions, but would also require ***modifying said proprietary software*** to meet claim limitations. As such, *Lockwood*’s reasoning is not applicable to Petitioner’s proposed combination.

To clarify, the Federal Circuit has held “if an obviousness case is based on a non-self-enabled reference, and no other prior art reference or evidence would have enabled a skilled artisan to make the claimed invention, then the invention cannot be

said to have been obvious.” *Raytheon Techs. Corp. v. Gen. Elec. Co.*, 993 F.3d 1374, 1377 (Fed. Cir. 2021). As explained in Dr. Singhose’s declaration and deposition, a POSITA would need access to this proprietary software to successfully practice the teachings of *Raizer*. EX1009, 64:15–65:2; EX2007, ¶¶144–151. Petitioner has provided no record evidence that indicates a POSITA would have been capable of obtaining, much less modifying, *Raizer*’s proprietary software. Accordingly, because no evidence of record demonstrates that a POSITA would have been enabled to make the proposed combination, it is non-obvious. POR, ¶¶47–48.

2. Petitioner Ignores Multipath Effects During Mapping

Despite the opportunity to submit supplemental expert testimony and evidence to contend with the multipath issues outlined by OPEX, Petitioner instead attempts to dismiss the technological hurdles of multipath effects during robot-based mapping with attorney argument. Petitioner claims that OPEX did not provide any evidence of robot mapping existing as a technology distinct from collision detection. Reply, 18. This is simply untrue. Not only did Dr. Singhose provide citations to publications in the field and his own teaching experience in demonstrating the challenges in mapping technology, but *Raizer* itself explicitly discloses a “survey mode” that records a mapping survey. EX1005, ¶84; EX2007, ¶¶90, 151–162.

Petitioner misrepresents Dr. Singhose’s testimony, claiming he does not explain why automated mapping breaks down near obstacles. Reply, 18. Dr.

Singhose, however, thoroughly sets forth in his declaration that *multipath effects* are responsible for mapping challenges when robots approach obstacles, particularly low-hanging overhead obstacles. EX2007 ¶¶151–162. Petitioner asked Dr. Singhose about multipath effects in his deposition, where he provided a fulsome response, engaging in a detailed discussion as to which multipath effects would be relevant in certain configurations of obstacles, and annotating several diagrams representing multipath effects near objects. EX1009, 74:4–133:4.

Petitioner further alleges that Dr. Singhose fails to acknowledge multipath effects during collision detection. Reply, 19. As noted before, this is not the case. For example, when discussing multipath effects common to both *Raizer* and commercially available cleaning robots, Dr Singhose testified as follows:

Q So in operating -- after we have the map, when the robot is in operating mode, is the -- are multipath effects a problem?

A No. The multipath effect I'm talking about is the multipath effect during mapping. So their question is I'm done with mapping; is there multipath effects? Not the ones I'm talking about.

There are -- if you used an emitt[r] detector sensor to operate during the obstacle detection, you would get -- you would have those kind of multipath effects still, but that would be for the application of detecting obstacles, not for the application of mapping.

EX1009, 91:20–92:11. Dr. Singhose then explained that other types of sensors which are not susceptible to multipath effects (but cannot map) are typically used for obstacle detection. EX1009, 92:22–93:22. Finally, OPEX, contrary to Petitioner’s characterizations, has not taken the position that multipath effects exist only under shelves. Reply, 19. Rather, as Dr. Singhose explained, multipath effects exist in aisles as well, but they become prohibitively complex so as to prevent effective mapping beneath shelves. EX1009, 77:5–80:20.

a. Petitioner’s Combined System Cannot Operate Without Survey Mode

Petitioner correctly recites the legal standard that the reasonable expectation requirement only extends to claimed limitations. But Petitioner ignores that the claims of the ’632 patent require a robot capable of driving to and under racks, which OPEX and Dr. Singhose have shown cannot be met with the proposed combination. POR, 47–48.

Petitioner further misconstrues Dr. Singhose’s testimony to assert that the ’632 Patent performs mapping in some other “presumably well-known” manner. Reply, 21. This is not the case -- Dr. Singhose cabined his testimony to the claim that the ’632 Patent does not require or disclose a survey function to operate, and

navigates via alternate means. EX1009, 141:2–142:18.⁴ Looking directly to the specification of the '632 patent, it offers multiple real-time navigational solutions that would not suffer from multipath effects, such as scanning laser triangulation or onboard dead reckoning. EX1001, 11:53–13:33. Crucially, nothing in the '632 Patent requires an initial mapping step to meet its claim limitations, while Petitioner's proposed combination *must* rely on *Raizer's* (proprietary) mapping process in order to function.

As such, the reasonable expectation of success analysis applies and Petitioner impermissibly proposes a combination that would render the system inoperable for its intended use. *See Medtronic, Inc. v. Teleflex Innovations SARL*, 69 F.4th 1341, 1349–50 (Fed. Cir. 2023). Indeed, as noted by Dr. Singhose, “The *Raizer* prior art

⁴ Misunderstanding Dr. Singhose's comments as to the mapping capabilities of iRobot and SharkNinja, Petitioner is “at a loss to explain how highly successful products somehow evidence an insurmountable inability of a robot to perform mapping functions.” Reply, 21. Dr. Singhose provided these examples of sophisticated companies employing teams of robotics experts to solve multipathing problems beneath low hanging obstacles in order to demonstrate that such technical barriers are not easy to overcome, as evidenced by these products' experienced difficulties in mapping in such conditions.

needs to do the survey mode where it goes around and creates a map ...” EX1009, 140:3–5. Therefore, a POSITA would not have had a reasonable expectation of success in making the modification.

b. Petitioner Does Not Understand Survey Mode

Petitioner goes on to contend that OPEX’s arguments as to surveying are premised on a single sentence in *Raizer*. Reply, 22. First, Petitioner identifies the exact passage in *Raizer* that teaches “Survey mode”, contradicting Exotec’s earlier assessment that “OPEX invent[s] a robot operating distinction not taught by *Raizer*.” Reply, 18, 22. Furthermore, the proprietary “survey” and “Fine Positioning” algorithms in *Raizer* are pervasive throughout its specification. EX1005, ¶¶32, 77, 84, 89, 137. Indeed, the “Fine Positioning” process is used *anytime Raizer’s robot picks up a box*, and the system has *no alternative means of determining the warehouse’s layout* other than through its “survey.” *Id.* at ¶¶77, 84, 133. Petitioner’s attempt to dismiss these features as a “single sentence in *Raizer*” demonstrates a misunderstanding of the technological background and its accompanying complexities. Reply, 22. Furthermore, OPEX has provided ample supplemental record evidence as to the prevalence of multipath effects during automated mapping. EX2007, ¶¶90, 151–162.

Second, the conclusion that the map is recorded by the robot’s sensors during survey mode is both supported by said record evidence as well as a plain reading of

the specification. Indeed, *Raizer* describes the mapping survey as “recorded” by a survey mode. EX1005, ¶84. This stands in contrast to Petitioner’s assertions that survey mode does not require the use of sensors, and could instead mean that *Raizer*’s robots are coded with a pre-loaded map.⁵ Not only are these positions facially untenable, they are also contradicted by the testimony of Petitioner’s own expert:

Q: When I see that description, especially with respect to survey mode, it sounds like to me Raizer is using the robots to go out and kind of map the area.

A: That’s a fair assessment.

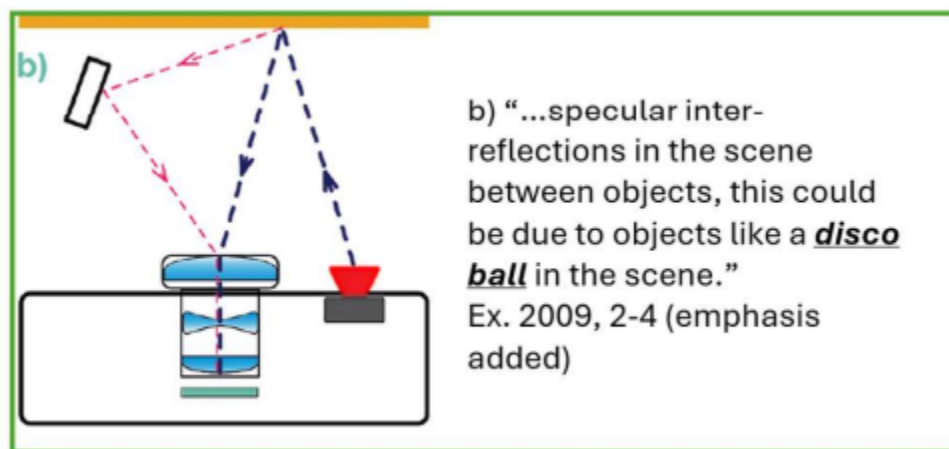
EX2006, 62:6–10. Petitioner references Dr. Spenko’s testimony as it pertains to mapping, claiming he confirmed mapping is not an insurmountable task. Reply, 22 *citing* EX2006, 86:16–87:15. But Dr. Spenko’s conclusory assertion—“I think a person of ordinary skill in the art sees this and is like all right, well, create a map. Like, done. Not an issue.”—ought not be given any weight, as he did not provide a single example of how such a map would be created or what method a POSITA

⁵ Petitioner further asserts that the software being *loaded* onto the robots supports this reading of the text. Reply, 22. This makes no sense. Any software responsible for autonomous operation would necessarily be *loaded* onto the robots at some point.

would use to create such a map. Indeed, Exotec's expert's conclusory and unsupported assessment of what was needed stands in stark contrast to the examples and record evidence provided in Dr. Singhose's declaration. EX2007, ¶¶90, 151–162.

c. Multipath Effects are Not Easily Mitigated

Petitioner argues the exemplary multipath cases Dr. Singhose identified as prevalent in warehouse environments are routinely and simply addressed by a POSITA. Reply, 22–23. EX2009, 3-4. Again, Petitioner does not accurately recount Dr. Singhose's testimony.

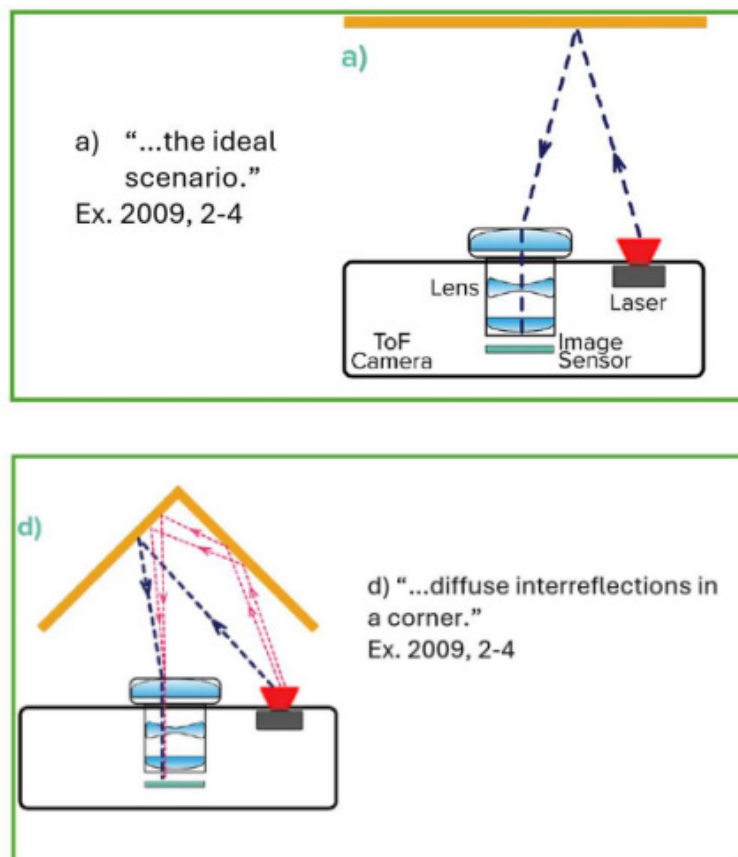


EX2009, 3-4(b) (annotated by Petitioner)(excerpted). Petitioner first asserts that Dr. Singhose confirmed, with respect to scenario (b) above, that a POSITA could simply deploy "less reflective surfaces" beneath shelves to avoid multipath interference. Dr. Singhose was clear in his testimony, excerpted below, that a POSITA would be unable to get rid of reflection paths from shelf bottoms.

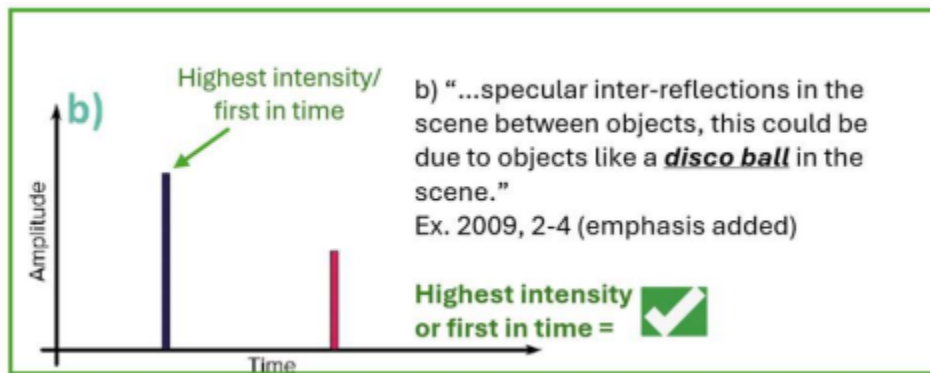
Q: Could you use a nonreflective surface for the bottom of the shelf?

A: Well, there is no such thing as a nonreflective surface, you know, totally, but certainly you could apply coatings or paints or -- you could try all sorts of stuff to reduce the reflection path, but there's no way to get rid of it.

EX1009, 103:3–10. Furthermore, Dr. Singhose repeatedly clarified that the ideal scenario portrayed by case (a) was rare, while scenarios (b) and (d) would have been common and inevitable in warehouse environments. *Id.*, 104:5–105:4.



EX2009, 3-4(a), 3-4(d) (annotated by Petitioner) (excerpted). Petitioner similarly misconstrues Dr. Singhose's testimony with respect to the received amplitude over time scenarios reproduced below in EX2009, 5.



representations do not capture the full scope of the interference effects created by obstacles in warehouses. EX1009, 112:6–13.

In summary, all record evidence points to the fact that multipath effects are complex, persistent, and create technical difficulties for mapping under shelves, which is required by Petitioner’s combination. Notably, despite the opportunity to do so, Petitioner fails to provide exemplary evidence of whether or how a POSITA could solve multipath effects in such contexts, or provide any other substantive evidence supporting their attorney argument.

III. PETITIONER FAILS TO SUFFICIENTLY DETAIL HOW THE DEPENDENT CLAIM LIMITATIONS ARE MET

A. Claim 5

Petitioner fails to identify disclosures in either *Raizer* or *Hangzhou* that would render Claim 5 obvious. Reply, 27. Neither *Raizer* nor *Hangzhou* teach how far a robot’s path must be from the shelves’ vertical posts. *See generally* EX1005, EX1006. Petitioner attempts to infer from *Hangzhou*’s disclosures that (1) its trolleys’ diameter is less than the short side of the channel support frame, and (2) that its trolleys turn 90° in place, that the combined system must be capable of “driving the vehicle along a path spaced apart from the vertical posts by *a distance greater the half the length of the vehicle.*” Reply, 27; EX1001 25:57–63.

Petitioner continues to overlook that *Hangzhou*’s trolleys’ ability to turn in place without hitting vertical posts is a consequence of their symmetrical layout.

EX1006, ¶48. Petitioner claims their combination does not utilize *Hangzhou*'s trolleys, but Petitioner does not account for *Raizer*'s robots' profile in their proposed system. Reply, 27. Furthermore, even if *Raizer*'s robot was run along a travel path disclosed in *Hangzhou*, the limitation would not necessarily be met, because Exotec itself argues that *Raizer* is longer than it is wide. Reply, 26–27. Petitioner's proposed combination contains no additional details regarding the width of the travel pathways relative to the robot's dimensions, and thus, Petitioner fails to show this limitation is obvious.

B. Claims 8 and 9

Petitioner reaffirms that they do not rely on *Hangzhou*'s robots to meet the limitations of claims 8 and 9, but they continue to rely on functionality specific to *Hangzhou*'s robots without explaining how a POSITA would modify *Raizer* to accommodate such functionality. Reply, 28; Petition, 7.

C. The Remaining Challenged Claims

Given the remaining challenged claims are dependent on claim 1, their non-obviousness follows from the arguments above.

IV. CONCLUSION

For the reasons set forth above, the Board should find the challenged claims 1, 3-12, 14, and 23-27 patentable.

Case IPR2024-00850
U.S. Patent No. 11,472,632
Dated: June 18, 2025

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Case IPR2024-00850
U.S. Patent No. 11,472,632

CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

I hereby certify that this Patent Owner's Response, excluding the portions exempted under 37 C.F.R. § 42.24(a), has 5,460 words as counted by the word-processing system used to prepare this document, in compliance with 37 C.F.R. §42.24(d).

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that a complete copy of the foregoing, Patent Owner's Sur-Reply was caused to be served on counsel of record for Petitioner by filing this document through P-TACTS and by sending this document via electronic mail to the following addresses:

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