

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHARKNINJA OPERATING LLC,
SHARKNINJA MANAGEMENT LLC, and
SHARKNINJA SALES COMPANY

Petitioners,

v.

IROBOT CORPORATION,

Patent Owner

Case IPR2020-00734
Patent 9,921,586

**PATENT OWNER'S
NOTICE OF APPEAL**

Pursuant to 28 U.S.C. §§ 141(c) and 319, and 37 C.F.R § 90.2(a), notice is hereby given that Patent Owner iRobot Corporation (“iRobot”) hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision entered on October 4, 2021 (Paper 34), and from all underlying orders, decisions, rulings and opinions that are adverse to iRobot. This appeal is timely under 35 U.S.C. § 142, 37 C.F.R. § 90.3, and Rule 15(a)(1) of the Federal Rules of Appellate Procedure.

In accordance with 37 C.F.R § 90.2(a)(3)(ii), the expected issues on appeal include, but are not necessarily limited to:

- (1) The Board’s decision that claims 8, 10, and 13 of U.S. Patent No. 9,921,586 were shown to be unpatentable as obvious in view of the cited prior art;
- (2) the Board’s interpretation of the limitation “user-selected command to initiate an area rug cleaning operation” in claim 13 and its application of that construction to the prior art, including at least the Board’s holding that a “command to initiate an ... operation” includes setting a mode that only later may cause the operation actually to be performed;
- (3) the Board’s determination that the subject matter disclosed by Japanese Patent Application Publication No. 2002-85305 (“Toshiba”), combined

- as described in the Final Written Decision with U.S. Patent Application Publication No. 2002/0156556 (“Ruffner ’556”) and German Patent Publication No. DE10113105 (“Köchel”), satisfies the “user-selected command to initiate an area rug cleaning operation” limitation;
- (4) the Board’s reliance on Toshiba’s “motion command” to satisfy the “user-selected command to initiate an area rug cleaning operation” limitation, despite Petitioners’ failure to rely on Toshiba’s “motion command” for that limitation in the Petition, and the Board’s failure to provide iRobot with adequate notice and opportunity to respond before doing so;
- (5) the Board’s interpretation of “navigate . . . about the home based on a location of the autonomous robotic cleaning device relative to the points” in claim 10 and its application of that construction to the prior art, including at least the Board’s refusal to construe the claim language, and the Board’s implicit assumption that a device determining its position in a room inherently includes navigating based on its location relative to visible points on wall surfaces;
- (6) the Board’s reliance on conclusory and insufficient expert testimony;
- (7) the Board’s interpretation of the prior art;

- (8) the Board's legal errors in undertaking the aforementioned anticipation and obviousness analyses;
- (9) the Board's findings that conflict with the evidence of record or are that are otherwise not supported by substantial evidence;
- (10) the Board's failure to consider evidence of record fully and properly;
and
- (11) all other issues decided adversely to iRobot in any orders, decisions, rulings, and opinions underlying or supporting the Final Written Decision.

Per 35 U.S.C. § 142 and 37 C.F.R. § 90.2(a)(1), this notice is being filed with the Director of the U.S. Patent and Trademark Office, and a copy is also being filed electronically with the Patent Trial and Appeal Board. Per Federal Circuit Rule 15(a)(1) and 37 C.F.R. 90.2(a)(2), Petitioner is also submitting a copy of this Notice of Appeal, along with the required docketing fee set forth in Federal Circuit Rule 42, to the Clerk of the United States Court of Appeals for the Federal Circuit.

Respectfully submitted,

Date: December 6, 2021

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CERTIFICATE OF SERVICE

In accordance with 37 CFR § 90.2(a)(1) and § 104.2, I hereby certify that on December 6, 2021, in addition to being filed electronically through the Board's E2E System, the original version of the foregoing, Patent Owner's Notice of Appeal was filed by hand on the Director of the United States Patent and Trademark Office, at the following address:

Director of the United States Patent and Trademark Office
c/o Office of the General Counsel
Madison Building East, 10B20
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CERTIFICATE OF SERVICE

I hereby certify that on December 6, 2021, a true and correct copy of the foregoing, Patent Owner's Notice of Appeal, along with a copy of the Final Written Decision, was filed electronically with the Clerk's Office of the United States Court of Appeals for the Federal Circuit, at the following address:

United States Court of Appeals for the Federal Circuit
717 Madison Place, N.W., Suite 401
Washington, DC 20005

CERTIFICATE OF SERVICE

Pursuant to 37 CFR § 42.6(e)(1), the undersigned certifies that on December 6, 2021, a complete and entire copy of this Patent Owner's Notice of Appeal was provided via email, to the Petitioner by serving the email correspondence addresses of record as follows:

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

SHARKNINJA OPERATING LLC,
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Petitioner,

v.

IROBOT CORPORATION,
Patent Owner.

IPR2020-00734
Patent 9,921,586 B2

Before TERRENCE W. McMILLIN, AMANDA F. WIEKER, and
JASON W. MELVIN, *Administrative Patent Judges*.

MELVIN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

SharkNinja Operating LLC, SharkNinja Management LLC, and SharkNinja Sales Company (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting institution of *inter partes* review of claims 1–19 of U.S. Patent No. 9,921,586 B2 (Ex. 1001, “the ’586 patent”). iRobot Corporation (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). After our email authorization, Petitioner filed a Preliminary Reply (Paper 7) and Patent Owner filed a Preliminary Sur-Reply (Paper 9). We instituted review. Paper 11 (“Institution Decision” or “Inst.”).

Patent Owner filed a Response. Paper 19 (“PO Resp.”). Petitioner filed a Reply. Paper 23 (“Pet. Reply”). Patent Owner filed a Sur-Reply. Paper 28 (“PO Sur-Reply”). We held a hearing on July 12, 2021, and a transcript appears in the record. Paper 33 (“Tr.”).

This is a final written decision as to the patentability of the challenged claims. For the reasons discussed below, we determine Petitioner has shown by a preponderance of the evidence that claims 8, 10, and 13 are unpatentable, and has not shown by a preponderance of the evidence that claims 14–16 are unpatentable.¹

A. RELATED MATTERS

The parties identify the following matters related to the ’586 patent: *SharkNinja Operating LLC v. iRobot Corporation*, Civil Action No. 1:19-cv-01935 (D. Del.) (filed Oct. 11, 2019); *iRobot Corporation v. SharkNinja Operating LLC, et al.*, Civil Action No. 1:19-cv-12125 (D. Mass.) (filed

¹ Patent Owner disclaimed claims 1–7, 9, 11–12, and 17–19. Prelim. Resp. 1 n.1; Ex. 2001; Inst. 3.

Oct. 15, 2019); and *SharkNinja Operating LLC v. iRobot Corporation*, Civil Action No. 1:19-cv-12236 (D. Mass.) (filed Oct. 30, 2019).
Pet. 73; Paper 4, 2.

B. THE '586 PATENT

The '586 patent is titled Celestial Navigation System for an Autonomous Vehicle. Ex. 1001, code (54). It addresses “the demand for robotic devices that can navigate around a complex environment or [working] space with little or no assistance from a human operator.” *Id.* at 1:31–34. The '586 patent uses “vacuuming as a demonstrative task of the depicted robotic cleaning device 12.” *Id.* at 4:19–21. In one aspect, the specification discloses projecting infrared signals onto a room’s ceiling or walls and refers to regions where the signals contact a surface as “points.” *Id.* at 4:43–46. Alternatively, it explains, “visible points can be used in place of infrared points” and may be detected using a camera. *Id.* at 5:14–19. Then, the device’s microprocessor can calculate bearings from the robot to the signals and, ultimately, “determine the location of the autonomous vehicle 12 within the working area 14.” *Id.* at 5:19–25.

The '586 patent describes aspects of how an autonomous vehicle may take advantage of location information. For example, it discloses that “an operator may be able to direct the autonomous vehicle to clean specific rooms in a particular order and/or at a specific time.” *Id.* at 11:53–55.

C. CHALLENGED CLAIMS

Claims 8, 10, and 13–16 are at issue (the “challenged claims”). Challenged claim 8 depends from claim 7, which in turn depends from claim 1; both claims 1 and 7 have now been disclaimed. Ex. 2001. We reproduce claim 8 below, including the limitations of claims 1 and 7:

- [1.] An autonomous robotic cleaning device comprising:
- a robot body;
 - a drive supporting the robot body above a floor surface of a home and configured to maneuver the robot body across the floor surface;
 - a cleaning apparatus to clean the floor surface;
 - a processor configured to
 - wirelessly receive data indicative of a user selection of one or more rooms in the home and a user selection of a schedule to clean the floor surface in the one or more rooms, and
 - initiate, in accordance to the schedule, one or more cleaning operations, wherein during each of the one or more cleaning operations, the drive maneuvers the autonomous robotic cleaning device about the floor surface in accordance to the user selection of the one or more rooms while the cleaning apparatus cleans the floor surface[;]
- [7.] . . . a wireless antenna to communicate with a remote device, wherein the processor is configured to initiate operations for the wireless antenna to receive the data from the remote device[;]
8. . . . wherein the remote device includes a cellular phone.

Ex. 1001, 19:8–25, 19:66–20:5.

Claim 10 depends from claim 1 and recites that the cleaning device further comprises an “upward-angled camera . . . to capture visible points on wall surfaces” and can “navigate . . . based on a location . . . relative to the points.” *Id.* at 20:12–19. Claim 13 depends from claim 1 and recites that the device can “initiate the area rug cleaning operation” in response to a received user command. *Id.* at 20:36–40. Claim 14 depends from claim 1 and recites that the processor is “configured to create a map of the home

while navigating the autonomous robot cleaning device about the home to perform the one or more cleaning operations.”²

D. PRIOR ART AND ASSERTED GROUNDS

Petitioner asserts the following grounds of unpatentability:

| Claim(s) Challenged | 35 U.S.C. § | References/Basis |
|----------------------------|--------------------|---|
| 8, 14 | 103 | Toshiba ³ , Ruffner-556 ⁴ |
| 10 | 103 | Toshiba, Ruffner-556, Goncalves ⁵ |
| 13 | 103 | Toshiba, Ruffner-556, Köchel ⁶ |
| 15 | 103 | Toshiba, Ruffner-556, Taylor ⁷ |
| 16 | 103 | Toshiba, Ruffner-556, Minolta ⁸ |

Pet. 2. Petitioner also relies on the Declaration of Dr. Alonzo Kelly.

Ex. 1002.

² The limitations of claims 15 and 16 are not relevant to this decision, as unpatentability for those claims turns on our determination for claim 14. *See infra* at 16.

³ Japanese Patent Application Publication No. 2002-85305 (Ex. 1005 (English translation); Ex. 1004 (original)).

⁴ U.S. Patent Application Publication No. 2002/0156556 (Ex. 1006).

⁵ U.S. Patent Publication No. 2004/0167667 (Ex. 1014).

⁶ German Patent Publication No. DE10113105 (Ex. 1008 (English translation); Ex. 1007 (original)).

⁷ U.S. Patent Publication No. 2005/0000543 (Ex. 1015).

⁸ Japanese Patent Application Publication No. H07-281752 A (Ex. 1010 (English translation); Ex. 1009 (original)).

II. ANALYSIS

A. LEVEL OF ORDINARY SKILL IN THE ART

Petitioner submits that a person of ordinary skill in the art “would have at least a four-year degree in mechanical engineering, electrical engineering, or a closely related field and at least one year of experience in the design and implementation of robotics and embedded systems.” Pet. 4. Patent Owner does not contest that definition, and we apply it in our analysis, as it appears consistent with the prior art and challenged patent.

B. CLAIM CONSTRUCTION

Patent Owner expressly raises the construction of two terms, discussed below. PO Resp. 5–14. In addition, our consideration of claim 14 requires that we construe the relevant language, which we do in the context of the parties’ unpatentability contentions below. *See infra* at 15–16. No other term requires express construction. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). We construe claim terms “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b).” 37 C.F.R. § 42.100(b) (2020).

1. “navigate . . . about the home based on a location of the autonomous robotic cleaning device relative to the points”
(claim 10)

In the Institution Decision, we addressed Patent Owner’s asserted distinctions over Toshiba and stated that “claim 10 appears to require nothing beyond capturing an image of the wall, using it to determine the robot’s position, and then navigating based on that position.” Inst. 11–12. Patent Owner submits that we “read[] out the requirement for navigation

based on the ‘relative’ location of the robotic cleaning device to the points.” PO Resp. 9; *accord id.* at 10 (noting claim 10 requires “navigation based on the relative location of the robotic cleaning device to the points” (emphasis omitted)).⁹ Patent Owner does not offer a construction other than reiterating the claim language and asserting that the Institution Decision departed from the plain meaning. *Id.* at 9–14.

Petitioner asserts that the language requires no construction. Pet. Reply 9–12. Further, Petitioner takes issue with Patent Owner’s characterizations asserting that claim 10 would read on “navigating based solely on features such as physical attributes of one or more points such as color/size, or information encoded in the points, even when there is no consideration of the robot’s location relative to the points.” *See* Pet. Reply 10–11 (quoting PO Resp. 9–10). We agree that Patent Owner’s statement stretches our view of the claim scope. The claim language states that the device must navigate “based on a location of the . . . device relative to the points.” Ex. 1001, 20:16–19. That language requires location-based navigation and our Institution Decision did not hold otherwise. Rather, when we stated that the claim requires using a captured image “to determine the robot’s position,” that implied the claimed requirement that the “position” is relative to the captured points (and thus relative to the room). Inst. 11–12;

⁹ As Petitioner points out, at times Patent Owner inaccurately restates our Institution Decision. Pet. Reply 10 (citing PO Resp. 13). We stated that the language encompasses “any approach to *navigating* the device within a room as long as the device determines its position in the room by capturing visible points on wall surfaces.” Inst. 12 (emphasis added). Patent Owner rephrases that to permit “any approach to determining [the robot’s] position in the room by capturing visible points on wall surfaces.” PO Resp. 13.

accord id. at 12 (explaining that the claimed navigating requires “the device determines its position *in the room* by capturing visible points on wall surfaces” (emphasis added)).

Patent Owner points to the specification’s examples of determining the device’s relative position by using azimuth and elevation between the device and identified points in the room. PO Resp. 11–13 (citing Ex. 1001, 4:51–52, 5:11–15, 5:19–27, 10:11–17, Fig. 1. Patent Owner makes the leap of interpreting “relative” location to all but require following the approach in those examples—while Patent Owner does not expressly argue the examples limit the claims, it does not allow for other methods of determining “relative” location. *Id.* The claim language does not restrict how the device must determine its location “relative to the points” and the specification’s examples do not justify imposing a restriction. If a device determines its location in the room using visible points on a wall, it has also determined its location relative to the points if the points remain fixed relative to the room. The explanation in the Institution Decision does not unduly expand the claim scope; it merely recognizes the applicable logical relationships.

We conclude that the plain claim language does not require express construction.

2. “user-selected command to initiate an area rug cleaning operation”
(claim 13)

Patent Owner argues that a “user selected command to initiate an area rug cleaning operation,” as recited in claim 13, requires, by its plain meaning, “a command that, upon selection by a user, directs the robot to initiate an area rug cleaning operation.” PO Resp. 5 (citing Ex. 2013 ¶¶ 38–41). Patent Owner elaborates—“Claim 13 is not met by a command that only

incidentally results in an area rug getting cleaned, rather, it requires a command that specifically directs initiation of the area rug cleaning operation.” *Id.* at 6. Patent Owner emphasizes the claim language requiring that the robot initiates the operation “responsive to receiving data indicative” of the command. *Id.*; *see* Ex. 1001, 20:37–40. Patent Owner points to the specification’s description that the user places the robot as desired and then presses the “CLEAN” button to initiate cleaning. PO Resp. 6–7 (citing Ex. 1001, 17:5–18:67, Fig. 21B). In Patent Owner’s view, “[s]election of the ‘CLEAN’ button thus provides a command with the specific purpose and result of initiating area rug cleaning.” *Id.* at 7.

Petitioner challenges that construction, arguing that it imposes additional time and causation requirements beyond the claim language and specification. Pet. Reply 2–4. In that regard, Petitioner points out that claim 13 requires that the robot receive data “indicative of a user-selected command,” not that it receive the command itself. *Id.* at 3 (quoting Ex. 1001, 20:38) (emphasis omitted). Thus, reasons Petitioner, the claim language indicates a broad scope. Petitioner further focuses on the specification, which shows the interface transition from selecting “AREA RUG” mode to a later step where “CLEAN” begins cleaning once the robot is placed on the rug to be cleaned. Ex. 1001, Figs. 21A, 21B, 18:1–10.

The dispute raised by Patent Owner relates to whether the robot must begin cleaning as soon as the claimed command is received. We are not persuaded that the claim language and specification are consistent with Patent Owner’s construction. The claim language requires that the device “initiate the area rug cleaning operation” “responsive to receiving data indicative of a user-selected command.” We view the “responsive to”

language as sufficiently ambiguous as to intervening steps such that we should look to the specification for guidance.

The specification describes that a user may select “area rug” mode, after which the remote indicates “AREA RUG MODE ACTIVE” and “ROBOT WILL CLEAN THE RUG ONLY,” and cleaning does not start until the user places the robot appropriately and presses “CLEAN.” Ex. 1001, Figs. 21A, 21B, 17:63–18:10. Because the claim language requires data indicative of a “command to initiate an area rug cleaning operation,” some aspect of the command must be specific to area-rug cleaning. Pressing the “CLEAN” button does not satisfy that requirement, as nothing about the command itself indicates the claimed operation.¹⁰ Patent Owner contends that “what command is going to be sent” “depends on what mode you’re in” (Tr. 25:13–19), but we find no support for that in the specification. Indeed, Patent Owner agrees that the specification does not go into such detail but submits that we “can infer that the command and the data that’s sent associated with that command is different.” Tr. 27:16–28:2. We do not agree and determine that, instead, the specification is consistent with a command to initiate area-rug cleaning that indicates to the robot the desired mode but does not immediately start cleaning. That is, the claimed command is described as selecting an “AREA RUG” mode, which does not

¹⁰ In this regard, Patent Owner’s proposed construction would suffer from a similar deficiency as Petitioner’s mapping to Toshiba’s priority mode discussed below. *See infra* at 10. In that mapping, Toshiba’s device would clean an area rug if it happens to lie in a map grid selected for cleaning. Similarly, the “CLEAN” button would initiate area-rug cleaning if the “AREA RUG” mode happens to have been selected prior to that. We think the claim language requires more, in both instances.

cause the robot to begin operation; a later-issued generic “CLEAN” command causes the robot to begin operation. Ex. 1001, 17:63–18:10.

Other than as discussed, we conclude the claim language does not require further construction.

C. OBVIOUSNESS OVER TOSHIBA AND RUFFNER-556

Petitioner relies on Toshiba as teaching most limitations of claim 1 (which are included in every challenged claim). Pet. 11–39. For certain aspects, Petitioner relies on Ruffner-556. Pet. 17–39. Patent Owner disclaimed claim 1 but challenges aspects of Petitioner’s showing for claims 8 and 14. PO Resp. 48–57.

Toshiba discloses an “autonomous traveling robot cleaner” and a “home server” for controlling the robot. Ex. 1005, code (57). Toshiba’s robot propels itself with drive wheels, each driven by a motor. *Id.* ¶¶ 16, 18, Fig. 3. It includes a vacuum with a powered brush to clean the floor surface. *Id.* Toshiba further describes its control through onboard processing and through wireless connection to the home server. *Id.* ¶¶ 17, 20, 28–37, Figs. 1, 4–10. Through the home server, a user may select a room for cleaning and may set a future time to begin cleaning. *Id.* ¶¶ 30, 32, 37, 65, Figs. 6, 9, 11; *see* Ex. 1002 ¶ 98. Toshiba provides that a mobile phone may be used to select a room and cleaning mode through the home server. Ex. 1005 ¶ 39.

Ruffner-556 discloses methods for controlling a mobile appliance such as a vacuum, to allow it to map a work area and perform a task in the area. Ex. 1006, code (57). Petitioner relies on Ruffner-556 for explicitly disclosing that an autonomous robot such as Toshiba’s would use a controller with a processor. Pet. 16 (citing Ex. 1006 ¶ 125). Petitioner relies

on Ruffner-556 also for claim elements requiring the cleaning robot receive a user's selection of a cleaning schedule.¹¹ Pet. 17–18, 29–35. Ruffner-556 discloses that a user may enter scheduling information into the cleaning robot. Ex. 1006 ¶ 231. It further discloses that a user may enter schedule information remotely, using a Web interface, phone, or other connection. *Id.* ¶ 233.

1. Claim 8

As noted above, claim 8 depends from claim 7, which it turn depends from claim 1. Claim 7 further recites “a wireless antenna to communicate with a remote device, wherein the processor is configured to initiate operations for the wireless antenna to receive the data from the remote device.” Ex. 1001, 19:66–20:3. Petitioner relies on Ruffner-556 disclosing its “wireless transceiver 73 as a means through which the user can remotely control the movement and task means of the mobile unit . . . through a direct wireless connection.” Ex. 1006 ¶ 130; Pet. 48–50. Petitioner reasons that modifying Toshiba's device in light of Ruffner-556's teachings would have allowed Toshiba's robot to operate as it had, with the added ability to receive data from a mobile phone. Pet. 50.

Claim 8 requires the robotic cleaning device be configured to receive the claimed data¹² from a remote cellular phone. Ex. 1001, 20:4–5. Petitioner contends that Toshiba satisfies claim 8's additional limitation

¹¹ Petitioner asserts additionally that Ruffner-556 discloses the robot receiving a user's room selection, but that aspect of Toshiba does not appear to be disputed. *See* Pet. 29–30.

¹² The claimed data is “data indicative of a user selection of one or more rooms in the home and a user selection of a schedule to clean the floor surface in the one or more rooms.” Ex. 1001, 19:15–18.

because it discloses that its home server is connected to a base station for communicating with a mobile phone. Pet. 50–51 (citing Ex. 1005 ¶¶ 13, 39).

Patent Owner asserts that Toshiba discloses using a mobile phone only to select room and cleaning mode, not to set a schedule. PO Resp. 49–54. As we explained in the Institution Decision, Petitioner’s asserted combination relies on Ruffner-556 as teaching operation according to a user-selected schedule. Pet. 29–35, 37–39; *see* Inst. 8–9. Petitioner’s asserted combination is therefore a device that includes scheduling functionality—“when the user finishes programming path data, the mobile unit 1 will ask the user for scheduling information.” Pet. 30 (quoting Ex. 1006 ¶ 231). Moreover, Petitioner specifically asserts that skilled artisans would have incorporated Ruffner-556’s scheduling functionality to include its ability for remote access—“[s]cheduling for the mobile unit 1 can also be programmed remotely.” *Id.* at 31 (quoting Ex. 1006 ¶ 233), 34 (“to allow the robot cleaner to wirelessly receive inputs regarding both room selection and a cleaning schedule”). Thus, when Toshiba teaches that a mobile phone may be used for “[s]election of a room and cleaning mode” (Ex. 1005 ¶ 39), in the asserted combination, that would have reasonably included a schedule.

Patent Owner argues that Ruffner-556’s teachings “would not have provided for the receipt of ‘scheduling’ data with a cellular phone, as recited in Claim 8.” PO Resp. 50. Patent Owner admits that Ruffner-556 discusses remote scheduling “using a touch-tone phone” but contends that the record lacks sufficient evidence to show those capabilities “would be further applicable to a ‘cellular phone.’” *Id.* at 51. We do not agree, as we find persuasive Petitioner’s assertion that mobile phones at the time used cellular networks (Pet. 50–51 (citing Ex. 1002 ¶ 141)); additionally, Ruffner-556

discloses use with “numerous communication utilities,” making clear the broad nature of its teachings (Ex. 1006 ¶ 71).

Although Patent Owner argues that Petitioner did not rely on Ruffner-556 for claim 8 (*id.*), it is claim 7 that introduces the requirement to receive data from “a remote device” and Petitioner relies on Ruffner-556 for that ability. Pet. 48–50. Patent Owner argues that because Toshiba describes a system in which the home server controls the robot’s movements, any scheduling data received from a remote device would be managed and maintained by the home server, not the robot itself. PO Resp. 52–53. But in the assertions for claim 7, Petitioner specifically asserts a modification allowing “a direct wireless connection.” Pet. 48–50 (quoting Ex. 1006 ¶ 130). Although Patent Owner argues that Toshiba expresses a preference for the server to control the robot (PO Resp. 53), Petitioner’s asserted combination supplements Toshiba with Ruffner-556’s teaching of allowing control directly through a remote device. We are persuaded that allowing direct control would have provided a sufficient benefit in and of itself to overcome Toshiba’s preference.

Patent Owner does not otherwise contest Petitioner’s assertions against claim 8. *See* PO Resp. 48–54. Accordingly, Patent Owner has waived any such challenge. *See* Paper 12, 8 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”); *In re NuVasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016); Consolidated Trial Practice Guide 52 (Nov. 2019). Having considered all of the parties’ contentions and evidence, we are persuaded that Petitioner has proven claim 8’s obviousness over Toshiba and Ruffner-556.

2. Claim 14

Claim 14 depends from claim 1 and recites further that “the processor is configured to create a map of the home while navigating the autonomous robotic cleaning device about the home to perform the one or more cleaning operations.” Ex. 1001, 20:41–45. For that limitation, Petitioner relies on Toshiba’s teaching that, when there is no map information, the robot “collects room layout information.” Pet. 57–58 (citing Ex. 1005 ¶¶ 58, 65).

Patent Owner argues that, unlike claim 14, Toshiba discloses that room plan data is created in a first operation, “after which cleaning is performed based on this created map information.” Ex. 1005 ¶ 65; PO Resp. 54–57. Petitioner contends that claim 14 does not require simultaneous mapping and cleaning. Pet. Reply 18–21. In Petitioner’s view, “the claim language requires mapping while navigating, not mapping while cleaning.” *Id.* at 18–19.

Although Petitioner identifies specification disclosures that allow for mapping first, then using that map to clean, we consider the claim language to the contrary. The claim does not use any punctuation that would suggest “to perform the one or more cleaning operations” modifies anything other than the preceding phrase—“navigating the autonomous robotic cleaning device about the home.” And, as Patent Owner identifies (*see* Tr. 33:8–34:10), the specification supports a claim to mapping while cleaning. It states that the vehicle may “improve its cleaning function . . . to roughly mark areas . . . where large obstacles exist, so that those areas can potentially be avoided in future runs.” Ex. 1001, 11:36–41. That describes mapping during cleaning because marking areas is a form of mapping and

“in future runs” shows that the mapping was performed during a “run,” or cleaning operation.

Another passage relates to Figure 6, which depicts how the “vehicle uses a number of signals for headings to move from room to room.” *Id.* at 12:17–19, Fig. 6. The specification addresses when the vehicle’s “power level drops below a predetermined level, requiring its return to a base charging station 622.” *Id.* at 12:20–23. The returning vehicle continues cleaning during the return. *See id.* at 12:54–58 (“Upon detecting the unique marker associated with a particular working space, the autonomous vehicle may alter its cleaning function.”). The returning vehicle “detects and stores information about each coded signal that it detects along its route.” *Id.* at 13:23–26. By doing so, the “vehicle can create a map.” *Id.* at 13:26–29. Therefore, “[a]fter charging, the autonomous vehicle can return to the room it was working in prior to returning to its base” using the map. *Id.* at 13:29–32. Based on the specification passages, we conclude the claim language, which has ordinary meaning requiring cleaning while mapping, is consistent with the specification.

Toshiba’s sequential process is not the same as the concurrent process recited by claim 14. Nor does Petitioner account for the differences. *See* Pet. 57–58; *accord* Pet. Reply 21 (arguing that Toshiba discloses claim 14’s additional limitations only under Petitioner’s construction). Because we do not agree with Petitioner’s claim construction, we conclude that Petitioner has not proven claim 14 would have been obvious.

Because claims 15 and 16 depend from claim 14, we reach the same conclusion as to those two claims. We recognize that each is challenged in a ground separate from claim 14, but Petitioner does not rely on disclosures

from the other references in those grounds in a way that would remedy the deficiency with its assertions for claim 14. *See* Pet. 66–69.

D. OBVIOUSNESS OVER TOSHIBA, RUFFNER-556, AND GONCALVES
(CLAIM 10)

Claim 10 depends from claim 1 and recites that the device includes the following:

an upward-angled camera directed at least partially away from a ceiling of the home to capture visible points on wall surfaces within the home, wherein the processor is configured to navigate the autonomous robotic cleaning device about the home based on a location of the autonomous robotic cleaning device relative to the points.

Ex. 1001, 20:12–19. Petitioner relies on Toshiba and Goncalves for this limitation. Pet. 58–61. Toshiba discloses a “visual sensor” that acquires images. Ex. 1005 ¶¶ 19, 53, Fig. 3. Toshiba’s device includes processing to “recognize a position on the map by comparing an image acquired by the visual sensor 9 with an image showing the appearance of the room to be cleaned or image of a particular object in the room stored in the map information memory section 47a.” *Id.* ¶ 24. To the extent that Toshiba’s visual sensor’s “forward field of view” (*id.* ¶ 19) does not satisfy the claimed “upward-angled camera directed at least partially away from a ceiling of the home,” Petitioner relies on Goncalves. Pet. 60–61.

Like Toshiba, Goncalves discloses a mobile robot that may be an autonomous cleaner. Ex. 1014 ¶ 58. Goncalves’s robot may navigate based on input from a visual sensor, and that sensor “can correspond to a generally upward-pointing camera, to a sideways-looking camera, or to positions between forward looking, upward, and/or sideways.” *Id.* ¶ 161. Petitioner

asserts that skilled artisans would have incorporated Goncalves's camera "to allow the navigation system of Toshiba's robot cleaner to employ a forward field of view including higher-positioned landmarks 'mounted on a wall.'" Pet. 60–61 (citing Ex. 1002 ¶ 155).

Patent Owner challenges whether Toshiba teaches the claimed navigation "based on a location of the . . . device relative to the points." PO Resp. 36–45. According to Patent Owner, the Institution Decision took an overly broad view of the claim language and should not have read claim 10 on Toshiba's disclosures. *Id.* at 8–13, 36–37. As explained above, we do not agree that the Institution Decision interpreted the claim language as broadly as Patent Owner asserts. *See supra* at 6. Moreover, neither the claim language nor the specification supports claim scope that restricts how a device determines its location relative to points on the wall. *Id.* Much of Patent Owner's distinction over Toshiba depends on its asserted claim construction (*see* PO Resp. 37–45), and because we do not adopt that construction, Patent Owner's arguments are not persuasive.

Patent Owner argues that claim 10 requires "identification of visible points," whereas Toshiba discloses capturing an image as a whole. PO Resp. 38–39. The claim, however, does not require identification of the points, only that they be captured. Ex. 1001, 20:12–19. Patent Owner argues additionally that simply capturing an image does not satisfy the claimed requirement "to capture visible points on wall surfaces" because the claimed points must "exist independently of any image(s) of the points." PO Sur-Reply 4. In Patent Owner's view, "[c]laim 10 delineates between what the 'upward-angled camera' captures (e.g., an *image* of the visible points) and what the robot navigates relative to (i.e., the visible points themselves)." *Id.*

We do not agree, as the claim language does not support that distinction. Rather, it recites a camera that captures “visible points” and navigation based on a location relative to the points. Ex. 1001, 20:12–19. Further, Patent Owner has not advanced a construction of “visible points” that would distinguish capturing those points as part of an overall image. *See* PO Resp. 8–14 (addressing claim 10 only as to the requirement for navigation “relative to” the points).¹³ Thus, we agree with Petitioner that Toshiba’s sensor captures “visible points” because it captures pixels, which are discrete parts of an image. Pet. Reply 12 (citing Ex. 1028, 34:25–35:16); *see* Ex. 1002 ¶ 153.

Patent Owner argues that Toshiba fails to disclose the claimed navigation because its “approach to analyzing images acquired with ‘visual sensor 9’ is described with only the barest of detail, and leaves crucial questions unanswered.” PO Resp. 37. Patent Owner agrees that Toshiba discloses that its device can “recognize its position on a map” using image comparison (*id.* at 38) but argues that Toshiba is deficient because it “does not explain the nature of the image comparison or suggest use of the location of the robot relative to the points to achieve this output.” *Id.* at 38–39. In

¹³ At the oral hearing, Patent Owner asserted that the navigational method must consider specific points and that the term “visible points” imposed such a requirement. Tr. 22:21–23:14. Petitioner responded that Patent Owner had not timely proposed a construction. *Id.* at 35:22–36:3. Patent Owner identified its Sur-Reply as having raised the issue and its Response as containing the construction. *Id.* at 41:7–20. Having considered the record, we conclude that Patent Owner did not raise the construction for “visible points” in its Response and has waived that argument. *See* Paper 12, 8 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”).

Patent Owner's view, Toshiba's method would allow a robot to identify, for example, that it "arrived at the correct room" but not the robot's location relative to points on the wall. *Id.* at 40–44.

We do not agree with Patent Owner. Its arguments that Toshiba provides for only coarse positioning using its visual sensor (e.g., to locate which room the robot is in) are undermined by Toshiba's disclosures. In particular, Toshiba discloses identifying its position using rotary encoders on its wheels and then discloses that the visual-sensor-based positioning "can be used for position confirmation or fine-tuning." Ex. 1005 ¶¶ 23–24. Thus, Toshiba directly contradicts that its imaging-based positioning is only suitable for coarse positioning.

Patent Owner attempts to distinguish Toshiba's "position in an environment" from "location of the robot relative to the points" as claimed, arguing that the claimed navigation requires "measurements that reflect the location of the robot relative to visible points captured with the visual sensor 9." PO Resp. 39. We do not agree that the claim requires specific measurements be used for navigation. Rather, it simply requires navigation "based on" the robot's location relative to the points. Because Toshiba's image sensor captures "the room" and uses that to "recognize a position on the map" (Ex. 1005 ¶ 24; *see* Ex. 2014, 156:16–157:5), its position information is relative to points on wall surfaces, as claimed. And Toshiba discloses that the measured position is used to determine the robot's movement (Ex. 1005 ¶ 26)—the robot navigates based on the determined position, as claimed.

Other than as discussed, Patent Owner does not contest Petitioner's assertions against claim 10. *See* PO Resp. 36–48. Accordingly, Patent

Owner has waived any such challenge. *See* Paper 12, 8 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”); *In re NuVasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016); Consolidated Trial Practice Guide 52 (Nov. 2019). Having considered all of the parties’ contentions and evidence, we are persuaded that Petitioner has proven claim 10’s obviousness in view of Toshiba, Ruffner-556, and Goncalves. Pet. 11–39, 58–61.

E. OBVIOUSNESS OVER TOSHIBA, RUFFNER-556, AND KÖCHEL
(CLAIM 13)

Claim 13 depends from claim 1 and recites that “the processor is configured to, responsive to receiving data indicative of a user-selected command to initiate an area rug cleaning operation, initiate the area rug cleaning operation.” Ex. 1001, 20:36–40.

Petitioner asserts that Toshiba and Köchel teach claim 13’s additional limitations. Pet. 62. As to Toshiba, Petitioner points to its “Priority” mode, where a user may select a portion of the room layout for cleaning in “Extra Care” mode. *Id.* (citing Ex. 1005 ¶¶ 36, 49).

Petitioner further relies on Köchel for claim 13’s area-rug cleaning. Pet. 62–63. Köchel discloses a vacuum cleaner that includes ultrasonic sensors to recognize different floor coverings, including “soft carpet, carpet, and hard floor.” Ex. 1008 ¶¶ 33, 34, 48. Further, Köchel discloses its applicability to “an automatic floor care device,” such that the device can change direction when detecting a change in floor covering. *Id.* ¶ 9. Thus, explains Köchel, “it is possible to systematically clean an area having different floor coverings, that is, to travel parallel to edges and transitions.” *Id.*; *accord id.* ¶ 10 (disclosing “a method for aligning the displacement

movement of an automatic floor care device, such as, in particular, of a vacuum cleaner, along a boundary of a particular floor covering, such as a carpeted floor”).

Petitioner reasons that incorporating Köchel’s teaching to automatically follow carpeted boundaries would allow Toshiba’s robot “to be able to clean a particular area of the floor thoroughly while ensuring neither the floor nor robot cleaner brush become damaged.” Pet. 65.

Petitioner asserts further that skilled artisans would have programmed the robot “to remain within a boundary of a particular type of floor covering and/or turn its brush on or off based on signals received from the ultrasonic floor sensor.” *Id.*

1. Area rug cleaning operation

Patent Owner argues that Toshiba alone does not teach claim 13’s area-rug cleaning. PO Resp. 14–18. Because Toshiba’s priority mode applies to a particular area on the map, Patent Owner submits that it does not meet the claimed language, which requires cleaning specifically targeting a rug, not just the area a rug may happen to overlap. *Id.* We agree. Toshiba discloses selecting priority cleaning that targets areas designated after “the room is divided by dotted lines into units of 1 m².” Ex. 1005 ¶ 36. That does not comport with the claim language requiring an “area rug cleaning operation” because there is no indication that the robot’s operation correlates to an area rug. Petitioner is correct that a designated portion may be “occupied by an area rug” (Pet. 62) but, in our view, the claim language requires a cleaning operation that specifically targets a rug. Thus, Toshiba alone does not teach the claimed area-rug cleaning.

Petitioner, however, asserts further that skilled artisans would have modified Toshiba's robot in light of Köchel's teachings that enable automated recognition of floor coverings and behavior to maintain the robot on a particular floor covering. Patent Owner argues that Köchel does not benefit the combination because it describes merely a "rudimentary navigation routine that allows the robot to follow the transitional 'edge' between adjacent floor surfaces using ultrasonic transducers." PO Resp. 30. We do not agree. While Köchel describes an edge-following behavior, that is merely one possible behavior when recognizing a floor-covering transition. Köchel also discloses "adjusting cleaning behavior (e.g., by turning carpet brush on or off) in response to an ultrasonic transducer signal indicative of the type of floor." Pet. 8 (citing Ex. 1008 ¶ 5); *accord* Ex. 1008 ¶ 7 ("[A] floor care device is thus able to clean efficiently even in such transition regions, and to clean an area as a function of the changing surface structure thereof."). Moreover, even when describing its edge-following behavior, Köchel expresses that it makes "possible to systematically clean an area having different floor coverings." Ex. 1008 ¶ 9. By explaining that edge following allows the robot to systematically clean areas with different floor coverings, Köchel supports applying its disclosures to a robot such that it stays within the boundaries of a particular floor covering to clean the entire area. *See* Ex. 1002 ¶ 160; Pet. 62–63.

Accordingly, Petitioner has shown by a preponderance of the evidence that the combination of Toshiba and Köchel teaches the claimed "area rug cleaning operation."

2. User-selected command to initiate

Patent Owner argues also that Petitioner fails to show Toshiba discloses a “user-selected command to initiate an area rug cleaning operation.” PO Resp. 18–30. Patent Owner focuses its argument on “a command that specifically initiates an area rug cleaning operation that cleans just the rug and not all the space around it (or even a command that specifically initiates cleaning of a designated priority area).” *Id.* at 19. Because Toshiba’s priority mode requires a user to select a particular area for “Extra Care” cleaning before providing a separate “Start” command, Patent Owner submits that it does not satisfy the claimed command to initiate an area rug cleaning operation. *Id.* at 19–24. As discussed above, however, we construe the claimed “user-selected command to initiate an area rug cleaning operation” as reading on a user selection of area-rug cleaning followed by a subsequent command to start cleaning. *See supra* at 6–11. While Patent Owner emphasizes the potentially long separation between a user selecting an area for Extra Care cleaning and Toshiba’s robot beginning to move (*see* PO Resp. 25–26), that is not meaningfully different from the ’586 patent’s description of area-rug cleaning (Ex. 1001, 17:63–18:10). Thus, we do not agree with Patent Owner’s argument, as Toshiba describes nearly the same sequence of commands as described in the ’586 patent’s specification.

Further, even under Patent Owner’s construction, we conclude that Toshiba’s disclosures teach the limitation. The Petition identifies two actions by a user, both designating “the portion of the room occupied by an area rug in the ‘Priority’ mode” and also “caus[ing] Toshiba’s robot cleaner to clean the area rug using the Extra Care mode.” Pet. 62. And the Petition relies on

Toshiba’s “motion command” that instructs the robot to begin cleaning. Pet. 27. Although the Petition discusses the motion command in the context of claim 1’s requirement that the robot’s processor be configured to “initiate . . . one or more cleaning operations,” that is consistent with Patent Owner’s view of claim 13’s language, in that Patent Owner views the described “CLEAN” button as initiating cleaning, regardless of whether the robot is in an area-rug cleaning mode. Tr. 25:13–28:2.¹⁴ If the claim requires a command that triggers the robot to start moving upon receipt of the command, then the claim language reads on Toshiba’s motion command when it is issued after a user has selected an area for cleaning with Extra Care mode. Ex. 1005 ¶¶ 39, 45, Fig. 11. We do not agree with Patent Owner that the claim language supports an interpretation that the robot may perform only an area-cleaning operation and no other cleaning operation when it receives a command to begin cleaning. *See* PO Resp. 28–29.

Patent Owner argues also that the claim language does not read on selecting an area as Toshiba describes, because it “has nothing to do with an area rug and the type of cleaning is applied to the selected area regardless of whether an area rug is present or not.” PO Resp. 27. As discussed above, that argument is persuasive as to Toshiba alone but does not address the combination of Toshiba and Köchel. In the combination, Köchel’s teachings are used to give the robot the ability to distinguish floor types and maintain itself within a particular floor type. We agree with Patent Owner’s argument

¹⁴ We acknowledge that Patent Owner takes the position that the command sent when a user presses the CLEAN button depends on what mode the robot is in (Tr. 25:17–19), but as discussed above regarding claim construction, we do not agree that the specification supports that view.

that Köchel’s teachings do not impact how the combined device would initiate an area-rug cleaning operation. *See* PO Resp. 32–34. But, as discussed, we determine that Toshiba teaches that aspect of claim 13.

Accordingly, Petitioner has shown by a preponderance of the evidence that the combination of Toshiba and Köchel teaches the recited “user-selected command to initiate the area rug cleaning operation.”

3. Reason to combine

Patent Owner argues that Toshiba and Köchel use “fundamentally different methods of boundary detection”—Toshiba using preselected boundaries and Köchel simply following edges. PO Resp. 34. Thus, in Patent Owner’s view, “[a]ttempts to marry these fundamentally different approaches for the purpose of ‘area rug cleaning’ would inevitably fail (at least without additional technology not described in the prior art) due to the inherent tension between Toshiba’s pre-defined (and immovable) priority boundaries, and Köchel’s real-time sensing of the transitional edges between floor surfaces.” *Id.* Patent Owner faults the Petition for not addressing possible scenarios that a robot may encounter, and argues that the asserted tension would violate Toshiba’s principle of operation. *Id.* at 34–35.

We do not agree. In our view, Petitioner has explained that incorporating Köchel’s teachings to modify Toshiba’s device would offer a distinct benefit—cleaning “a particular area of the floor thoroughly while ensuring neither the floor nor robot cleaner brush become damaged.” Pet. 65. That benefit adequately justifies the combination. Additionally, cleaning according to grid squares is not so fundamental to Toshiba’s teachings that supplementing its approach to use floor-covering differences as boundaries would interfere with Toshiba’s principle of operation. *See,*

e.g., Ex. 1005 ¶ 5 (describing generic “cleaning areas” rather than the grid approach).

We conclude that Petitioner has shown an adequate reason that skilled artisans would have modified Toshiba’s device to incorporate Köchel’s teachings.

4. Conclusion

Other than as discussed, Patent Owner makes no further arguments against Petitioner’s contentions for claim 13. Accordingly, Patent Owner has waived any such challenge. *See* Paper 12, 8 (“Patent Owner is cautioned that any arguments not raised in the response may be deemed waived.”); *In re NuVasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016); Consolidated Trial Practice Guide 52 (Nov. 2019). Having considered all of the parties’ contentions and evidence, we are persuaded that Petitioner has proven claim 13’s obviousness over Toshiba, Ruffner-556, and Köchel.

III. CONCLUSION¹⁵

For the reasons discussed above, we conclude:

¹⁵ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

| Claims | 35 U.S.C. § | Reference(s)/Basis | Claims Shown Unpatentable | Claims Not Shown Unpatentable |
|----------------------------|----------------------------|---------------------------------------|--|--|
| 8, 14 | 103 | Toshiba, Ruffner-556 | 8 | 14 |
| 10 | 103 | Toshiba, Ruffner-556, Goncalves | 10 | |
| 13 | 103 | Toshiba, Ruffner-556, Köchel | 13 | |
| 15 | 103 | Toshiba, Ruffner-556, Taylor | | 15 |
| 16 | 103 | Toshiba, Ruffner-556, Minolta | | 16 |
| Overall Outcome | | | 8, 10, 13 | 14–16 |

IV. ORDER

Accordingly, it is

ORDERED that Petitioner has proven claims 8, 10, and 13 of the '586 patent are unpatentable;

FURTHER ORDERED that Petitioner has not proven claims 14–16 of the '586 patent are unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 9,921,586 B2

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