

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WESTINGHOUSE AIR BRAKE TECHNOLOGIES CORPORATION,
Petitioner,

v.

SIEMENS MOBILITY, INC.,
Patent Owner.

Case IPR2017-01866
Patent 7,036,774 B2

Before KRISTEN L. DROESCH, MEREDITH C. PETRAVICK, and
TIMOTHY J. GOODSON, *Administrative Patent Judges*.

GOODSON, *Administrative Patent Judge*.

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

I. INTRODUCTION

Petitioner filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1, 7–9, 15, 19, 20, and 26–28 of U.S. Patent No. 7,036,774 B2 (Ex. 1001, “the ’774 patent”) on the following grounds:

Ground	References	Basis	Claims Challenged
1	Birkin ¹ and Petit ²	§ 103	1, 7, 15, 19, 20, and 26
2	Birkin and RSAC ³	§ 103	1, 7, 15, 19, 20, and 26
3	Birkin, Petit, and Blesener ⁴	§ 103	7–9 and 26–28
4	Birkin, RSAC, and Blesener	§ 103	7–9 and 26–28

See Pet. 9. Patent Owner filed a Preliminary Response. Paper 7.

We initially instituted an *inter partes* review on all claims challenged in the Petition, but on only a subset of the asserted grounds. See Paper 9 (“Dec. on Inst.”). Specifically, we determined based on the preliminary record that Petitioner had demonstrated a reasonable likelihood of prevailing in all of its challenges except for the challenges to claims 7 and 26 in Ground 2, and its challenges in Ground 4. *Id.* at 19–20, 26–27. In accordance with the Board’s practice at that time, we instituted review only on the challenges for which Petitioner showed a reasonable likelihood of prevailing. Subsequently, pursuant to *SAS Inst., Inc. v. Iancu*, 138 S.Ct.

¹ U.S. Patent No. 4,932,614, issued June 12, 1990, Ex. 1006.

² U.S. Patent No. 5,092,544, issued Mar. 3, 1992, Ex. 1008.

³ Railroad Safety Advisory Committee, *Implementation of Positive Train Control Systems*, Ex. 1005.

⁴ Int’l Pub. No. WO 02/091013 A2, published Nov. 14, 2002, Ex. 1007.

1348, 1355–57 (2018),⁵ we modified our institution decision to institute review of all grounds and claims presented in the Petition. Paper 19; *see also* Paper 20 (adjusting case schedule in light of modification to institute on all grounds presented in the Petition).

After institution of trial, Patent Owner filed a Patent Owner Response. (Paper 25, “PO Resp.”), and Petitioner filed a Reply (Paper 32, “Reply”). To support its arguments, Petitioner relies on the testimony of Mr. Steven Ditmeyer (Ex. 1002), while Patent Owner relies on testimony from Mr. John Loud (Ex. 2007). With our authorization, Patent Owner submitted Exhibit 2017 as supplemental information along with a brief paper arguing the relevance of that exhibit, and Patent Owner submitted a brief response. *See* Paper 27; Paper 28. Patent Owner filed a motion to exclude certain evidence, which motion we address in Section IV. An oral hearing was held, a transcript of which is included in the record. Paper 43 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has shown by a

⁵ *See also* “Guidance on the Impact of SAS on AIA Trial Proceedings” (April 26, 2018), *available at* www.uspto.gov/patentsapplication-process/patent-trial-and-appeal-board/trials/guidance-impact-sas-aia-trial(explaining that a decision granting institution will institute on all challenged claims and on all grounds presented in the petition).

preponderance of the evidence that claims 1, 7–9, 15, 19, 20, and 26–28 of the '774 patent — i.e., all of the challenged claims — are unpatentable. See 35 U.S.C. § 316(e).

A. Related Matters

Patent Owner is asserting the '774 patent against Petitioner in *Siemens Industry, Inc. v. Westinghouse Air Brake Technologies Corp.*, Case No. 1-16-cv-00284 in the U.S. District Court for the District of Delaware (“the Parallel District Court Case”). Pet. vi; Paper 5, 1; Paper 16, 1. In addition, the parties list Case IPR2017-01533, involving U.S. Patent No. 6,845,953, as a related matter. Paper 16, 1.

B. The '774 Patent

The '774 patent is titled “Method and System for Checking Track Integrity.” Ex. 1001, (54). In the background section, the patent describes that track circuits “have been used for many years . . . to determine whether sections or blocks of train track are safe for transit.” *Id.* at 1:16–18. “In their simplest form, these circuits involve applying a voltage across an electrically discontinuous section of rail at one end and measuring the voltage at the other end.” *Id.* at 1:29–32. “[I]f the voltage cannot be detected, there is either a break in the rail or the track is occupied by another train. In either event, it is not safe for a train to enter the section of track monitored by the track circuit.” *Id.* at 1:40–43. The '774 patent further describes that in traditional systems, the track circuit operated continuously, regardless of whether a train was approaching, and was connected to a wayside color signal to indicate the track’s status to approaching trains. *Id.* at 1:56–61. According to the '774 patent, such systems wasted power and were not failsafe because they depended on the engineer to observe the

signal and stop the train. *Id.* at 1:61–2:3. The '774 patent seeks to provide a system that uses track circuits in a way that minimizes power consumption and avoids undue burden on a dispatcher or control authority. *Id.* at 2:35–39.

In the computerized train control system described in the '774 patent, a control module determines a train's position using a positioning system such as GPS and consults a database to determine when the train is approaching a track circuit. *Id.* at 2:43–49. At that point, the train transmits an interrogation message to a transceiver associated with the track circuit. *Id.* at 2:49–54. If the track circuit fails to respond or indicates a problem, the train takes corrective action. *Id.* at 2:60–62, (57). Such a system saves power compared to systems in which wayside devices continuously transmit information regardless of whether trains are in the area. *Id.* at 6:65–7:5. The low power usage allows the system to be utilized in remote areas, where no power source is available at low cost. *Id.* at 7:23–36. Another advantage is that it is failsafe insofar as there is no danger if the track circuit or its transceiver fails to respond to an interrogation. *Id.* at 7:37–42.

C. Challenged Claims

Petitioner challenges claims 1, 7–9, 15, 19, 20, and 26–28. Pet. 1. Of these, claims 1 and 19 are independent claims. Claim 1 is reproduced below, with labels added by Petitioner for ease of reference:

1. A system for controlling a train, the system comprising:
 - [a] a control unit;
 - [b] a warning device in communication with the control unit;
 - [c] a brake interface unit, the brake interface unit being in communication with the control unit and a train brake, the brake

interface unit being operable to activate the train brake under control of the control unit; and

[d] a transceiver, the transceiver being located on the train and being in communication with the control unit;

[e] wherein the control unit is configured to perform the steps of

transmitting an interrogation message to a track circuit transceiver associated with a track circuit;

[f] listening for a response from the track circuit transceiver, the response including an indication as to a condition of a section of track monitored by the track circuit;

[g] activating the warning device to provide a warning to the operator if the response indicates that it is not safe for the train to proceed; and

[h] activating the train's brake via the brake interface unit if an operator of the train fails to acknowledge the warning or fails to reduce the speed of the train to a safe speed within a period of time after the warning.

Ex. 1001, 7:54–8:11; *see also* Pet. 66 (reproducing claim with labels added).

II. CLAIM CONSTRUCTION

Under the version of our rules applicable to this *inter partes* review,⁶ claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2016); *Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct.

⁶ The claim construction standard to be employed in *inter partes* reviews has changed for proceedings in which the petition was filed on or after November 13, 2018. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42).

2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard).

In our Institution Decision, we determined that resolution of the disputed issues at that stage of the proceeding did not require an express interpretation of any claim term. *See* Dec. on Inst. 6 (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)). Based on the arguments presented during trial, we determine that construction of two terms is necessary to resolve the issues in dispute.

A. “*interrogation message*”

The term “interrogation message” appears in independent claims 1 and 19, and in several dependent claims. Patent Owner argues that we should construe the term as “a targeted request for status information,” which is consistent with the construction adopted in the Parallel District Court Case. PO Resp. 6 n.1 (citing Ex. 2004, 10–12); *see also Power Integrations, Inc. v. Lee*, 797 F.3d 1318, 1326 (Fed. Cir. 2015) (explaining that although the Board is not generally bound by a previous judicial interpretation of a disputed claim term, the Board should nevertheless assess whether it is consistent with the broadest reasonable construction of the term). In its Reply, Petitioner states that Patent Owner’s construction “is appropriate to resolve the factual disputes of the parties.” Reply 2. We adopt the parties’ agreed-upon construction as it is consistent with the plain meaning of the claim language read broadly but reasonably in light of the specification.

Thus, we interpret “interrogation message” to mean “a targeted request for status information.”

B. “transceiver”

Each of independent claims 1 and 19 recites “transmitting an interrogation message to a track circuit transceiver associated with a track circuit.” Ex. 1001, 7:66–67, 9:9–10. Petitioner did not propose a construction of “transceiver” in its Petition, and Patent Owner did not advocate for an express construction in its Patent Owner Response. See Pet. 7–8; PO Resp. 5–12. However, Petitioner argues in its Reply, and we agree, that Patent Owner’s rebuttal arguments concerning Birkin raise a claim construction issue of whether the claimed “transceiver” includes a transponder. See Reply 3–4; PO Resp. 28–29 (arguing that Birkin’s track circuit transponder is not a transceiver); see also *WesternGeco LLC v. ION Geophysical Corp.*, 889 F.3d 1308, 1328 (Fed. Cir. 2018) (“[T]he Board was permitted to issue a new construction in the final written decision given that claim construction was a disputed issue during the proceedings.”).

Petitioner argues that the broadest reasonable interpretation of “transceiver” must encompass a transponder because the ’774 patent uses those terms interchangeably. Reply 3–4. We agree. The ’774 patent uses reference number 190 to refer to the transceiver associated with the track circuit. See Ex. 1001, 3:45–49 (“The train control system includes . . . a plurality of pairs of track circuits 180 and transceivers 190 that monitor various sections of track 185. These track circuit 180/transceiver 190 pairs”); Fig. 1 (showing a box with the word “Transceiver” inside labeled with reference number 190).

The ’774 patent predominantly refers to this equipment as transceiver 190. See *id.* at 4:25–27 (“When the control module 110 determines that the train is approaching a track circuit 180 (which includes a transceiver

190)”); *id.* at 4:31–33 (“In addition to communicating with track circuit transceivers 190”); *id.* at 5:20–22 (“If a track circuit 180 is within a threshold distance at step 214, the transceiver 190 associated with the track circuit 180 is interrogated at step 216.”); *id.* at 5:25–26 (“the transceiver 190 connected to the track circuit 180”). But the ’774 patent also refers to the same equipment as a transponder. *See id.* at 7:6–9 (“As discussed above, preferred embodiments of the invention include an identification number in the interrogation messages sent to transponders 190 associated with track circuits 180.”); *id.* at 7:13–14 (“this allows all transponders to share the same frequency”). The patent also uses “transponder” and “transceiver” interchangeably in adjacent sentences. *See id.* at 7:26–31 (“[T]he track detection circuit need only be ‘on’ when the train approaches and may be in a low-power standby or off state with the **transceiver** in a low power ‘listening state’ at other times when no train is nearby. This in turn facilitates the use of solar cells as a power source for these track circuit/**transponder** combinations.”) (emphasis added).

The ’774 patent’s use of “transponders” in referring to the same devices that are elsewhere referred to as “transceivers” is a strong indication in the intrinsic record that the term “transceiver” includes a transponder. *See In re Power Integrations, Inc.*, 884 F.3d 1370, 1377 (Fed. Cir. 2018) (“[A] proper claim construction analysis endeavors to assign a meaning to a disputed claim term ‘that corresponds with . . . how the inventor describes his invention in the specification.’”) (quoting *In re Smith Int’l, Inc.*, 871 F.3d 1375, 1383 (Fed. Cir. 2017)).

Patent Owner argues that the references to “transponders” in the ’774 patent are “just a typo.” *See* Tr. 28:18. This is the same explanation offered

by Patent Owner's declarant, Mr. Loud, when he was asked about these portions of the Specification during his deposition. *See* Ex. 1032, 38:22–25. We are not persuaded that an ordinarily skilled artisan would understand the uses of the term “transponder” in the '774 patent as typographical errors. As just summarized, the patent uses “transponder” three times, and in one instance, transponder appears in the sentence immediately following the word transceiver. Further, as Petitioner points out, Patent Owner's typo argument is difficult to square with the fact that the multiple uses of “transponder” appear in the '774 patent as well as the originally filed specification of the parent patent to the '774 patent. *See* Reply 3 n.3; Ex. 1042, 38–39.

In connection with our claim construction analysis of this term, we have considered the testimony that Patent Owner submitted as Supplemental Information. *See* Paper 27; Ex. 2017, 112–13, 125. Specifically, Patent Owner submitted an excerpt of the deposition of Dr. Lori Kauffman from the Parallel District Court Case. *See id.* Dr. Kauffman did not testify in this proceeding, but served as a technical expert for Petitioner in the Parallel District Court Case. In the excerpt, Dr. Kauffman was asked whether an ordinarily skilled artisan would view the terms transceiver and transponder as synonymous, and she answered, “[n]ot in their purest form, but as we've been discussing it's their operational behavior. . . . If you look at from a functionality they perform similar, if not the same, actions.” Ex. 2017, 125:11–19. Dr. Kauffman agreed that “they're not the same device.” *Id.* at 125:20–21. In the excerpt that Patent Owner provided, Dr. Kauffman was not asked about the meaning of the term “transceiver” in the context of the '774 patent. To the extent Dr. Kauffman's testimony is at odds with the

usage of these terms in the '774 patent, we give greater weight to the intrinsic record of the '774 patent than the testimony from a different proceeding that is untethered to the disclosure of the patent at issue. See *Phillips v. AWH Corp.*, 415 F.3d 1303, 1318 (Fed. Cir. 2005) (en banc) (“We have viewed extrinsic evidence in general as less reliable than the patent and its prosecution history in determining how to read claim terms.”).

For the foregoing reasons, we determine that the broadest reasonable interpretation of “transceiver” includes a transponder.

III. OBVIOUSNESS ANALYSIS

A. Legal Standards

In *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), the Supreme Court set out a framework for assessing obviousness under § 103 that requires consideration of four factors: (1) the “level of ordinary skill in the pertinent art,” (2) the “scope and content of the prior art,” (3) the “differences between the prior art and the claims at issue,” and (4) “secondary considerations” of nonobviousness such as “commercial success, long felt but unsolved needs, failure of others, etc.” *Id.* at 17–18; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007). In this case, the parties did not present any evidence relating to secondary considerations. We discuss the first three *Graham* factors below.

B. Level of Ordinary Skill in the Art

In determining the level of skill in the art, we consider the type of problems encountered in the art, the prior art solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir.

1986); *Orthopedic Equip. Co., Inc. v. United States*, 702 F.2d 1005, 1011 (Fed. Cir. 1983).

In our Institution Decision, we adopted Petitioner’s proposal that a person of ordinary skill in the art at the time of the invention

“would have had an undergraduate degree or the equivalent thereof and at least five (5) years of experience in train operations or train control systems” and “would have had knowledge of train control systems, train safety systems that include wayside systems, track circuits and train communication systems, and would have understood how to search available literature for relevant publications.”

Dec. on Inst. 7 (quoting Pet. 7). Following institution, Patent Owner “agrees that the definition of a [person of ordinary skill in the art] proposed by the Petitioner and adopted by the Board [in the Institution Decision] is appropriate for purposes of this proceeding.” PO Resp. 12. We adopt the parties’ agreed-upon definition of the level of ordinary skill in the art, which is the one set forth above.

C. Ground 1: Obviousness Based on Birkin and Petit

Petitioner contends that claims 1, 7, 15, 19, 20, and 26 are unpatentable under 35 U.S.C. § 103(a) as obvious over Birkin and Petit. Pet. 21–38; Reply 20–21. Patent Owner disputes those contentions. PO Resp. 21–33.

1. Summary of Birkin

Birkin discloses a communication system for a train having a “proving circuit for proving conditions of the railway track ahead of the train.” Ex. 1006, (57). The proving circuit includes a transponder “positioned in advance of the track section to be proved so that it is interrogated by the train prior to the train entering that section.” *Id.* at 2:11–13. The track

circuit transponder can respond to the train's interrogation with a message indicating the condition of the circuit. *Id.* at 1:34–39, 2:66–3:1. If the train is notified of or predicts an upcoming track circuit transponder but receives no response to an interrogation, the train assumes that the rail circuit is open. *Id.* at 2:34–41.

2. *Summary of Petit*

Petit describes a system that controls the operation of crossing protection equipment for a highway crossing on a railroad. Ex. 1008, 1:58–62. In Petit's system, a communications link is established between a train approaching the crossing and the crossing equipment. *Id.* at 2:4–6. The first message from the train is initiated when the locomotive passes a beacon transponder located beyond a safe braking distance for trains travelling toward the crossing. *Id.* at 2:32–37. The messages from the approaching train to the crossing equipment include fields for crossing ID, train speed, the train's distance from the crossing, and other information. *Id.* at 2:10–12, 4:58–67, 5:12–14. The messages from the crossing equipment to the train contain information as to when the next message from the train is required, as well as minimum time for the train to reach the crossing. *Id.* at 2:12–20, 7:41–57. The approaching train and the crossing equipment can interchange these messages multiple times, with the minimum time being repeatedly updated. *Id.* at [57], 7:64–66. When the minimum time has expired, the highway crossing gates are activated to drop. *Id.* at 7:67–8:2. Because the gates are activated when the train reaches the crossing, “[t]he time for the gates to be down is then minimized with the advantages of improved vehicular traffic flow over the crossing.” *Id.* at 8:4–8. Petit employs “vital communications logic which activates the protection equipment to its safe

condition or sets alarms or brakes in the train in the event of errors or failures in the messages being handled in the crossing controller or in the train equipment. . . .” *Id.* at [57]; *see also id.* at 1:62–68, 6:1–5, 6:58–65, 7:16–19.

3. *Analysis of Claim 1*

a. *Whether the Cited Combination Teaches Each Limitation*

We are persuaded by Petitioner’s contentions that Birkin and Petit teach every limitation of claim 1. *See* Pet. 28–34. Our findings for each limitation are presented below. We note at the outset that Patent Owner only disputes Petitioner’s contentions for limitations [e] and [f]. *See* PO Resp. 27–33.⁷

i. *Limitation [a]: “a control unit”*

We find that Petit discloses a control unit because it teaches a “controller . . . or CPU 58” that participates in establishing a communications link with crossing equipment and “is connected to drive the controller of a brake or to actuate the train’s brakes or an alarm.” *See* Ex. 1008, 4:22–23, 4:32–34, 4:49–51; *see also* Pet. 28.

⁷ The scheduling order in this proceeding reminded Patent Owner that “any arguments for patentability not raised in the [Patent Owner Response] will be deemed waived.” Paper 12, 3; *see also* 37 C.F.R. § 42.23(a) (“Any material fact not specifically denied may be considered admitted.”); *In re Nuvasive, Inc.*, 842 F.3d 1376, 1380–81 (Fed. Cir. 2016) (holding that a patentee waived an argument by presenting it only in the preliminary proceeding and not during the trial, despite the Board cautioning the patentee that arguments not briefed in the response would be deemed waived).

- ii. *Limitation [b]: “a warning device in communication with the control unit”*

We find that Petit discloses this limitation because it describes that the CPU can actuate an alarm. *See* Ex. 1008, 4:49–51; *see also* Pet. 28.

- iii. *Limitation [c]: “a brake interface unit, the brake interface unit being in communication with the control unit and a train brake, the brake interface unit being operable to activate the train brake under control of the control unit”*

We find that Petit discloses this limitation because it teaches that the CPU can actuate the train’s brakes due to a failure in the system or a communications failure. *See* Ex. 1008, 4:49–57, 6:1–5; *see also* Pet. 29.

- iv. *Limitation [d]: “a transceiver, the transceiver being located on the train and being in communication with the control unit”*

We find that Birkin’s interrogator discloses a transceiver located on the train. *See* Ex. 1006, 1:29, 2:5–6; Ex. 2009, 49:16–20 (Petitioner’s declarant, Mr. Ditmeyer, testifying that Birkin’s interrogator is a transceiver); *id.* at 48:17–21, 55:11–17 (Mr. Ditmeyer testifying that Birkin’s communications from the train to the transponder and from the transponder to the train were radio-based); *see also* Pet. 29–30. As discussed in greater detail below, Birkin’s interrogator sends a signal to a transponder and the interrogator then receives a responsive message from the transponder. *See* Ex. 1006, 2:18–20, 2:53–57, 2:67–3:1, 4:31–35; Tr. 26:21–25, 25:19–26:2.⁸ Additionally, we find that Petit’s radio 64 also discloses this limitation. *See* Ex. 1008, 4:32–35, Fig. 2; *see also* Pet. 29–30.

⁸ In connection with limitation [e], Patent Owner argues that Birkin’s interrogator is not a transceiver. *See* PO Resp. 28. We address that argument below.

- v. *Limitation [e]: “wherein the control unit is configured to perform the steps of transmitting an interrogation message to a track circuit transceiver associated with a track circuit”*

We find that Birkin discloses this limitation. Birkin teaches an interrogator on the train for interrogating the transponder of an upcoming track circuit. *See* Ex. 1006, 2:11–13, 4:31–35; Ex. 1002 ¶ 48; *see also* Pet. 30; Reply 20–21. As discussed in Section II.B, we construe “transceiver” to encompass transponders. Applying that construction, we find that Birkin’s transponder is “a track circuit transceiver associated with a track circuit” as recited in this limitation. *See* Ex. 1006, 2:11–13, 4:31–35.

As discussed in Section II.A, we construe “interrogation message” to mean “a targeted request for status information.” Under that construction, we find that Birkin’s interrogator sends a targeted request for status information to the track circuit transponder. Birkin’s interrogator sends a signal to the track circuit transponder and the interrogator receives a responsive message from the transponder. *See* Ex. 1006, 2:18–20, 2:53–57, 2:67–3:1, 4:31–35. Patent Owner agrees with these aspects of Birkin’s operation. *See* Tr. 26:21–25, 25:19–26:2. Further, the purpose of the train’s interrogation is to gather information regarding the condition of the track ahead, and the message the transponder sends in response to the interrogator indicates the track circuit’s condition. *See* Ex. 1006, 1:24–30, 1:34–39, 2:18–20, 3:15–16, 3:22–24, 3:46–52; Ex. 2009, 44:22–45:4. Thus, the interrogator’s signal to the transponder is a request for status information.

The signal from the train’s interrogator is also targeted. Birkin discloses that “transponder 1 is positioned in advance of the track section to be proved so that it is interrogated by the train prior to the train entering that

section.” Ex. 1006, 2:11–13. “The position of the transponder 1 may be predicted by the train by the use of an odometer on the train or by a beacon 3 . . . or another transponder placed on the track in advance of the transponder.” *Id.* at 2:34–38. Thus, Birkin’s interrogation is targeted to the transponder, such that “if the train does not receive the expected message from transponder 1, the assumption made by the interrogator is that the rail circuit is open.” *Id.* at 2:38–41; *see also* Ex. 1032, 57:7–15 (Patent Owner’s declarant, Mr. Loud, testifying that Birkin’s interrogator “knows it’s talking to one transponder . . . [b]ecause it can only read one transponder at a time”); Ex. 2009, 45:15–18; Reply 20.

We have considered Patent Owner’s rebuttal arguments concerning this limitation but we do not find them persuasive. Patent Owner argues that “[t]he ‘interrogator’ on Birkin’s train is . . . effectively a power source for the track circuit transponder but lacks a transceiver and is unable to transmit any ‘request’ to the transponder, much less a targeted request for status information.” PO Resp. 28 (citing Ex. 2007 ¶ 205). We are not persuaded that the nature of the signal Birkin’s interrogator sends to the transponder prevents it from being an interrogation message. Patent Owner’s proposed construction for “interrogation message,” which we adopted, is “a targeted request for status information.” That construction does not require any particular format for the targeted status request. Birkin teaches that the purpose of the train’s interrogation is to gather information from the transponder about the track circuit to which it is connected, to ensure that the condition of the track is safe. *See, e.g.*, Ex. 1006, 1:24–30, 1:34–39. We credit Mr. Ditmeyer’s testimony that “[b]y energizing the transponder, the

train is indicating that it is there at the transponder and needs information from the transponder.” Ex. 2009, 45:15–18.

Patent Owner also argues that Birkin’s interrogations are not targeted because the interrogator “will power any track circuit transponders that come within immediate proximity of these ‘interrogations’ when the train passes over them. These ‘interrogations’ are therefore not intended for any particular track circuit of interest.” PO Resp. 29 (citing Ex. 2007 ¶ 205; Ex. 2009, 60:6–12). This argument confirms that both parties, as well as their experts, agree that Birkin’s interrogator only interacts with the transponder it is directly over. See Tr. 10:19–11:24; Ex. 2007 ¶ 77; Ex. 2009, 60:6–12; Ex. 1032, 57:7–15. We agree with Petitioner that this shows one reason why the interrogation is targeted. See Reply 20 (“That the signal is emitted to an area between the track ensures that only a transponder for that section of track can respond, confirming a directional targeting.”). In other words, Birkin’s interrogation is intended only for the transponder that is directly beneath the train, because that transponder is connected to the track circuit that tests the condition of the track the train is about to reach.

For the foregoing reasons, we find that Birkin teaches limitation [e].

- vi. *Limitation [f]: “listening for a response from the track circuit transceiver, the response including an indication as to a condition of a section of track monitored by the track circuit”*

We find that Birkin discloses this limitation because Birkin’s transponder responds to the interrogation, and the response can indicate the condition of the track circuit connected to the transponder. Ex. 1008, 1:34–39, 2:68–3:1; Ex. 2007 ¶ 79 (Mr. Loud testifying that Birkin’s transponder “receive[s] power from the ‘interrogator’ and transmit[s] the status of its

track circuit(s) once the track circuit(s) determine(s) the condition of the track”); Ex. 2009, 44:22–45:8; *see also* Pet. 31; Reply 21. Patent Owner argues that Birkin does not transmit an interrogation message and, therefore, there can be no response to such a message. PO Resp. 32. This argument is unpersuasive for the reasons just discussed in connection with limitation [e].

vii. *Limitation [g]: “activating the warning device if the response indicates that it is not safe for the train to proceed”*

We are persuaded by Petitioner’s argument that the cited combination teaches this limitation. *See* Pet. 32. We find that Petit teaches activating an alarm if the response message indicates an error or failure. Ex. 1008, 6:1–5; Ex. 1002 ¶¶ 58–59. We find that Birkin teaches that the response from the track circuit transponder can indicate the condition of the track circuit, or the interrogator may assume that the lack of a response means that the track circuit is open. Ex. 1006, 1:34–39, 2:38–41. Thus, the proposed combination, in which the response includes the condition of the upcoming track circuit as taught in Birkin, teaches this limitation.

viii. *Limitation [h]: “activating the train’s brake via the brake interface unit if an operator of the train fails to acknowledge the warning or fails to reduce the speed of the train to a safe speed within a period of time after the warning”*

We are persuaded by Petitioner’s argument that the cited combination teaches this limitation. *See* Pet. 33–34. Petit teaches setting the brakes or activating an alarm if the response message indicates an error or failure. Ex. 1008, 6:1–5; Ex. 1002 ¶¶ 58–59. Petit also teaches pre-acknowledge push button switches that the driver manually actuates to ensure that the driver is alerted to upcoming crossings. Ex. 1008, 3:66–68. We are persuaded by

Mr. Ditmeyer’s testimony that an ordinarily skilled artisan would understand that the manual actuation acknowledgement of Petit would be incorporated into the onboard computer of the proposed combination to provide operator alerts when a response message indicates an unsafe condition, and if the operator fails to acknowledge the alert, the brakes would be activated. *See* Ex. 1002 ¶¶ 112. Thus, the combination teaches this limitation. Patent Owner’s only rebuttal concerning this limitation refers to its arguments concerning limitations [e] and [f]. *See* PO Resp. 33 n.5. Those arguments are not persuasive for the reasons already discussed.

b. Reason to Combine

We find that Petitioner has presented reasoning supported by rational underpinnings for why an ordinarily skilled artisan would have combined Birkin and Petit. As Petitioner notes, Birkin describes a system in which a train interrogates an upcoming track circuit to determine the condition of an upcoming section of track, but it “is silent as to what the train does with the response signal when received from the upcoming track circuit or other upcoming targets.” Pet. 22 (citing Ex. 1002 ¶¶ 110–112). We credit Mr. Ditmeyer’s testimony that an ordinarily skilled artisan “would be motivated to look to similar references that disclose communication systems to expand upon the ideas set forth in Birkin to fill in the gap of Birkin (namely what to do with the response message from the transponder).” Ex. 1002 ¶ 111. Petit teaches that an on board computer determines whether to activate an alarm or the train’s braking system based on the response message from an upcoming device. Ex. 1008, 4:32–35, 4:49–57, 6:1–5; *see also* Pet. 24; Ex. 1002 ¶ 112. Specifically, Petit teaches that the on board computer activates the brakes or alarm if there is “an error in the message, which, of course, is

indicative of a communications failure or a failure in a component of the system.” Ex. 1008, 6:1–5. We are persuaded by Petitioner’s argument that an ordinarily skilled artisan would have been motivated to improve safety by combining Birkin’s teachings regarding the train’s interrogation of upcoming devices with Petit’s teachings to use the returned signal to activate alarms or apply brakes. *Id.* at 23; *see also* Ex. 1002 ¶ 113 (Mr. Ditmeyer testifying that an ordinarily skilled artisan “would have understood that Petit improves the safety of the system in Birkin by introducing known automatic stop protection and activation of a warning device to alert the train operator in the even a track circuit indicates a broken rail or some other unsafe condition”) (citing Ex. 1008, 4:49–51).

Patent Owner counters that Birkin is not silent as to what the train does with the response; rather, Birkin says that it is used for radio-based cab-signaling systems, and a skilled artisan “would have known that in a cab-signaling system track status and condition information is communicated to the train engineer via some device within the locomotive cab.” PO Resp. 21 (citing Ex. 1006, 1:21; Ex. 2007 ¶¶ 69–71). This argument does not persuade us that a skilled artisan would not have been motivated to make the proposed combination. Indeed, Patent Owner’s argument that there is no gap in Birkin for Petit to fill only seems to amplify Petitioner’s obviousness case — i.e., that even without Petit, an ordinarily skilled artisan would have found it obvious to use the transponder’s response in Birkin to trigger an alarm to the engineer in the locomotive cab.

Patent Owner further argues that Petit does not teach how to use the information obtained from the transponder to activate brakes or alarms because in Petit, the information obtained from the transponder is used by

the train to transmit an activation message. PO Resp. 22 (Ex. 2007 ¶¶ 91–93, 158). This argument misconstrues Petitioner’s obviousness case. Petitioner does not point to the train’s initial read from the beacon transponder as the information used to trigger brakes or alarms in Petit. Rather, Petitioner points to the response signal the on board computer receives from an upcoming crossing. See Pet. 22–23; Ex. 1002 ¶ 112.

Relatedly, Patent Owner argues that “Petit only discloses the train taking action based on whether it receives an acknowledgement of its activation message, and not based on the configuration of the crossing, which is never communicated to the train.” PO Resp. 23 (citing Ex. 2007 ¶¶ 92, 96–108, 160). Yet as discussed above in connection with limitation [f], we find that Birkin teaches that the transponder’s response provides information about the upcoming track circuit. Thus, it is not necessary to the success of Petitioner’s obviousness case for Petit to teach that the train decides whether to brake based on the configuration of the crossing. Rather, it is sufficient for Petit to teach that the train’s on board computer decides whether to activate the brakes or alarms based on the response message it receives from the crossing, and we are persuaded that Petit does disclose that. See Ex. 1008, 4:32–35, 4:49–57, 6:1–5; Ex. 1002 ¶ 112.

Patent Owner also argues that Birkin lacks a transceiver and does not send an interrogation message. PO Resp. 22. We addressed these arguments in connection with limitation [e].

Still further, Patent Owner argues that an ordinarily skilled artisan “would have viewed Birkin and Petit as teaching two alternative and incompatible approaches to train communications with wayside devices and would not have been motivated to combine them.” PO Resp. 24 (citing Ex.

2007 ¶¶ 162–164). Patent Owner contends that Petit’s transponder is not physically connected to an upcoming crossing, and only serves to notify the train of the upcoming crossing, and the train then communicates with the crossing. *Id.* at 25. This contrasts with Birkin’s communication scheme, in which the train powers the transponder it passes over, the connected track circuit then determines the track’s condition, and the transponder automatically transmits that information to the train. *Id.* We fail to see how these differences undermine the obviousness case Petitioner has presented. Both references teach systems for communications between trains and wayside devices. The communication schemes need not be identical for an ordinarily skilled artisan to be motivated to combine Birkin’s interrogation of an upcoming device with Petit’s teaching regarding using the response message from the device to determine whether to brake or alert the engineer.

Patent Owner argues that Birkin teaches away from the combination because it recognizes radio based cab signaling systems but “nevertheless discloses a transponder-based method of cab signaling.” PO Resp. 26 (citing Ex. 2007 ¶ 166). We agree with Petitioner that Patent Owner has not identified any disclosure in Birkin that “criticize[s], discredit[s], or otherwise discourage[s]” the proposed combination to support its teaching away argument. Reply 5 (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 (Fed. Cir. 2018)).

For the foregoing reasons, we find that an ordinarily skilled artisan would have been motivated to combine Birkin and Petit as Petitioner proposes.

c. Conclusion Regarding Claim 1

In view of our findings above concerning the individual *Graham* factors on which the parties have presented evidence and argument, we determine that Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious to a person of ordinary skill in the art based on the combination of Birkin and Petit.

4. Analysis of Claims 15, 19, and 20

Petitioner explains how the limitations of claims 15, 19, and 20 are taught by Birkin and Petit. *See* Pet. 34–38. Patent Owner does not present any argument to these claims separate from the arguments discussed above regarding claim 1. *See* PO Resp. 21–33; *see also supra* n.7.

We are persuaded by Petitioner’s contentions. In particular, with respect to dependent claim 15, we find that Petit teaches the claimed subject matter because it discloses activating an alert if there is an error in the message from the crossing, which indicates a communications failure or a failure in a component of the system. Ex. 1008, 6:1–5; *see also* Pet. 34–35.

Independent claim 19 recites a method for controlling a train, the first two steps of which are substantially identical to limitations [e] and [f] of claim 1. These limitations are taught by Birkin for the reasons discussed above. *See supra* § III.C.3.a.v.–vi. The third and fourth steps in claim 19 are very similar to limitations [g] and [h] of claim 1 and are taught by the cited combination for the same reasons discussed above. *See supra* § III.C.3.a.vii.–viii.; *see also* Pet. 36–37.

Dependent claim 20 adds that the train is allowed to continue if a response is received indicating that it is safe for the train to proceed and activating the train brake to stop the train before reaching the section of track

monitored by the track circuit otherwise. *See* Ex. 1001, 9:21–27. We are persuaded by Petitioner’s argument that the cited combination teaches these limitations. *See* Pet. 37–38. We find that Petit teaches that the brakes are not applied if the train receives a satisfactory response from the upcoming crossing. Ex. 1008, 6:56–7:19, 8:37–39. We further find that Petit teaches to activate the train brake to stop the train before the crossing based on the response from the crossing device. *See id.* at 4:49–57, 5:67–6:5, 8:37–39, 11:28–12:2. In the combined system Petitioner proposes, the response includes the condition of the upcoming track circuit as taught in Birkin. *See* Pet. 37 (citing Ex. 1002 ¶¶ 58–59). We are persuaded by Petitioner’s argument that the combination teaches the subject matter of claim 20. *See id.* at 37–38 (citing Ex. 1002 ¶¶ 65, 50, 117).

After weighing the *Graham* factors on which the parties have presented argument and evidence, we determine that Petitioner has shown by a preponderance of the evidence that claims 15, 19, and 20 would have been obvious to a person of ordinary skill in the art based on the combination of Birkin and Petit.

5. Analysis of Claims 7 and 26

Dependent claims 7 and 26 recite that “the interrogation message includes an identifier of a track circuit for which the interrogation message is intended.” Ex. 1001, 8:26–28, 9:41–44.

We are persuaded by Petitioner’s assertion that Petit teaches to include in a message an identifier of the device to which a message is directed. *See* Ex. 1008, 5:12–14 (“The messages which are directed to the crossing equipment will be addressed to the crossing equipment because of the crossing I.D. field.”); *see also* Pet. 34.

However, we find that Petitioner has not offered a persuasive reason why an ordinarily skilled artisan would have modified Birkin's interrogation message to include this feature from Petit's communication scheme.

Petitioner argues that a skilled artisan would have been motivated to do so because Birkin contemplates the train communicating with multiple wayside devices but "is silent with respect to how the train can distinguish one upcoming device from another." Pet. 24 (citing Ex. 1002 ¶ 116); *see also id.* at 25–26. According to Petitioner, Petit fills this silence because its addressing technique allows the train to "distinguish different upcoming devices and ensure that interrogation messages are sent to the correct device." *See id.* at 24, 26 (citing Ex. 1002 ¶¶ 116, 117). But as noted above in the discussion of why Birkin's interrogation message is targeted, the parties and their experts are in agreement that Birkin's interrogator only communicates with the transponder it is directly over. *See supra* § III.C.3.a.v.

We agree with Patent Owner that this undercuts Petitioner's stated rationale for the proposed modification, because there is no apparent need for an interrogator that only communicates with one device at a time to distinguish between devices. *See* PO Resp. 23–24 (citing Ex. 2007 ¶¶ 74, 161). In his deposition, Mr. Ditmeyer was asked why Birkin would need to distinguish upcoming devices, considering that its interrogator simply energizes transponders as it encounters them, and he responded that it "[w]ouldn't. . . . That's why it's silent on it." *See* Ex. 2009, 146:25–147:17. Accordingly, we find that Petitioner has not provided a persuasive reason why an ordinarily skilled artisan would have combined Birkin and Petit to arrive at the subject matter of claims 7 and 26.

Thus, Petitioner has not shown by a preponderance of the evidence that claims 7 and 26 would have been obvious to an ordinarily skilled artisan based on the combination of Birkin and Petit.

6. Conclusion Regarding Ground 1

We determine that Petitioner has shown that each of claims 1, 15, 19, and 20 would have been obvious based on the combination of Birkin and Petit. We determine that Petitioner has not shown that either of claims 7 and 26 would have been obvious based on the combination of Birkin and Petit.

D. Ground 3: Obviousness Based on Birkin, Petit, and Blesener

Petitioner contends that claims 7–9 and 26–28 are unpatentable under 35 U.S.C. § 103(a) as obvious over Birkin, Petit, and Blesener. Pet. 52–61; Reply 22–24. Patent Owner disputes those contentions. See PO Resp. 48–61.

1. Summary of Blesener

Blesener relates to an “inexpensive, low-power vehicle collision/crossing warning system that enables simple and decentralized installation, operation, and maintenance. . . .” Ex. 1007, 1:14–15.

Blesener describes an embodiment in which a locomotive transmits every four seconds a beacon signal that contains the locomotive’s position, speed, direction, and heading. *Id.* at 11:4–7. “Any crossing can listen to any locomotive at all times, if the locomotive is within radio range of the crossing.” *Id.* at 11:8–9. Controller 20 at the crossing decides whether to activate the signal by deciding if the locomotive is approaching the crossing based on the locomotive’s location from the beacon. *Id.* at 11:10–15. “Once activation has occurred master controller 20 can optionally notify the locomotive that the crossing is activated.” *Id.* at 11:15–16. When the

locomotive has passed, controller 20 deactivates the crossing. *Id.* at 11:20–21.

Blesener’s system “uses a Smart Self Updating System (SSUS) to poll the crossing and share the latest systems information. In this way, as the locomotive moves down the track it is also updating itself and all crossings along the line with the latest system information.” *Id.* at 10:5–7. “Each locomotive SSUS contains a database of the status of all known crossings and each crossing controller has a copy of a smaller localized database. Each time a locomotive and crossing interact, the databases are compared and whoever has the latest information, passes this data to the other.” *Id.* at 10:22–25.

Blesener also describes a fail-safe for a broken crossing, which utilizes the GPS systems on board the locomotive and master controller 20. *Id.* at 12:14–19. Because “[t]his data allows the system to know about . . . the location of a crossing and . . . where the locomotive is, the system can cross check if it is approaching a crossing and has not gotten a confirmation that the crossing is activated.” *Id.* at 12:16–18. “Typically the locomotive does not need to know there is a crossing ahead because, if the crossing is working, the locomotive beacon will cause it to activate. When the crossing activates, it sends geo-location data to the locomotive” and data about the newly discovered crossing is placed in the locomotive’s database. *Id.* at 12:20–25.

2. Summary of Petitioner’s Proposed Combination for Ground 3

Petitioner’s combination for this ground is based on the combination discussed in the first ground, but modified to include Blesener’s teachings regarding using a database and a positioning system. In particular, Petitioner

argues that an ordinarily skilled artisan would have been motivated to reduce the hardware requirements of the Birkin/Petit combination and consolidate the vital processing aboard the train, per Blesener's teachings. Pet. 52 (citing Ex. 1002 ¶ 134). In the Birkin/Petit system, a transponder notifies the train of an upcoming track circuit, prompting the train to send an interrogation message to the track circuit. *Id.* (citing Ex. 1002 ¶ 132). According to Petitioner, an ordinarily skilled artisan seeking to improve on the Birkin/Petit system "would have sought to take advantage of the fact that Petit's onboard CPU is a vital component and minimize trackside hardware by consolidating the fail-safe (vital) functions onboard, and to modify Birkin/Petit's communication protocol to reduce the interfaces (particularly over-air interfaces) where potential failures could occur." *Id.* at 53 (citing Ex. 1002 ¶ 134). Petitioner further argues that Blesener describes a database onboard the train that "organizes the location and type of crossings and other upcoming devices that a train may encounter along its path" and that "uses the device's location as an address within the database to locate the next upcoming crossing." *Id.* (citing Ex. 1007, 10:22–26, 22:14–16). "Pursuant to the teachings of Blesener, the Birkin/Petit OBC would be modified to no longer rely on trackside beacons or transponders to provide an indication of approaching track circuits; instead the GPS and database enable the OBC to detect upcoming devices." *Id.* at 54 (citing Ex. 1002 ¶¶ 135–136).

3. *Claims 7 and 26*

Dependent claims 7 and 26 recite that "the interrogation message includes an identifier of a track circuit for which the interrogation message is intended." Ex. 1001, 8:26–28, 9:41–44.

We find that Petit teaches to include in a message an identifier of the device to which a message is directed. *See* Ex. 1008, 5:12–14 (“The messages which are directed to the crossing equipment will be addressed to the crossing equipment because of the crossing I.D. field.”); *id.* at 9:35–45; *see also* Pet. 34, 58. We further find that Blesener’s on board computer includes a database that uses devices’ geolocation as their address, and we credit Mr. Ditmeyer’s testimony that Blesener’s “methodology uses location information as a crossing identifier akin to the crossing I.D.” in Petit. Ex. 1002 ¶ 97; Ex. 1007, 10:22–23, 12:14–18, 22:12–16, 26:24–25. The proposed combination, in which an interrogation message (per Birkin’s teachings) is sent remotely (per Blesener’s teachings) to an upcoming track circuit and the message includes an identifier of the intended device (per Petit’s and Blesener’s teachings), discloses the claimed subject matter.

We have considered Patent Owner’s rebuttal arguments that the cited references do not teach the subject matter of claims 7 and 26, but we do not find those arguments persuasive. *See* PO Resp. 52–55. Referring back to its rebuttal arguments against Ground 1, Patent Owner argues that neither Birkin nor Petit teaches an “interrogation message.” *See id.* at 52. For the reasons discussed above in connection with Ground 1, we find that Birkin teaches an interrogation message. *See supra* § III.C.3.a.v. Patent Owner further argues that Blesener does not teach an “interrogation message.” *See* PO Resp. 53–55. However, because we find that Birkin teaches an interrogation message, Blesener need not also teach an interrogation message for Petitioner’s obviousness theory to succeed. *See In re Merck*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) (“Nonobviousness cannot be

established by attacking references individually where the rejection is based upon the teachings of a combination of references.”).

We further find that Petitioner has articulated sufficient reasoning as to why a skilled artisan would have been motivated to combine Birkin, Petit, and Blesener as claimed. We find persuasive Petitioner’s argument, supported by Mr. Ditmeyer’s testimony, that an ordinarily skilled artisan would have been motivated to modify the Birkin/Petit system’s use of a transponder to trigger an interrogation message by instead employing an onboard database as a trigger for the message in order to remove one potential source of error, and to consolidate more of the safety critical system on the train itself. *See* Pet. 55–56; Ex. 1002 ¶¶ 1343–135.

We have considered Patent Owner’s rebuttal arguments concerning motivation, but we do not find them persuasive. *See* PO Resp. 48–52. Patent Owner argues that Birkin teaches away from radio based cab signaling. PO Resp. 49 (citing Ex. 1006, 1:6–13; Ex. 2007 ¶¶ 179–180). For the reasons already discussed in connection with Ground 1, we disagree. *See supra* § III.C.3.b.

Patent Owner also argues that Blesener teaches against using transponders to activate upcoming devices because of the expense of installing, operating, and maintaining them. *See* PO Resp. 49 (citing Ex. 1008, 2:1–25; Ex. 2007 ¶ 181). This argument does not undercut, but rather affirms, Petitioner’s motivation arguments, which point to this same portion of Blesener as suggesting to a skilled artisan to eliminate the transponder of the Birkin/Petit system. *See* Pet. 55; Ex. 1002 ¶ 133.

In another teaching away argument, Patent Owner asserts that Blesener’s background section recognized something similar to Petit’s

system as an alternative approach to crossing activation but still stated that there continued to be a need for an inexpensive and reliable crossing system. PO Resp. 49–50 (citing Ex. 1007, 2:22–25; Ex. 2007 ¶¶ 182–185). Again, we are not persuaded that this teaches away from Petitioner’s proposed combination. “A reference that ‘merely expresses a general preference for an alternative invention but does not criticize, discredit, or otherwise discourage investigation into’ the claimed invention does not teach away.” *Meiresonne v. Google, Inc.*, 849 F.3d 1379, 1382 (Fed. Cir. 2017).

Next, Patent Owner argues that Blesener does not teach using the onboard database to detect upcoming devices in order to be able to communicate with them, but instead only uses the database to determine whether an acknowledgement should have been received from a crossing. PO Resp. 50–51 (citing Ex. 1007, 12:14–25; Ex. 2007 ¶ 186). Further, Patent Owner asserts that Blesener’s database is dynamically maintained and that a train may not know of a crossing until it interacts with it. *Id.* at 51 (citing Ex. 2007 ¶ 187). Patent Owner contends that the proposed combination would therefore be inoperable. *Id.* We are not persuaded that the proposed combination would be inoperable. When asked about this contention at the hearing, Patent Owner’s counsel agreed that although the train would not have the capability to discover new devices not in its database, the train would still be able to communicate with the devices that are in its database. *See* Tr. 34:21–35:7. We agree with Patent Owner that the proposed combination operates somewhat differently than Blesener and would not have all of the features that Blesener’s system provides. But this does not dissuade us from the motivation arguments Petitioner presents, because Petitioner has pointed to advantages that the proposed combination

would provide over the Birkin/Petit system—namely, eliminating one potential source of error and consolidating safety systems onboard the train. *See Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (“A given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine.”) (quoting *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006)).

For these reasons, we determine that Petitioner has shown by a preponderance of the evidence that claims 7 and 26 would have been obvious to a person of ordinary skill in the art based on the combination of Birkin, Petit, and Blesener.

4. *Claims 8 and 27*

Dependent claim 8 recites a positioning system and a database of locations for the track circuits, and further recites that the control unit is configured to “identify[] a track circuit in the database which is a next track circuit which the train will pass based on information from the positioning system” and “obtain[] an identifier from the database associated with the track circuit identified in the identifying step and including the identifier in the interrogations message.” Ex. 1001, 8:29–44. Dependent claim 27 recites substantially the same “identifying” and “obtaining” steps recited in claim 8. *Id.* at 9:45–52.

We find that Blesener teaches a positioning system and a database that includes the locations of devices. Ex. 1007, 3:11–14, 10:22–25, 12:14–16; *see also* Pet. 58–59. We further find that the cited combination teaches the “identifying” step. Blesener teaches that because its system knows the location of the train and upcoming crossings, the system can “cross check if

it is approaching a crossing and has not gotten a confirmation that it is safe.” Ex. 1007, 12:16–18. In the proposed combination, the train uses Blesener’s GPS to determine the train’s location and Blesener’s database to identify an upcoming track circuit. *See* Pet. 59; Ex. 1002 ¶ 137.

Regarding the “obtaining” step, we find that Blesener teaches a database that includes the location of devices and that a device’s controller can use its geoposition as its address. Ex. 1007, 12:14–16, 22:12–16. Blesener also suggests the use of “unique ID’s” when clusters of devices overlap. *Id.* at 26:25. Further, we find that Petit teaches that messages to an upcoming device include an identification number to distinguish the target device from other devices on the tracks. Ex. 1008, 5:12–14, 9:35–45. As Petitioner points out, in Petit, the train obtains the address of the device through its read of the track-side transponder. Reply 23 (citing Ex. 1008, 4:3–13). We are persuaded by Petitioner’s argument that “when Petit’s scheme is modified per Blesener, the I.D. that Petit receives from trackside beacons originates in the onboard database.” *Id.* at 23–24. Thus, we are persuaded that the combination teaches a skilled artisan to include an identifier for the devices in the database to be used in the train’s communications with those devices. *See* Ex. 1002 ¶ 141; *see also* Ex. 2011, 283:23–284:23. Thus, we find that the combination teaches the “obtaining” step to a person of ordinary skill in the art.

Patent Owner argues that Blesener does not teach obtaining an identifier from the database and that the Petition relied only on Blesener for this limitation. PO Resp. 55–56. We disagree. The Petition makes clear that the arguments regarding the limitations in these claims, including the “obtaining” step, are based on the combination of Blesener with Birkin and

Petit, not Blesener alone. *See* Pet. 58–59 (repeatedly referencing “the combined system of Birkin/Petit and Blesener”).

Patent Owner further argues Petitioner conflates location with identification number, in contravention of the ’774 patent claims treating these as distinct features. PO Resp. 56–58. Relatedly, Patent Owner argues that Blesener suggests a crossing’s location is insufficient to serve as its identification number. *Id.* at 57. But as summarized above, we do not understand Petitioner’s arguments to conflate location and identification number. Blesener teaches using geolocation and unique ID’s as identifiers for devices. Petit teaches using identification numbers in communications with a device. Thus, the combination teaches that devices can be identified not only by location but also by unique IDs or identification numbers. To the extent Patent Owner is correct that Blesener suggests location is insufficient to identify a device, this is all the more reason why a skilled artisan would have incorporated Petit’s identification numbers into the database.

Next, Patent Owner argues that including identification numbers would not “make sense in the context of Blesener’s train, which indiscriminately broadcasts its activation message. . . .” PO Resp. 58. Yet Petitioner’s combination does not incorporate that aspect of Blesener’s operation. The relevant question is not whether including identification numbers makes sense in Blesener’s train, but whether it makes sense in the context of the proposed combination. For the reasons discussed above, Petitioner persuades us that it does.

Finally, Patent Owner argues that “Petitioner’s proposal to also store the crossing IDs of Petit in the Blesener train would have resulted in an

inoperable system.” PO Resp. 59. This argument is unpersuasive for the same reason as the inoperability argument Patent Owner presented with respect to claim 7. *See supra* § III.D.3. In short, the train of the proposed combination would be operable because it would be able to communicate with the devices in its database, even though it would not be able to discover new devices that are not in the database, as Blesener teaches that its train is able to do. Patent Owner does not persuade us that a proposed combination must have every beneficial feature of the references on which the combination is based in order to be considered operable.

For these reasons, we determine that Petitioner has shown by a preponderance of the evidence that claims 8 and 27 would have been obvious to a person of ordinary skill in the art based on the combination of Birkin, Petit, and Blesener.

5. Claims 9 and 28

Dependent claims 9 and 28 recite transmitting the interrogation message “when a distance between the train’s location and the track circuit identified in the identifying step is below a threshold.” Ex. 1001, 8:45–48, 9:54–56.

We find persuasive Petitioner’s contentions that the combination teaches this limitation. *See* Pet. 59–60; Reply 24. In Birkin, the interrogation is triggered when the train passes a transponder “positioned in advance of the track section to be proved.” Ex. 1006, 2:11–13. Birkin also teaches that the transponder’s position “may be predicted by the train by the use of an odometer on the train or by a beacon . . . or by another transponder. . . .” *Id.* at 2:34–38. Similarly, in Petit, “[t]he first message from the train is initiated when the train locomotive passes a beacon, . . .

which beacon transponder is located well beyond the safe braking distance for trains traveling at fastest speeds allowed toward the crossing.” Ex. 1008, 2:32–37. In both of these references, communication from train to device can be triggered by a device located a set distance from the section of the track over which the train may need to be prevented from moving. In Petitioner’s proposed combination, an on-board computer is used to trigger the train’s interrogation of an upcoming track circuit. See Pet. 60; Ex. 1002 ¶ 141. Blesener teaches that its on-board computer database is able to determine the train’s distance to an upcoming device. Ex. 1007, 14:6–8. Thus, the information is already available in Blesener’s system to simply use the positioning system and database to determine when to send the message in lieu of trackside devices set at predetermined distances ahead of the potentially hazardous section of track, as in the Birkin/Petit system. We find that the combined references teach using a threshold distance to the track circuit to determine when to send an interrogation message.

Patent Owner counters that Birkin’s interrogation “occurs only when the train is within immediate proximity of the transponder, with no determination made as to the train’s distance to the track circuit.” PO Resp. 60. Yet in Birkin, the transponder itself is at a certain distance ahead of the track circuit. Ex. 1006, 2:11–13. Thus, in the proposed combination, when the transponder is replaced by remote communications, the interrogation would occur at a distance ahead of the actual track circuit to be proved, just as in Birkin. Moreover, Birkin discloses that the transponder’s position “may be predicted by the train by the use of an odometer on the train or by a beacon . . . or by another transponder. . . .” Ex. 1006, 2:34–38. Using this predicted position, Birkin’s interrogator assumes that the rail circuit is open

if it does not receive an expected message from the transponder. *Id.* at 2:38–41. This disclosure teaches that Birkin’s system uses distance information to monitor communications with the upcoming device to ensure that the train does not proceed onto an unsafe section of track. Patent Owner also argues that “Blesener did not suggest using the locations in its database to trigger an activation message to a crossing, and instead teaches broadcasting an activation message.” PO Resp. 61. As discussed previously, the proposed combination need not operate the same way as Blesener. Petitioner has explained why a skilled artisan would have combined the references as proposed, which is basically to use Blesener’s positioning information as a trigger for interrogation rather than the position of trackside devices located ahead of a device to be interrogated.

Accordingly, we determine that Petitioner has shown by a preponderance of the evidence that claims 9 and 28 would have been obvious to a person of ordinary skill in the art based on the combination of Birkin, Petit, and Blesener.

6. Conclusion Regarding Ground 3

We determine that Petitioner has shown that each of claims 7–9 and 26–28 would have been obvious based on the combination of Birkin, Petit, and Blesener.

E. Other Grounds

In its Ground 2, Petitioner contends that claims 1, 7, 15, 19, 20, and 26 are unpatentable as obvious over Birkin and RSAC. Pet. 38–51. In Ground 4, Petitioner contends that claims 7–9 and 26–28 are unpatentable as obvious over Birkin, RSAC, and Blesener. Pet. 61–65.

In a final decision, the Board is required to address the patentability of all claims challenged in a petition. *See* 35 U.S.C. § 318(a) (providing that the Board “shall issue a final written decision with respect to the patentability of any patent claim challenged by the petitioner and any new claim added” by amendment during the proceeding); *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1354 (2018) (“[W]hen § 318(a) says the Board’s final written decision ‘shall’ resolve the patentability of ‘any patent claim challenged by the petitioner,’ it means the Board *must* address *every* claim the petitioner has challenged.”); Guidance on the Impact of SAS on AIA Trial Proceedings (Apr. 26, 2018)⁹ (“[I]f the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition The final written decision will address, to the extent claims are still pending at the time of decision, all patent claims challenged by the petitioner and all new claims added through the amendment process.”).

However, we are not aware of any requirement that once all challenged claims have been determined unpatentable, the Board must go on to analyze additional grounds challenging the same claims.¹⁰ In some cases, doing so is an inefficient use of the Board’s resources, in that it may detract

⁹ Available at www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/trials/guidance-impact-sas-aia-trial.

¹⁰ We note that in *Adidas AG v. Nike, Inc.*, 894 F.3d 1256 (Fed. Cir. 2018), the Federal Circuit remanded to the Board to consider a second ground when the Board’s final decision had only addressed a first ground covering the same claims. *Id.* at 1258. However, in that case, the Board’s final decision held that the challenged claims were not unpatentable based on the first ground. *Id.* at 1257. And the Board’s decision did not “suggest[] that its conclusions as to ground 1 would be dispositive as to ground 2.” *Id.* Thus, unlike the circumstances here, the Board’s decision in *Nike* was not dispositive of the Petitioner’s challenges.

from the time and attention that is available to analyze and explain our reasoning for the dispositive issues. In final written decisions both before and after SAS, the Board has declined to reach grounds that challenge claims that have already been held unpatentable. *See Sure-Fire Elec. Corp. v. Yongjiang Yin*, Case IPR2014-01448, slip op. at 25 (PTAB Feb. 22, 2016) (Paper 56), *aff'd*, 702 F. App'x 981 (Fed. Cir. 2017); *SK Hynix Inc. v. Netlist, Inc.*, Case IPR2017-00692, slip op. at 40 (PTAB July 5, 2018) (Paper 25). Similarly, the Federal Circuit generally declines to reach additional grounds of unpatentability when it has affirmed determinations of unpatentability for the same claims. *See, e.g., Victaulic Co. v. Iancu*, ___ F. App'x ___, 2018 WL 6264235, at *5 (Fed. Cir. Nov. 29, 2018) (“We discern no error in the Board’s analysis and affirm its conclusion that claims 2 and 10 would have been obvious in view of Lewis and Lane. We thus do not reach the question of whether claims 2 and 10 would have been obvious in view of Vieregge and Lane.”); *Cole Kepro Int’l, LLC v. VSR Indus., Inc.*, 695 F. App'x 566, 570 n.2 (Fed. Cir. 2017) (“Because we determine that the Board did not err in concluding that claims 1–14 of the ’814 [patent] are unpatentable as obvious in view of Runte, we do not address the other instituted grounds analyzed by the Board.”); *In re Gleave*, 560 F.3d. 1331, 1338 (Fed. Cir. 2009) (not reaching obviousness after finding anticipation).

Here, Petitioner’s Grounds 2 and 4 challenge claims we have already determined are unpatentable under Grounds 1 and 3. In addition, Petitioner’s challenges in Grounds 2 and 4 appear to present many of the same issues as already discussed, insofar as Birkin and Blesener are used in a similar manner as in the earlier grounds, with a different secondary reference, RSAC, used in the place of Petit for other features. *See* Pet. 45–

51, 64–65. Petitioner’s arguments regarding motivation to combine also overlap substantially with the earlier grounds. *See* Pet. 38–44, 61–63.

Accordingly, in the circumstances of this case, we decline to address the challenges presented in Petitioner’s Grounds 2 and 4.

IV. PATENT OWNER’S MOTION TO EXCLUDE

Patent Owner moves to exclude Exhibits 1035–38, 1041, and 1044. *See* Paper 36. We did not rely on any of these exhibits above. Thus, we dismiss as moot Patent Owner’s motion to exclude.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1, 7–9, 15, 19, 20, and 26–28 of U.S. Patent No. 7,036,774 B2 have been shown to be unpatentable;

FURTHER ORDERED that Patent Owner’s Motion to Exclude Exhibits dismissed as moot; and

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

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