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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte ALEX OLSON, NALIN WEERASINGHE, KUN WANG, and MILOS MILOSEVIC

Appeal 2018-000365
Application 13/705,130
Technology Center 2600

Before JOSEPH L. DIXON, LINZY T. McCARTNEY, and SCOTT E. BAIN, *Administrative Patent Judges*.

McCARTNEY, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants request review of the Examiner's final rejection of claims 1–5, 7–9, 11, and 13–16 under 35 U.S.C. § 134. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

BACKGROUND

The present patent application "relates to cable telemetry for a wellsite." Specification ¶ 27, filed December 4, 2012 ("Spec."). "'Cable telemetry' refers generally to communication between an uphole modem and a downhole modem over a cable." Spec. ¶ 27. The cable telemetry described in the application "enable[s] data reception from tools and send[s] data commands to downhole tools via, for example, a wireline heptacable." Spec. ¶ 27.

Claims 1, 7, and 11 are independent. Claim 1 illustrates the claimed invention:

> 1. A method for multiple carrier frequency, half duplex cable telemetry for a wellsite, comprising:
>
> generating a first type of bi-directional message in a first propagation mode;
>
> generating a second type of bi-directional message in the first propagation mode and in a second propagation mode;
>
> transmitting the first and second types of bi-directional message over a cable operatively coupling a surface modem and a downhole modem sequentially in a plurality of time periods across a single frequency bandwidth, the downhole modem being located downhole in a wellbore, wherein the first and second types of bi-directional messages are separated by a quiet time sample during which no message is transmitted either uphole or downhole along the wellbore;
>
> wherein a length of the quiet time sample is determined based on one or more of:
>
> a length of the cable,
>
> a time interval sufficient for a cross-talk ECHO to dissipate, and
>
> a variable user input,
>
> so as to allow sufficient time for the residual energy caused by a message most recently transmitted, in a direction

along the wellbore, to dissipate before another message, transmitted in the other direction along the wellbore, is received.

Appeal Brief 23, filed January 6, 2017 ("App. Br.").

REJECTION

Claims	Basis	Reference(s)
1–5, 7–9, 11, and 13–16	§ 103	Miyamae,[1] Botzel,[2] and Hoymann[3]

DISCUSSION

We have reviewed the Examiner's rejection in light of Appellants' arguments, and we disagree with Appellants that the Examiner erred. As consistent with the discussion below, we adopt the Examiner's findings, conclusions, and reasoning set forth in the Final Office Action mailed June 15, 2016 ("Final Act."), Advisory Action mailed October 27, 2016 ("Advisory Act."), and Answer mailed May 3, 2017 ("Ans.").

Claim 1 recites a method in which bi-directional messages are separated by a "quiet time sample," where a length of the quiet time sample "is determined based on one or more of" "a length of the cable," "a time interval sufficient for a cross-talk ECHO to dissipate," and "a variable user input." App. Br. 23. The claim also recites determining a length of the quiet time sample "so as to allow sufficient time for the residual energy caused by a message most recently transmitted, in a direction along the wellbore, to dissipate before another message, transmitted in the other direction along the wellbore, is received." App. Br. 23.

[1] Miyamae et al. (US 6,552,665 B1; Apr. 22, 2003).
[2] Botzel et al. (US 2004/0105405 A1; June 3, 2004).
[3] Hoymann et al. (US 2013/01364041 A1; May 30, 2013).

Although not entirely clear, Appellants seem to contend the Examiner did not show these limitations would have been obvious over the cited art for three reasons. First, Appellants contend that "[t]he problems addressed by Botzel and Hoymann have no nexus to the claimed subject matter" and the evidence presented "is insufficient to demonstrate why one . . . would search, find, and read" Botzel. App. Br. 15, 19; *see also* App. Br. 17–21. We understand this to mean that Appellants argue Botzel and Hoymann are non-analogous art. Second, Appellants argue the Examiner erroneously found Hoymann's propagation delay analogous to "a length of the cable." App. Br. 14. Third, Appellants assert the Examiner's motivation to combine the cited references lacks adequate support. App. Br. 14–17. We address each of these arguments in turn.

Analogous Art

To support their contention that Botzel and Hoymann are non-analogous art, Appellants argue that the claimed invention concerns cross-talk between cable conductors and "residual energy in a cable," while Botzel and Hoymann involve time division duplex (TDD) wireless systems that use the same frequency band. App. Br. 15, 17–19. According to Appellants, neither Botzel nor Hoymann "provide[s] evidence of issues with respect to residual energy in a cable" such as "ECHO" interference or addresses the "real-world problems associated with long cables." App. Br. 15–16. Appellants also point to several other differences between the claimed invention and the cited art. For example, Appellants assert that Botzel's system transmits data "over short distances of only a few meters," Botzel's guard time intervals "have nothing to do with" a transmission medium, Hoymann concerns interference among multiple base stations, and

Hoymann's switching time has "no relationship to the real-world physics underlying the cable-based approach" of the claimed invention, among other things. App. Br. 13, 15, 18–21.

We find these arguments unpersuasive. For an obviousness determination under § 103, a reference qualifies as prior art only if the reference is analogous to the claimed invention. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). Generally, a reference is analogous to the claimed invention when the reference either is from the same field of endeavor as the claimed invention or is reasonably pertinent to the problem faced by the inventor. *Bigio*, 381 F.3d at 1325. "A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem." *In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992).

Here, the Examiner found Botzel and Hoymann reasonably pertinent to the problem faced by the inventors: preventing overlap or interference between transmissions in half-duplex communication. *See* Ans. 3–4, 8; *see also* Advisory Act. 2. The record provides adequate support for this finding. Appellants' written description discloses that a receiver in a full-duplex architecture may encounter ECHO interference, that is, the receiver "may see a portion of the locally transmitted signal on the same mode." Spec. ¶¶ 46–47. The written description explains that the disclosed invention uses a half-duplex architecture with guard periods to avoid the effects of ECHO interference. Spec. ¶¶ 50–51.

Botzel and Hoymann address similar problems in much the same way. Botzel discloses using "guard time intervals" to prevent overlapping data bursts caused by asynchronous transmission cycles. *See* Botzel ¶¶ 5, 21, 38.

And Hoymann discloses using "guard periods" to not only allow user equipment to receive all downlink data before transmitting uplink data, but also to avoid interference from other base stations. Hoymann ¶¶ 5–6, 36–41. The Examiner found that Botzel and Hoymann use TDD communication and that TDD communication is "a half-duplex communication link." Advisory Act. 2 (citing supporting references). Thus, Botzel and Hoymann each "logically would have commended itself to an inventor's attention in considering" how to prevent overlap or interference between transmissions in half-duplex communication. *Clay*, 966 F.2d at 659.

Even if Botzel and Hoymann were not reasonably pertinent to the problem faced by the inventors, one of ordinary skill in the art still would have considered the references. The Examiner found both the claimed invention and the cited art use half-duplex communication. *See* Advisory Act. 2; *see also* Spec. ¶ 50 (explaining that "[t]he architecture disclosed herein" is referred to as a half-duplex architecture). Appellants have not persuasively challenged this finding. Although Botzel and Hoymann transmit data wirelessly and the claimed invention transmits data through a cable, the Examiner found—and we agree—that when "considering . . . half-duplex communications in a cable between two devices, one of ordinary skill in the art may want to consider other applications of half-duplex communications, including half-duplex communications in wireless communications." Advisory Act. 2; *see also* Ans. 3 (finding that protecting against "overlapping as a result of asynchronous transmission cycles would be relevant to both wired and wireless communications"); Advisory Act. 2 (finding that using the length of a guard period to improve performance "could also apply to wired communication systems employing half-duplex communications"). As explained by the Supreme Court, "[w]hen a work is

available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field *or a different one*." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) (emphasis added).

For at least the above reasons, we agree with the Examiner that Botzel and Hoymann are analogous art.

"A Length of the Cable"

Claim 1 recites "wherein a length of the quiet time sample is determined based on one or more of," among other things, "a length of the cable." App. Br. 23. The Examiner found Hoymann, in combination with Miyamae and Botzel, teaches this limitation. Final Act. 2–5. Of note, the Examiner found Hoymann discloses determining the duration of a guard interval in part based on the propagation delay between communication devices. *See* Final Act. 4. The Examiner found that Hoymann's propagation delay is "analogous to the length of a cable" because the delay relates to the time needed to transmit information to a device over a communication medium. Final Act. 4; Ans. 4.

Appellants contend the Examiner erred because "the purpose of calculating propagation delay in the wireless system of Hoymann lacks an analogy to two pieces of equipment operatively coupled by a cable." App. Br. 14.

We disagree. Hoymann uses propagation delay essentially the same way the claimed invention uses "a length of the cable": to determine how long a gap between data transmissions should be to reduce or eliminate interference. Hoymann discloses inserting a guard period between downlink and uplink transmission frames, the duration of the guard period set to allow user equipment to receive data before transmitting data of its own or to

reduce interference from other base stations. *See* Hoymann ¶¶ 29–31, 36–41. In either case, Hoymann discloses basing the guard period duration at least in part on a propagation delay. *See* Hoymann ¶¶ 31 (determining a guard period duration based in part on the propagation delay between a base station and user equipment), 36 (determining a guard period duration based on the propagation delay between first and second base stations). Similarly, claim 1 recites determining "a length of the quiet time sample" based on "a length of the cable" "to allow sufficient time for the residual energy caused by a message most recently transmitted . . . to dissipate before another message . . . is received." App. Br. 23.

The Examiner concluded that it would have been obvious to combine Hoymann's method of determining the length of a guard period, Botzel's guard time interval, and Miyamae's cable-based borehole telemetry method to arrive at the disputed limitation. *See* Final Act. 2–5. In this combination, messages flow through Miyamae's *cable*, not through the air as in Hoymann's system. *See* Final Act. 2–5. And as found by the Examiner—and not disputed by Appellants—propagation delay is based on the length of the associated transmission medium. *See* Ans. 4 (finding that propagation delay is "the ratio between the *link length* and the propagation speed *over the specific medium*" (emphases added)). We thus agree with the Examiner that it would have been obvious to consider the length of Miyamae's cable when setting the guard period length. *See* Final Act. 2–5.

For at least the above reasons, we agree with the Examiner that the combination of Miyamae, Botzel, and Hoymann teaches or suggests "wherein a length of the quiet time sample is determined based on one or more of" "a length of the cable."

Motivation to Combine

Appellants argue that the Examiner's motivation for combining the teachings of the cited references is "based on impermissible hindsight reconstruction" and "lacking in evidence as to real-world physics" for the reasons discussed above in the analogous art section. App. Br. 14–21. As in that section, Appellants contend that the Examiner erred "by citing [the] wireless technologies" described in Botzel and Hoymann that do not "experience residual energy in a cable" and by ignoring that although "information may be transmitted via wire or . . . via air, the means of transmission differ significantly, as do their associated issues." App. Br. 15–16; *see also* App. Br. 7. As for Miyamae, Appellants argue one of ordinary skill in the art would not have modified Miyamae to include the recited "quiet time sample." App. Br. 17. Appellants assert "Miyamae is directed to *increasing* data transmission rates" in downlink data flows and argue that including a quiet time sample "does not increase the amount of time for downlink data flow." App. Br. 17 (emphasis modified).

We disagree. The Examiner found one of ordinary skill in the art would have been motivated to modify Miyamae's borehole telemetry method to include Botzel's guard intervals because the guard intervals would "compensate for overlap of data when a sequence of data is being transmitted." Final Act. 3; Advisory Act. 2 (citing Botzel ¶ 21). The Examiner found one of ordinary skill in the art would have been motivated to modify the Miyamae-Botzel method to employ Hoymann's method of determining guard interval length because doing so would "allow[] for a time period large enough to avoid interference, while not taking away resources for the transmission of payload data." Final Act. 4–5 (citing Hoymann ¶ 4). The Examiner also found this modification "would improve

performance of a communication system." Final Act. 5 (citing Hoymann ¶ 4); *see also* Ans. 3 (providing additional motivation for the combination); Advisory Act. 2 (same).

We see no error in these findings. Rather than rely on impermissible hindsight, the Examiner found the references themselves provide the necessary motivation to combine their respective teachings in the claimed manner. *See* Final Act. 4–5 (citing Hoymann ¶ 4); Advisory Act. 2 (citing Botzel ¶ 21). And although Appellants assert that cables have properties and "associated issues" that separate Appellants' system from the systems disclosed by Botzel and Hoymann, as explained below, Appellants have not persuasively explained why these differences undermine the Examiner's motivations to combine.

For instance, Appellants assert that cables suffer from ECHO interference, "a property of the physical interfaces, such as the hybrid and its impedance matching to the cable, as well as the relative size of the signal to the ECHO." App. Br. 15. According to Appellants, "[s]uch a phenomenon does not occur for wireless communication as there is no equivalent to impedance matching." App. Br. 15. Even assuming these assertions are true, the assertions at best establish that cables suffer from a different type of interference than wireless communication systems. But Appellants have not persuasively explained why this difference, or any other difference identified by Appellants, is relevant. Appellants have not argued, much less shown, that Botzel's and Hoymann's transmission delays cannot address the type of interference suffered by cables. Nor could Appellants—Appellants' written description explicitly describes using similar transmission delays to address this type of interference. *See, e.g.*, Spec. ¶ 53 (explaining that a guard period "allows sufficient time for the residual energy caused by the most recently

transmitted frame to dissipate before the other direction's telemetry unit begins receiving data").

As to Miyamae, the part of Miyamae relied on by Appellants describes a telemetry system that "can be configured to allow increased downlink data flow *when required*," for example, during "reprogramming." Miyamae 2:1–16 (emphasis added). But Miyamae discloses a "normal logging operation" not configured to allow increased downlink data flow. Miyamae 4:21–32, Fig. 5. The Examiner found that the words "'when required' indicate[] that there are times when increased downlink data flow is not required." Ans. 7. And because Miyamae's normal logging operation is not configured to increase downlink data flow, the Examiner found "Miyamae does not foreclose the use of guard intervals or quiet time samples during the normal logging operation, where time would not be of the essence." Ans. 7. We agree with the Examiner and thus find Appellants' argument unpersuasive.

CONCLUSION

For the above reasons, we sustain the Examiner's rejection of claim 1. Because Appellants have not presented separate, persuasive arguments for the patentability of claims 2–5, 7–9, 11, and 13–16, we also sustain the Examiner's rejection of these claims.

DECISION

Claims Rejected	Basis	Reference(s)	Affirmed	Reversed
1–5, 7–9, 11, and 13–16	§ 103(a)	Miyamae, Botzel, and Hoymann	1–5, 7–9, 11, and 13–16	
Summary			1–5, 7–9, 11, and 13–16	

No period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED