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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JONATHAN LING, DAVID PEREZ-LOPEZ, BONGHO KIM, VASUDEVAN SUBRAMANIAN, and SATISH KANUGOVI

Appeal 2019-003039
Application 15/254,797
Technology Center 2400

Before JOHN A. EVANS, JUSTIN BUSCH, and JOHN P. PINKERTON, *Administrative Patent Judges*.

PINKERTON, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant[1] appeals under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 1–20, which are all of the claims pending in the application. We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Alcatel Lucent. Appeal Br. 1.

STATEMENT OF THE CASE

Appellant's Invention

Appellant generally describes the disclosed and claimed invention as relating to estimating bandwidth in a wireless communication system that includes a base station, an access point, and user equipment (UE). Spec. ¶¶ 1, 10. Figure 1 is reproduced below.

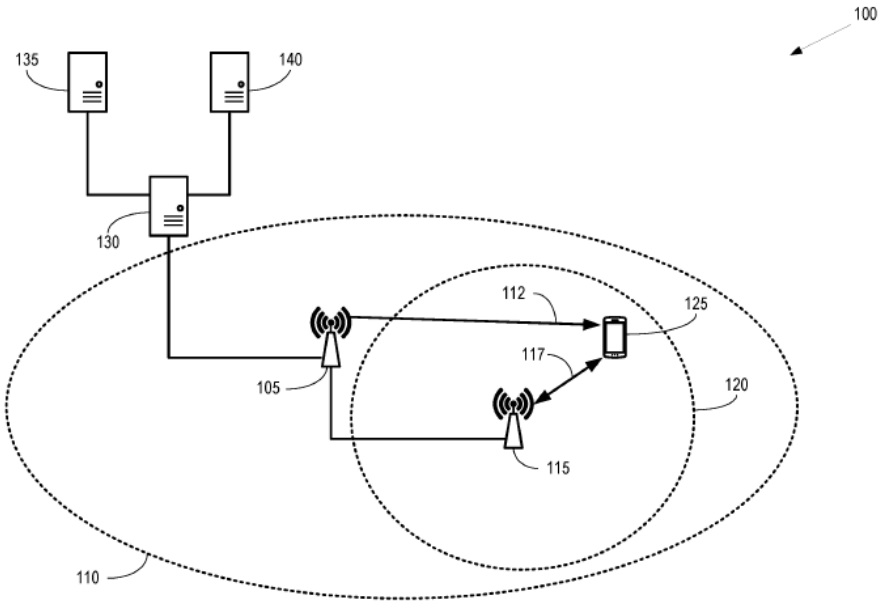

FIG. 1

Figure 1 depicts a wireless communication system according to certain embodiments of Appellant's invention. *Id.* ¶ 4. Wireless communication system 100 may include base station 105 that provides wireless connectivity according to a first radio access technology (RAT)[2] within cell 110 over air interface 112. *Id.* ¶ 14. Wireless communication system 100 may also

[2] For example, in a licensed frequency band according to the Long Term Evolution ("LTE") standards defined by the Third Generation Partnership Project (3GPP). *See* Spec. ¶¶ 10, 14.

include access point 115 that provides wireless connectivity according to a second RAT[3] over air interface 117 within cell 120. *Id.* The respective coverage areas of cell 110 and cell 120 may fully or partially overlap with one another. *Id.*

> In one embodiment,
>
> depending on the available bandwidth in the unlicensed frequency band, . . . base station 105 can selectively operate in a Wi-Fi or cellular boost mode or switch wireless connectivity between the licensed frequency bands supported by . . . base station 105 and the unlicensed frequency band supported by . . . access point 115.

Spec. ¶ 20. To estimate this bandwidth, base station 105 may generate a stream of probe packets and provide them to access point 115, which may then transmit the probe packets to UE 125. *Id.* Access point 115 may aggregate multiple probe packets into single packets for transmission depending on interference or channel quality over the air interface (for example, if there is significant traffic in the unlicensed frequency band). *Id.* UE 125 may receive the transmitted packets and determine their inter-arrival packet delay times. *Id.* UE 125 may then estimate a bandwidth in the unlicensed frequency band based on the inter-arrival packet delay times, the number of probe packets in the stream, and a time interval for transmission of the stream. *Id.* Base station 105 may receive information indicating the estimated bandwidth and determine whether to use the licensed or unlicensed frequency band for communicating with UE 125.

[3] For example, in an unlicensed frequency band according to Wi-Fi or IEEE 802 standards. *See* Spec. ¶¶ 10, 14.

Illustrative Claim

Claims 1, 5, 11, and 15 are independent. Appeal Br. 18, 19, 20, 21 (Claims App.). Claim 5 is illustrative of the subject matter on appeal and provides as follows:

> 5. A method comprising:
>
> receiving, at a user equipment, a first number of packets over an air interface;
>
> determining, at the user equipment, inter-arrival packet delays for the first number of packets;
>
> estimating, at the user equipment, a bandwidth of the air interface based on the inter-arrival packet delays, a second number of probe packets used to generate the first number of packets, and a time interval for transmission of the second number of probe packets; and
>
> transmitting, from the user equipment, information indicating the bandwidth.

Id. at 19 (Claims App.).

References

The prior art relied upon by the Examiner is:

Name	Reference	Date
McCormack	US 2003/0185210 A1	Oct. 2, 2003
Nammi et al. ("Nammi")	US 2016/0135210 A1	May 12, 2016
Vasseur et al. ("Vasseur")	US 9,813,259 B2	Nov. 7, 2017

Rejection on Appeal

Claims 1–20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Nammi, Vasseur, and McCormack. Final Act. 7–25.

ANALYSIS

Appellant argues Examiner error in the rejection of claims 1–20 under 35 U.S.C. § 103 for obviousness over Nammi, Vasseur, and McCormack. Appeal Br. 5–16; Reply Br. 2–3. Appellant argues, in relevant part, that the cited combination of Nammi, Vasseur, and McCormack does not disclose or suggest "a second number of probe packets used to generate the first number of packets," as recited in independent claim 5. Appeal Br. 10. As discussed in greater detail below, each of independent claims 1, 11, and 15 requires a similar element. For the reasons that follow, we are persuaded of Examiner error.

An obviousness analysis involves two steps. "We first construe the claim, a question of law, and second we compare the construed claim to the prior art, a question of fact." *In re Hiok Nam Tay*, 579 F. App'x 999, 1000 (Fed. Cir. 2014) (citing *Key Pharms. v. Hercon Labs. Corp.*, 161 F.3d 709, 714 (Fed. Cir. 1998)).[4] "Claims in patent applications are given their broadest reasonable construction in light of the claims themselves and the specification as it would be interpreted by one of ordinary skill in the art." *Hiok Nam Tay*, 579 F. App'x at 1000 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005)).

Claim Construction

Method claim 1 recites, in relevant part, "a bandwidth over the access network path estimated by the user equipment based on delays between packets received by the user equipment from the access point over the access network path, *wherein the packets are generated by the access point using*

[4] *Hiok Nam Tay* involves anticipation, but, as stated in *Key Pharms.*, the same two-step analysis applies to obviousness as well. *Key Pharms.*, 161 F.3d at 714.

the probe packets." *Id.* at 18 (emphasis added). Similarly, method claim 5 recites "estimating, at the user equipment, a bandwidth of the air interface based on . . . *a second number of probe packets used to generate the first number of packets*." Appeal Br. 19 (Claims App.) (emphasis added). From a plain reading of the claim language in view of the Specification, each of these claims requires, among other things, the function of generating a first number of packets using a second number of probe packets. *See, e.g.*, Spec. ¶ 20 (explaining that "access point 115 can aggregate multiple probe packets into single packets for transmission" to the UE).

Independent claims 11 and 15 are apparatus claims. Independent claim 11 is directed to a base station, and independent claim 15 is directed to a UE. The base station of claim 11, and the UE of claim 15, each have a transceiver and a processor to perform various functions. In addition, claim 11 recites "a second number of packets generated by the access point using the first number of probe packets" (Appeal Br. 20), and claim 15 similarly recites "a second number of probe packets used to generate the first number of packets" (*id.* at 21). In claim 11, the "the access point" generates the second number of packets using the first number of probe packets. And, although claim 15 does not specify what element is "to generate the first number of packets," the Specification describes the access point as performing this function using probe packets. *See, e.g.*, Spec. ¶¶ 12, 20, 24, 36.

Unlike method claims 1 and 5, "[a]pparatus claims cover what a device is, not what a device does." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1468, 1468 n.2 (Fed. Cir. 1990). It is therefore important to determine the scope of any additional functional limitations and what patentable effect they may have on the claim. In that regard, the

Federal Circuit's analysis in *HTC Corp. v. IPCom GmbH & Co., KG*, 667 F.3d 1270, 1273 (Fed. Cir. 2012) is instructive. At issue in *HTC* were claims directed to a mobile station (i.e., a cellular telephone) for use with a cellular telephone network that achieves a handover between base stations when, for example, a cellular telephone travels in a car between coverage areas. *Id.* Independent claim 1 recited the following:

> A mobile station for use with a network including a first base station and a second base station that achieves a handover from the first base station to the second base station by:
>
> storing link data for a link in a first base station,
>
> holding in reserve for the link resources of the first base station, and
>
> when the link is to be handed over to the second base station:
>
> initially maintaining a storage of the link data in the first base station,
>
> initially causing the resources of the first base station to remain held in reserve, and
>
> at a later timepoint determined by a fixed period of time predefined at a beginning of the handover, deleting the link data from the first base station and freeing up the resources of the first base station, the mobile station comprising:
>
> an arrangement for reactivating the link with the first base station if the handover is unsuccessful.

Id. The Court explained that the claim did not "recite a mobile station and then have the mobile station perform the six enumerated functions," but rather, "merely establish[ed] those functions as the underlying network environment in which the mobile station operates." *Id.* at 1277. Moreover, the court determined that although the claim had an "unconventional format," it still made clear "that infringement occurs when one makes, uses,

offers to sell, or sells the claimed apparatus: the mobile station—which must be used in a particular network environment." *Id.*

Claim 11 similarly has an "unconventional format." While the claim recites a base station comprising a transceiver and processor to perform certain functions, it additionally recites, for example, "a bandwidth over the air interface estimated by the user equipment" and "a second number of packets generated by the access point using the first number of probe packets." Even though these functions are not performed by the base station itself, like the claim in *HTC*, claim 11 makes clear that its base station must be used in a particular network environment, including an access point, user equipment, and an air interface. In particular, claim 11 requires an access point to (1) receive a first number of probe packets for transmission and (2) generate a second number of packets using the first number of probe packets. The claim also recites user equipment to (1) receive transmission of data from the access point and (2) estimate bandwidth over the air interface and transmit it to the base station. Likewise, claim 15 requires user equipment that must be used in a particular network environment including other network elements and an air interface. In particular, claim 15 requires an element from which the transceiver is to receive a first number of probe packets (e.g., access point), an element capable of using a second number of probe packets to generate a first number of packets (e.g., access point), and an element to which the transceiver is to transmit information indicating the bandwidth (e.g., base station).

Prior Art Analysis

Having construed the claim language, we now turn to the prior art. In rejecting claim 5, the Examiner finds Nammi teaches "receiving, at a user equipment, a first number of packets over an air interface." Final Act. 13

(citing Nammi ¶¶ 56–59, Fig. 4), *see also id.* at 8 (citing Nammi, Abstract, ¶¶ 7, 69–70, Figs. 1, 4, 6), 17, 21. Nammi describes a heterogeneous wireless communication network including a base station that controls a plurality of low power nodes (LPN). Nammi ¶ 7, Fig. 1. The LPNs may be deployed to eliminate holes in the base station's coverage area and to offload traffic from the macro base station. *Id.* Nammi also describes probing procedures to determine which nodes to select for downlink (DL) transmissions to UEs. *See, e.g.*, *id.* ¶¶ 15, 49. In one embodiment, the base station may instruct one or more LPNs to transmit a probing signal or channel to a UE. *See id.* ¶¶ 59, 69. Based on the power of the received probing signal or channel, the UE may measure downlink channel quality and report it to the base station. *See id.* ¶¶ 62, 69. Based on the reported measurement, the base station may signal to a particular LPN to transmit or not transmit, or transmit with low power to the UE. *See id.* ¶¶ 59, 69.

According to the Examiner, however, "Nammi does not explicitly disclose," among other elements, "a second number of probe packets used to generate the first number of packets." *Id.* at 13. The Examiner finds Vasseur in combination with Nammi teaches this element. *Id.* at 14 (citing Nammi ¶¶ 56–59, Fig. 4; Vasseur 11:14–31).

Appellant argues, in relevant part, that "[t]he cited combination . . . does not disclose any entity (such as an access point) that receives a first number of probe packets and then generates a second number of packets using the received probe packets." Appeal Br. 10. Consequently, Appellant argues the cited combination "does not disclose that a bandwidth over an air interface is estimated based on the second number of probe packets that is generated by an access point." *Id.*, *see also id.* at 11–12 (making a similar argument for claim 11).

We are persuaded of Examiner error. As discussed above, Nammi describes probing procedures that use probing channels or signals, but the Examiner does not identify any persuasive evidence that Nammi teaches using a probing channel or probing signals to generate a number of packets, or estimating bandwidth over an air interface based on such a procedure.

Vasseur describes various probing techniques for determining available bandwidth along a given path in a network. *See, e.g.*, Vasseur 11:14–13–23, 14:12–15:32. In one embodiment, Vasseur describes an incremental probing controller (IPC) that sends probe packets along a specific network path to determine the characteristics of a given network. *Id.* at 12:5–8, 12:23–26. The IPC may adjust not only the rate at which probe packets are sent but also the type and size of a probe. *Id.* at 12:67–13:4. The IPC may also calculate bandwidth estimates based on observations regarding the probe packets, including the rate and size of the probe packets sent. *Id.* at 13:5–7, 14:60–15:12. For example, the IPC may estimate a network's average available bandwidth by periodically sending conservative packet bursts and performing probing computations over a plurality of time periods. *Id.* at 13:7–15. Accordingly, while Vasseur may suggest that different sizes of probing packets may be sent at different time periods, and that the bandwidth of a network path may be determined by observing the transmission of probe packets, the Examiner does not identify any persuasive evidence that Vasseur's device uses one number of probing packets to generate another number of packets as required.

For the foregoing reasons, the Examiner has not adequately shown that Nammi or Vasseur, alone or in combination, teach or suggest "a second number of probe packets used to generate the first number of packets," as recited in claim 5. Nor has the Examiner provided an additional finding (for

example, in McCormack) or a rationale to fill the gaps in the prior art. We decline to resort to speculation to fill the gaps in the Examiner's rejection. *See Ex parte Braeken*, 54 USPQ2d 1110, 1112 (BPAI 1999). We therefore determine that the Examiner erred in rejecting independent claim 5 under 35 U.S.C. § 103 for obviousness over Nammi, Vasseur, and McCormack. The above analysis applies with equal force to the Examiner's § 103 rejection of independent claims 1, 11, and 15, each of which recites a similar element for which the Examiner fails to provide a finding or reasoning that cures the defects discussed above. *See* Final Act. 8–10, 17–19, 21–23.

Accordingly, constrained by this record, we decline to sustain the Examiner's § 103 rejection of independent claims 1, 5, 11, and 15. For similar reasons, we decline to sustain the Examiner's § 103 rejection of dependent claims 2–4, 6–10, 12–14, and 16–20, for which the Examiner fails to provide a finding or reasoning that cures the defects discussed above. *See* Final Act. 11–13, 15–17, 20–21, 23–25; *cf. In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992) ("dependent claims are nonobvious if the independent claims from which they depend are nonobvious").

CONCLUSION

We reverse the Examiner's rejection of claims 1–20 under 35 U.S.C. § 103 as being unpatentable over Nammi, Vasseur, and McCormack.

DECISION SUMMARY

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–20	103	Nammi, Vasseur, McCormack		1–20

REVERSED