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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRIAN S. LEIBOWITZ and BRUNO W. GARLEPP

Appeal 2019-001770
Application 15/165,134
Technology Center 2600

Before ST. JOHN COURTENAY III, LARRY J. HUME, and PHILLIP A. BENNETT, *Administrative Patent Judges.*

BENNETT, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 2, 3, 5–10, 19 and 20. Claims 1 and 11–18 are cancelled. Claims 4 and 21 are allowed. Claims 22–24 are objected to. We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

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[1] We use the word "Appellant" to refer to the applicant as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as Rambus, Inc. Appeal Br. 1.

CLAIMED SUBJECT MATTER

The claims are directed to "DFE margin test methods and circuits that decouple sample and feedback timing." Spec., Title. Claim 2, reproduced below with the disputed limitation in italics, is illustrative of the claimed subject matter:

> 2. A receiver comprising:
>
> a data input terminal to receive a stream of input data symbols;
>
> a first data sampler with first decision-feedback equalization to sample the input data symbols and output a first series of samples, the first decision-feedback equalization based on feedback of the first series of samples;
>
> a second data sampler with second equalization to sample the input data symbols and output a second series of samples*, the second equalization based on an assumption for each preceding data symbol absent consideration of any of the preceding data symbols*; and
>
> a comparison circuit to compare the first series of samples with the assumptions of preceding data symbols.

Appeal Br. 8 (Claims Appendix).

REFERENCES

The prior art relied upon by the Examiner as evidence is:

Name	Reference	Date
Henry	US 4,285,046	Aug. 18, 1981
Arnon et al.	US 4,864,590	Sept. 5, 1989
Lewyn	US 6,100,834	Aug. 8, 2000
Ueno	US 6,691,260 B1	Feb. 10, 2004
Chennakeshu et al.	US 7,099,410 B1	Aug. 29, 2006

REJECTIONS UNDER 35 U.S.C. § 103

Claims 2, 3, 5, 6, 19, and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Ueno, Henry and Chennakeshu. Final Act. 2.

Claims 7, 9, and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Ueno, Henry, Chennakeshu, and Arnon. Final Act. 6.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Ueno, Henry, Chennakeshu, Arnon, and Lewyn. Final Act. 8.

ISSUE

Has the Examiner erred in finding Ueno, Henry and Chennakeshu teach or suggest "the second equalization based on an assumption for each preceding data symbol *absent consideration of any of the preceding data symbols,*" as recited in claim 2?

ANALYSIS

Claim 2 recites "the second equalization based on an assumption for each preceding data symbol absent consideration of any of the preceding data symbols." Appeal Br. 8 (Claims Appendix). In rejecting claim 2 as obvious, the Examiner relies on both Ueno and Chennakeshu for teaching this limitation. Specifically, the Examiner finds Ueno teaches "the second equalization based on an assumption," but that the assumption in Ueno is an assumption for polarity, and not "for each preceding data symbol absent consideration of any of the preceding data symbols" as recited in the claim. Final Act. 3–4. To address this deficiency, the Examiner turns to

Chennakeshu, finding that "Chennakeshu teaches an equalization based on an assumption for each preceding data symbol absent consideration of any of the preceding data symbols (see col. 1, lines 46–67, where Chennakeshu describes a MLSE equalizer that uses two possible values for two previous symbols, no consideration of actual values of previous symbols)." Final Act. 5 (italics omitted). The Examiner concludes:

> It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Ueno, and to include that the second equalization based on an assumption for each preceding data symbol absent consideration of any of the preceding data symbols, as taught by Chennakeshu, thus allowing for coherent demodulation of multipath signals, as discussed by Chennakeshu (see col. 1, lines 36-45).

Final Act. 5.

Appellant argues "[b]oth of Ueno's detectors are provided with feedback from preceding symbols so neither employs equalization that is 'absent consideration of any of the preceding data symbols' as recited in claim 2." Reply Br. 4. Appellant contends that if Chennakeshu's equalizer was substituted for the equalizers in Ueno as proposed by the Examiner, then neither of the equalizers in the resultant device would be provided feedback—which is contrary to the claimed device which requires one equalization performed using feedback, and one equalization without feedback. Appeal Br. 5–6.

Appellant also challenges the Examiner's rationale for combining Ueno's teachings with Chennakeshu's, arguing that nothing in either Ueno or Chennakeshu suggests "modifying Ueno's a dual-equalizer system to support two different forms of equalization, one 'based on feedback of [a]

first series of samples' and the other 'absent consideration of any of the preceding data symbols . . .'." Reply Br. 4–5.

We are persuaded the Examiner erred in rejecting claim 2. We agree with Appellant that Ueno fails to teach or suggest any equalization that is "absent consideration of any of the preceding data symbols." As correctly explained by Appellant, Ueno's Figure 13 shows that both detectors 92 and 96 receive preceding data symbols which are fed back via feedback filters 93 and 97 and additional circuits 91 and 95. Thus, Ueno's both of data samplers utilize feedback-based equalization.

The cited portions of Chennakeshu teach the use of a "maximum-likelihood-sequence-estimation (MLSE)" equalizer which does not perform feedback-based equalization. Chennakeshu col. 1, ll. 36–67. The Examiner finds that it would have been obvious to modify Ueno such that one of the data samplers uses Chennakeshu's equalizer and is not feedback-based, but the other remains the same. Ans. 4. The Examiner finds that a person of ordinary skill in the art would have been motivated to incorporate Chennakeshu's equalizer into Ueno's device because it allows for coherent demodulation of multipath signals. Although this reasoning may support replacement of both of Ueno's equalizers with Chennakeshu's approach, the Examiner does not sufficiently explain why a person or ordinary skill in the art would have thought to replace one of Ueno's equalizers with Chennakeshu's, while leaving the other the same.

The Examiner finds that "Ueno suggests that one equalization may have a feedback, and the other equalization may not have a feedback." Ans. 4 (citing col. 2, ll. 50–54). However, we discern no such suggestion in the cited portion of Ueno. We agree with Appellant that "Ueno appears to

be referring to a control method that does not work for a multi-level DFE with multiple paths despite applicability to a single feedback equalizer." Thus, Ueno does not suggest implementing a dual-equalizer system supporting two different forms of equalization. The Examiner does not identify any other record evidence that suggests the desirability of the proposed modification. As such, we conclude the modification of Ueno proposed by the Examiner uses the claimed invention as a roadmap, which infects the proposed modification with impermissible hindsight bias, and we do not sustain the rejection of claim 2.

For the same reasons, we also reverse the rejection of independent claim 19, which recites the disputed limitation in commensurate form, as well as of the rejections of remaining claims 3, 5–10, and 20, which depend from independent claims 2 and 19.[2]

CONCLUSION

We reverse the Examiner's decision to reject claims 2, 3, 5–10, 19 and 20 under 35 U.S.C. § 103(a).

[2] Because we find these argument persuasive and dispositive of the rejections made under § 103, we do not address Appellant's remaining § 103 arguments.

DECISION SUMMARY

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
2, 3, 5, 6, 19, 20	103	Ueno, Henry, Chennakeshu		2, 3, 5, 6, 19, 20
7, 9, 10	103	Ueno, Henry, Chennakeshu, Arnon		7, 9, 10
8	103	Ueno, Henry, Chennakeshu, Arnon, Lewyn		8
Overall Outcome				2, 3, 5–10, 19, 20

REVERSED