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HALLIBURTON ENERGY SERVICES, INC.		ALKAFAWI, EMAN A
C/O PARKER JUSTISS, P.C.		

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte TIANRUN CHEN, YIBING ZHENG, TATIANA GILSTRAP,
ARTHUR CHUEN HON CHENG, and ROBERT ERIC EPSTEIN

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Appeal 2019-002992
Application 14/413,404
Technology Center 2800

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Before MONTÉ T. SQUIRE, AVELYN M. ROSS, and BRIAN D. RANGE,
Administrative Patent Judges.

RANGE, *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 1–21. 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 "applicant" as defined in
37 C.F.R. § 1.42. Appellant identifies the real party in interest as
Halliburton Energy Services, Inc. Appeal Br. 3.

CLAIMED SUBJECT MATTER[2]

Appellant describes the invention as relating to measuring the thickness of a well casing of a well structure. Spec. ¶ 1. Such measurements may help assess damage or evaluate cement bonding between a casing and a surrounding formation. *Id.* at ¶ 2. The Specification describes, for example, a system that makes use of measuring acoustic waves to measure the casing. *Id.* at ¶ 38. Claim 1 is illustrative:

1. A method comprising:

disposing a tool in a wellbore;

directing an acoustic signal towards a well casing in the wellbore, the acoustic signal generated by an acoustic transmitter of the tool;

accessing a measured waveform associated with an acoustic signal returned via the well casing based on operating an acoustic receiver of the tool within the wellbore comprising the well casing;

comparing the measured waveform to a plurality of model waveforms, wherein each of the plurality of model waveforms corresponds to a different thickness of the well casing;

determining, by operation of data processing apparatus, a thickness of the well casing based on results of comparing the measured waveform and the plurality of model waveforms;

and

assessing damage to the well casing based on the determined thickness of the well casing.

Appeal Br. 28 (Claims App'x) (emphasis added to certain key recitations at issue). The other independent claims on appeal, claims 8 and 15, recite recitations similar to those we emphasize above.

REFERENCES

The Examiner relies upon the prior art below in rejecting the claims on appeal:

Havira	US 4,255,798	Mar. 10, 1981
Miller et al. ("Miller")	US 5,859,811	Jan. 12, 1999
Bolshakov et al. ("Bolshakov")	US 2010/0263449 A1	Oct. 21, 2010
Froelich et al. ("Froelich")	US 2013/0155812 A1	June 20, 2013

REJECTIONS

The Examiner maintains (Ans. 3) the following rejections on appeal:

A. Claims 1–6, 8–13, and 15–20 under 35 U.S.C. § 102 as anticipated by Miller and Havira (as incorporated by reference in Miller). Final Act. 5.

B. Claims 1–6, 8–13, and 15–20 under 35 U.S.C. § 103 as obvious over Miller and Havira in view of Bolshakov. *Id.*[3]

C. Claims 7, 14, and 21 under 35 U.S.C. § 103 as obvious over Miller and Havira in view of Bolshakov and Froelich. *Id.* at 18.

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[3] The Examiner presents this rejection as a rejection "in the alternative" to the rejection under 35 U.S.C. § 102.

OPINION

To resolve the issues before us on appeal, we focus on the Examiner's findings and determinations that relate to the error Appellant identifies.

Rejection A, anticipation. The Examiner rejects claims 1–6, 8–13, and 15–20 under 35 U.S.C. § 102 as anticipated by Miller and Havira (as incorporated by reference in Miller). Final Act. 5. The Examiner finds that Miller teaches each recitation of claim 1. *Id.* at 5–8. With respect to claim 1's recitations "comparing the measured waveform to a plurality of model waveforms" and "determining . . . a thickness of the well casing based on results of comparing the measured waveform and the plurality of model waveforms," the Examiner finds that claim 24 of Miller teaches these recitations. *Id.* at 7. The Examiner refers to claim 24's "subtraction" and finds "subtraction between a model waveform and the sorted waveform is a type of comparison between the two waveforms." *Id.*

Appellant argues that Miller teaches assessing the waveforms corresponding to different physical interfaces (for example, between fluid and the casing) and subtracting out to determine a casing thickness. Appeal Br. 18–22. In contrast, claim 1 requires comparing a measured waveform to model waveforms where the model waveforms correspond to different well casing thicknesses. Appeal Br. 22; *see also* Spec. 58–60 (explaining Appellant's process for comparing measured waveforms to model waveforms).

Appellant's argument persuades us of error. Miller focuses on assessing waveforms from different physical interfaces and subtracting out waveforms that corresponding to unwanted interfaces. Miller 3:38–47

(explaining subtracting of waveforms in unwanted bins), 5:8–14 ("The object is to estimate the noise so that this can be subtracted from data to get the signal of interest."). The preponderance of the evidence indicates that the "subtraction" referenced by Miller's claim 24 (*id.* at 14:55–15:16) refers to removing unwanted noisy waveforms in order to obtain a desired waveform; this subtraction is not a comparison to model waveforms to determine thickness as claim 1 recites.

Miller incorporates Havira by reference (Miller 2:29–33). Appellant and the Examiner present some argument regarding the teachings of Havira (which Miller incorporates by reference). Appeal Br. 21–22; Reply Br. 5–6; Ans. 7. We do not, however, interpret the Examiner's position as relying on Havira to address the "comparing" or "determining" recitations addressed above. Final Act. 10–11 (referencing Havira without connecting any teaching of Havira to the "comparing" or "determining" recitations); Ans. 7 (emphasizing that Miler alone reads on the argued recitations). The Examiner's citation to Havira, therefore, does not cure the error addressed above.

Because the Examiner has not adequately explained how Miller (with Havira incorporated by reference) teaches the "comparing" and "determining" recitations of claim 1, we do not sustain the Examiner's rejection. Because claims 8 and 15 include similar recitations and because the Examiner's treatment of other claims does not cure this error, we do not sustain the Examiner's rejection of the other claims subject to this rejection.

<u>Rejections B and C, obviousness.</u> The Examiner rejects claims 1–6, 8–13, and 15–20 under 35 U.S.C. § 103 as obvious over Miller and Havira in view of Bolshakov. Final Act. 5. The Examiner relies on Bolshakov as

an alternative theory of reaching the "comparing" and "determining" recitations of claim 1 that we address above. *Id*. at 7–8. The Examiner finds that Bolshakov teaches comparisons in various figures as well as paragraphs 36, 41, and 44. *Id.* at 7.

Appellant argues that Bolshakov does not teach comparison of a measured waveform to model waveforms where the model waveforms correspond to different thicknesses of well casing. Appeal Br. 23–24. Appellant argues that, instead, Bolshakov uses mathematic formulas (for example, formula 9) to predict casing thickness based on wave form. Appeal Br. 23–25.

Appellant's argument persuades us of error. The Examiner has not adequately explained how Bolshakov teaches comparison of a measured waveform to model waveforms where the model waveforms correspond to different thicknesses of well casing and has not adequately explained how Bolshakov teaches determining well casing thickness based on results of the comparisons. Rather, Bolshakov estimates tubular thickness with mathematical relationships. Bolshakov ¶¶ 6 ("The tubular thickness (d) may be estimated using [a mathematic relationship]"), 25–27 ("Based on the [math] expressions in Table 1 it was determined that casing (or tubular) thickness is measureable based on results of a single nth mode."), 43 ("each model's thickness trend was predicted by this formulae"). Where Bolshakov refers to "models," it is referring to physical models that were created to test its math equations. *See, e.g.,* Bolshakov ¶¶ 30 ("FIG 4a illustrates a test stand 46a used for Model 1 that simulates an un-cemented free pipe 48 partially extending into water 50), 37 ("calculation of group velocity . . . was found to be difficult and unreliable in the cemented sections of the models");

see also Reply Br. 6–7. Bolshakov compares test data obtained from experiments made with different physical models in order to test its equations (Bolshakov ¶ 36), but the Examiner does not persuasively explain how Bolshakov teaches comparing waveforms to model waveforms to determine well casing thickness.

Because the Examiner has not adequately explained how any of the cited references, including Bolshakov, teach the "comparing" and "determining" recitations of claim 1, we do not sustain the Examiner's rejection. Because claims 8 and 15 include similar recitations and because the Examiner's treatment of other claims does not cure this error, we also do not sustain the Examiner's rejection of other claims.

CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–6, 8–13, 15–20	102	Miller, Havira		1–6, 8–13, 15–20
1–6, 8–13, 15–20	103	Miller, Havira, Bolshakov		1–6, 8–13, 15–20
7, 14, 21	103	Miller, Havira, Bolshakov, Froelich		7, 14, 21
Overall Outcome				1–21

REVERSED