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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte PAUL LECOCQ, CYRILLE REISER, and JOHN BRITTAN

Appeal 2017-002539
Application 12/661,727
Technology Center 2800

Before CATHERINE Q. TIMM, AVELYN M. ROSS, and DEBRA L. DENNETT, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellants[2] appeal from the Examiner's decision to reject claims 1–3, 7–10, and 14 under 35 U.S.C.

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[1] In explaining our Decision, we cite to the Specification dated March 23, 2010 ("Spec."), Final Office Action dated May 28, 2014 ("Final Act."), the Appeal Brief dated April 5, 2016 ("Appeal Br."), the Examiner's Answer dated October 7, 2016 ("Ans."), and the Reply Brief dated December 5, 2016 ("Reply Br.").

[2] Appellants identify the real party in interest as PGS Geophysical AS. Appeal Br. 1.

§ 102(b) as anticipated by Horne[3] and claims 4–6 and 11–13 under 35 U.S.C. § 103(a) as obvious over Horne in view of Koren[4]. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

The invention is directed to a method of imaging the earth's subsurface using stacked seismic data from azimuthally varying velocity and amplitude information. Spec., Title. Claim 1, with the limitation at issue highlighted, is illustrative:

> 1. A method for imaging earth's subsurface, comprising:
>
> using a programmable computer to perform the following:
>
> obtaining seismic data with a variety of source-receiver azimuth angles;
>
> determining *fast anisotropy axis values* for each sample in seismic data binned by the azimuth angles;
>
> determining a fast azimuth gather within each bin in the seismic data from the fast anisotropy axis values; and
>
> imaging the earth's subsurface, using the fast azimuth gathers.

Appeal Br. 13 (claims appendix).

OPINION

All of the claims require a step of "determining fast anisotropy axis values for each sample in seismic data binned by the azimuth angles." *See* Appeal Br. 13, 14 (claims 1 and 8). The issue for both rejections is: Have

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[3] Horne et al., US 2003/0167126 A1, published Sept. 4, 2003 (hereinafter "Horne").
[4] Koren et al., US 2008/0109168 A1, published May 8, 2008 (hereinafter "Koren").

Appellants identified a reversible error in the Examiner's finding that Horne determines such values?

Appellants have identified such an error.

First, we agree with Appellants' interpretation of "values" as limited to a numerical quantity. Where, as here, the Specification does not define the word, we look to the ordinary and customary meaning the ordinary artisan would give the term that is consistent with the Specification. According to the Specification, fast anisotropy axis values are obtained by velocity-based analysis, amplitude-based analysis, or a combination of both. Spec. ¶ 24. The analysis methods generate velocity values, amplitude values, or both. *Id.* Both velocity and amplitude are customarily reported as numerical values.

Horne, according to the Examiner, determines "fast shear-wave directions" are the required values. So the question is: Are these directions "fast anisotropy axis values" within the meaning of the claims?

We determine that the Examiner has not established that the "directions" disclosed by Horne are the required "values."

Horne seeks to characterize reservoir fractures using seismic waves. Horne ¶¶ 2, 3, 36. First, seismic data is obtained by a seismic survey system such as that shown in Figures 3A and 3B. Horne ¶ 36. This data contains mode-converted shear-wave data. Horne ¶ 42. According to Horne, there are generally two types of seismic waves used: compressional waves (P-waves) and shear-waves (S-waves). Horne ¶ 4. The shear-wave (S-wave) component of the seismic wave contains a fast wave and slow wave in anisotropic media. *Id.* These waves have amplitudes and travel times. *Id.* The fast and slow waves are separated by a time delay. *Id.* Horne collects

the data so that attributes of the reflected shear-wave, such as time delay variations with azimuth, are preserved. *Id.*

Horne partitions a plurality of converted split shear-wave data resulting from a common event and recorded at a plurality of azimuths into bins. Horne ¶¶ 23, 56; Fig. 5B. In the partitioned data, Horne separates fast and slow split shear-wave wavefields. Horne then derives at least one attribute of at least one of the separated shear-wave fields and analyzes that attribute. In the Figure 5 embodiment, the attribute is the difference in arrival times of the fast and slow shear-waves.

Separating the fast and slow wavefields involves (1) determining an angle of rotation, and then (2) performing a two-component rotation about the determined angle of rotation into a respective axis for each of the partitions. Horne ¶ 55. From the separated wavefields, Horne derives the at least one attribute, which involves determining the difference in arrival times (Δt) between the fast and slow split shear-wave wavefields. Horne teaches performing a dynamic cross-correlation of the arrival times to derive the attribute. Horne ¶ 56.

The embodiment of Figure 7 similarly determines directions and evaluates time delays using dynamic cross correlation. Horne ¶¶ 63–67.

The Examiner equates Horne's fast shear-wave directions with the fast anisotropy axis values of the claims. Final Act. 2, citing Horne ¶¶ 23, 47, 63–67. The Examiner points out that Horne evaluates the fast shear-waves of each azimuth using dynamic cross correlation, and the dynamic cross correlation takes into account the time delays accumulated gradually as the waves pass through the anisotropic medium. *Id.* But, as pointed out by Appellants, directions are not values. Appeal Br. 6. According to Merriam-

Webster.com, "direction," as used in the context of Horne, means "the line or course on which something is moving or is aimed to move or along which something is pointing or facing." *Direction Definition*, Merriam-Webster.com., http://www.merriam-webster.com/dictionary/direction (last visited Feb. 27, 2018). A direction itself does not have a "value" in the mathematical sense, i.e. "a numerical quantity that is assigned or is determined by calculation or measurement." *Value definition*, Merriam-Webster.com., https://www.merriam-webster.com/dictionary/value (last visited Feb. 27, 2018). A direction is described by coordinates rather than by numerical value.

Moreover, we agree with Appellants that the Examiner has failed to adequately explain the relevance of Horne's dynamic cross correlation, which evaluates time delays, to the finding that Horne determines fast anisotropy axis values. Appeal Br. 6; Reply Br. 2-3.

Appellants have identified a reversible error in the Examiner's finding that Horne determines fast anisotropy axis values. The Examiner's application of Koren does not cure the deficiency.

CONCLUSION

We do not sustain the Examiner's rejections.

DECISION

The Examiner's decision is reversed.

REVERSED