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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SERGIO GRION

Appeal 2018-000595
Application 13/670,900[1]
Technology Center 3600

Before LINDA E. HORNER, BRETT C. MARTIN, and LISA M. GUIJT, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant seeks our review under 35 U.S.C. § 134(a) of the Examiner's rejections of claims 1–20. Final Office Action (February 27, 2017) ("Final Act."). We have jurisdiction under 35 U.S.C. § 6(b).

Appellant contests the Examiner's rejection of the claims as directed to patent ineligible subject matter. The question presented by this appeal is

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[1] CGGVeritas Services SA ("Appellant") is the applicant under 37 C.F.R. § 1.46 and the real party in interest. Appeal Brief (July 17, 2017) ("Appeal Br."), at 2.

whether the claims are directed to an abstract idea. We find that they are not.

Appellant also contests the Examiner's rejections of claims as obvious over two different combinations of prior art. The question presented by these rejections is whether either combination of prior art renders obvious: (1) establishing equations, expressed as a function, that relate seismic data acquired on a non-flat datum to desired up-going and down-going wave fields on a second planar datum, wherein the functions include extrapolator operators for extrapolating the desired wave fields to the second planar datum, and (2) solving with an inversion procedure to obtain the desired up-going and down-going wave fields for a second planar datum. The Examiner has not demonstrated sufficiently how the combined teachings of the cited prior art would have led one having ordinary skill in the art to the technique claimed.

Thus, we REVERSE the Examiner's adverse decision on the patentability of claims 1–20.

CLAIMED SUBJECT MATTER

The claimed subject matter relates to "mechanisms and techniques for separating up-going and down-going wave fields from seismic data recorded underwater or under the surface of the earth by a seismic receiver." Specification (November 7, 2012) ("Spec.") ¶ 1. Claims 1, 10, and 20 are the independent claims. Claim 1 is illustrative of the subject matter on appeal and is reproduced below.

> 1. A method for generating an image based on separating up-going and down-going wave fields (U, D) in seismic data related to a subsurface of a body of water, or to a subsurface of a body of rock, the method comprising:

> receiving seismic data (P_0, Z_0) recorded in the time-space domain with seismic recorders distributed on a first datum, wherein the first datum is non-flat;
>
> transforming the seismic data (P_0, Z_0) from the time-space domain to transformed seismic data for water pressure (P) and transformed seismic data for particle velocity (Z), in another domain;
>
> establishing, in the another domain, a mathematical relation that relates (1) the transformed seismic data for water pressure (P) to desired up-going and down-going wave fields (U, D), wherein the transformed seismic data for water pressure (P) is expressed as a first function of the desired up-going and down-going wave fields (U, D) on a second planar datum, and (2) the transformed seismic data for particle velocity (Z) to the desired up-going and down-going wave fields (U, D), wherein the transformed seismic data for particle velocity (Z) is expressed as a second function of the desired up-going and down-going wave fields (U, D) on the second planar datum;
>
> solving with an inversion procedure, run on a processor, the first and second functions to obtain the desired up-going and down-going wave fields (U, D) for the second datum; and
>
> generating the image based on at least one of the desired up-going and down-going wave fields (U, D) for the second datum,
>
> wherein the second datum is different from the first datum,
>
> wherein each of the first and second functions includes extrapolator operators for extrapolating the desired up-going and down-going wave fields (U, D), respectively, to the second datum.

Appeal Br. 27–28 (Claims Appendix). Independent claim 10 is directed to a computing device for generating an image, including an interface for receiving seismic data and a processor configured to perform substantially the same steps recited above in claim 1. *Id.* at 29–30. Independent claim 20 is directed to a non-transitory computer readable medium including

instructions for performing substantially the same steps recited above in claim 1. *Id.* at 32–33.

EVIDENCE

The Examiner relies upon the following evidence:

Robertsson	GB 2 405 473 A	Mar. 2, 2005
Sollner	AU 2009212893 A1	Apr. 29, 2010

A. Ziolkowski et al., "Multiple wavefields: separating incident from scattered, up from down, and primaries from multiples," SEG Technical Program Expanded Abstracts, Society of Exploration Geophysicists, 1998, pp. 1499–1502 ("Ziolkowski").

G. Schuster, "Equations for Redatuming Seismic Data by an Asymptotic Inverse," www.utam.gg.utah.edu/tomo05/05_ann/PDF/jerry_inter_GRT_single.pdf, February 6, 2006 ("Schuster").

Applicant Admitted Prior Art, Appeal Brief (March 4, 2016), 17:14–17 and 21:9–11 ("AAPA").

REJECTIONS

The Final Office Action includes the following rejections:

1. Claims 1–20 stand rejected under 35 U.S.C. § 101 as directed to patent ineligible subject matter.
2. Claims 1–20 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Ziolkowski and Robertsson.
3. Claims 1–20 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Sollner, AAPA, and Schuster.

ANALYSIS

Rejection under 35 U.S.C. § 101

Appellant argues that the claims, when viewed as a whole, are not directed to an abstract idea because the water pressure and particle velocity measurements collected by the seismic recorders are combined via equations

to obtain up-going and down-going wave fields used to generate an image of an underground formation. Appeal Br. 9–10 (citing *Thales Visionix Inc. v. U.S.*, 850 F.3d 1343 (Fed. Cir. 2007)). The Examiner responds that the steps of "receiving," "transforming," "establishing," "solving," and "generating" are "similar to abstract idea steps." Ans. 4. The Examiner also responds that the claims do not recite "seismic survey equipment." *Id.* The Examiner distinguishes *Thales*, stating, "'Thales' is 'directed to' physical inertial sensors which measure the position of an object." *Id.* at 5.

Under *Alice*, first, we "determine whether the claims at issue are directed to a patent-ineligible concept." *Alice Corp. v. CLS Bank Int'l*, 134 S. Ct. 2347, 2355 (2014). If so, we "examine the elements of the claim to determine whether it contains an 'inventive concept' sufficient to 'transform' the claimed abstract idea into a patent-eligible application." *Id.* at 2357 (quoting *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 72, 79 (2012)). "While the two steps of the Alice framework are related, the 'Supreme Court's formulation makes clear that the first-stage filter is a meaningful one, sometimes ending the § 101 inquiry."' *Thales Visionix Inc. v. U.S.*, 850 F.3d 1343, 1346 (Fed. Cir. 2017) (quoting *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016)). At step one, "it is not enough to merely identify a patent-ineligible concept underlying the claim; we must determine whether that patent-ineligible concept is what the claim is 'directed to."' *Rapid Litig. Mgmt. Ltd. v. CellzDirect, Inc.*, 827 F.3d 1042, 1050 (Fed. Cir. 2016).

The Federal Circuit recently explained that claimed subject matter has been found to be patent eligible in cases where the claims "had the specificity required to transform a claim from one claiming only a result to

one claiming a way of achieving it." *SAP America, Inc. v. InvestPIC, LLC*, 898 F.3d 1161, 1167 (Fed. Cir. 2018) (citations omitted). For example, in *McRO*, the court held patent eligible claims limited to rules with specific characteristics for producing accurate and realistic lip synchronization and facial expression in animated characters. *McRO, Inc. v. Bandai Namco Games America Inc.*, 837 F.3d 1299, 1314 (Fed. Cir. 2016). In *Finjan*, the court held claims patent eligible because they recited specific steps—generating a security profile that identifies suspicious code and linking it to a downloadable—that accomplished the desired result. *Finjan, Inc. v. Blue Coat Sys., Inc.*, 879 F.3d 1299, 1305–06 (Fed. Cir. 2018)

By contrast, the court held claims that recite only the desired result without the particular way of achieving the result are directed to an abstract idea. For example, in *Apple*, the court invalidated claims related to a computer system that can generate a second menu from a first menu based on a selection of items on the first menu because the claims "d[id] not claim a particular way of programming or designing the software . . . but instead merely claim the resulting systems." *Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229, 1241 (Fed. Cir. 2016). Similarly, in *Affinity Labs*, the court held that a claim related to wirelessly communicating regional broadcast content to an out-of-region recipient was abstract and patent ineligible because there was nothing in the claim "directed to how to implement [the idea]. Rather, the claim is drawn to the idea itself." *Affinity Labs of Texas, LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1258, 1265 (Fed. Cir. 2016). *See also Two-Way Media, Ltd. v. Comcast Cable Communications, LLC*, 874 F.3d 1329, 1337 (Fed. Cir. 2017); *Secured Mail Solutions LLC v. Universal Wilde, Inc.*, 873 F.3d 905, 910 (Fed. Cir. 2017); *RecogniCorp, LLC. v. Nintendo Co.*, 855

F.3d 1322, 1326 (Fed. Cir. 2017); *Intellectual Ventures I LLC v. Symantec Corp.*, 838 F.3d 1307, 1316 (Fed. Cir. 2016).

In this case, the desired result, recited in the "generating step," is to generate an image based on one of the desired up-going and down-going wave fields for the second planar datum. The claims are not limited to this desired result. Rather, the claims recite in the "establishing" and "solving" limitations specific steps for generating the desired image. For instance, the claims recite using specific functions that include extrapolator operators to relate the acquired and transformed seismic data to the desired up-going and down-going wave fields (U, D) on the second planar datum. The claims also recite solving the functions using an inversion procedure to obtain the up-going and down-going wave fields (U, D) for the second planar datum. Thus, the claims are not directed to generic processes and machinery or a particular desired result or effect. Rather, the claims are directed to a specific method for achieving the result.

The court in *SAP America* also contrasted the claims before it with the claims at issue in *Thales,* describing that the claims in *Thales* were directed to an improvement in a physical tracking system. *SAP America*, 898 F.3d 1168. By contrast, the court stated that the claims at issue before it, directed to performing statistical analyses of investment information, were focused not on a physical-realm improvement, but on improvement in wholly abstract ideas—the selection and mathematical analysis of information, followed by reporting or display of the results. *Id.*

In this appeal, the claims are directed to generating an image of a subsurface of a body of water or a subsurface of a body of rock using seismic data recorded with seismic recorders distributed on a first, non-flat

datum. Akin to the claims before the court in *Thales*, the claims here are directed to a physical-realm improvement.

For these reasons, we disagree with the Examiner's determination that the claims are directed to an abstract idea.[2] Thus, we do not sustain the rejection of independent claims 1, 10, and 20, and their dependent claims 2–9 and 11–19, under 35 U.S.C. § 101 as being directed to patent ineligible subject matter.

Rejection under 35 U.S.C. § 103(a) based on Ziolkowski and Robertsson

The Examiner found that Ziolkowski discloses a method for generating an image based on separating up-going and down-going wave fields (U, D) in seismic data including the "receiving," "transforming," "establishing," "solving," and "generating" steps of each independent claim, except that Ziolkowski does not explicitly teach: (1) wherein the first datum is non-flat, (2) up-going and down-going wave fields (U, D) on a second planar datum, (3) generating the image based on at least one of the desired up-going and down-going wave fields (U, D) for the second datum, (4) wherein the second datum is different from the first datum, and (5) wherein each of the first and second functions includes extrapolator operators for extrapolating the desired up-going and down-going wave fields (U, D), respectively, to the second datum. Final Act. 4–7.

The Examiner turned to Robertsson for these missing teachings. *Id.* at 7–8. The Examiner determined that it would have been obvious to modify

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[2] Appellant also argues that the claims, even if directed to an abstract idea, recite significantly more than the abstract idea. Appeal Br. 10–12 (citing *Research Corp. Techs. Inc. v. Microsoft Corp.*, 627 F.3d 859 (Fed. Cir. 2010)). Because we find that the claims are not directed to an abstract idea, we need not proceed to step two. *Alice*, 134 S. Ct. at 2355.

Ziolkowski with the teaching of Robertsson so that seismic data obtained by streamers floating in the sea and/or surface bottom receivers may be time/phase corrected to appear as though the data was obtained at the same sensor/source positions so that the data may be adjusted so as to be comparable. *Id.* at 8.

Appellant argues that Ziolkowski does not disclose functions that include extrapolator operators for extrapolating the desired up-going and down-going wave fields to a second planar datum and that Robertsson does not cure this deficiency in Ziolkowski. Appeal Br. 19. The Examiner acknowledges that Ziolkowski does not teach a first non–flat datum and does not teach using functions that include extrapolator operators for extrapolating the desired up-going and down-going wave fields (U, D) to a second planar datum. Final Act. 7. Thus, we look to Robertsson to determine if it cures these deficiencies in Ziolkowski.

Robertsson discloses a system for conducting marine seismic survey that uses either streamers towed behind a vessel, vertical seismic profiling, or ocean bottom cable acquisition techniques. Robertsson, 4:11–13. Robertsson describes acquiring two sets of data, i.e., two surveys, that differ in the travel time of signals through the body of water located above the receivers. *Id.* at 4:15–17. The invention corrects one or both sets of signals for amplitude and/or other mismatches using a filter derived from matching clearly identifiable events in both data sets. *Id.* at 4:19–22. The invention also corrects for effects of rough sea. *Id.* at 4:24–27.

In one embodiment, Robertsson discloses conducting two surveys over the same section of seabed with both source and streamer at identical positions with the vessel at two different heights relative to the seafloor. *Id.*

at 6:27–31. Robertsson then separates the data sets into up-going U and down-going D wave fields. *Id.* at 7:25–26. Robertsson describes using a matched filter to remove differences due to variations between the two surveys or due to variations in receiver depths, e.g., to match data acquired during the same survey but with receivers at different locations. *Id.* at 8:23–9:11. To remove differences due to variations between two surveys, Robertsson describes, "The matched filter can be determined by matching data acquired through both surveys in a window where no multiples are present such as the first water bottom arrival." *Id.* at 8:28–31. To remove differences due to variations in receiver depths during the same survey, such as might occur when using the twin streamer methods proposed in U.S. Patent Application Publication No. 2003/0147306 A1, Robertsson discloses that a matched filter or operator can be used to "move" data acquired by two different streamers at the same survey to the same position relative to the seafloor. *Id.* at 9:9–14. Robertsson teaches that such methods of extrapolating data are "sometimes collectively referred to as redatuming or wavefield extrapolation." *Id.* at 9:14–17. It is not clear to us, and the Examiner has not demonstrated adequately on the record, that the matched filter technique disclosed in Robertsson for moving data acquired by two different streamers during the same survey involves the same functions recited in the "establishing" and "solving" steps of the independent claims.

For instance, the Examiner reads this portion of Robertsson as teaching to use this matched filter to match data acquired from a non-flat datum that occurs due to rough seas. Ans. 5 (citing Robertsson, 9:1–20). Robertsson does not discuss correcting for receivers at different depths on a single streamer resulting from rough seas in the paragraph on page 9 relied

on by the Examiner. Rather, the matched filter and other methods disclosed in the paragraph on page 9 relate to moving entire data sets acquired from different streamers during a single survey. Robertsson 9:9–14.

Robertsson describes a technique for accommodating for rough seas on page 10. It is not clear whether Robertsson's reference to "rough seas" implies accommodating for receivers at different depths on a single streamer, i.e., a non-flat datum, or whether this reference implies accommodating for variations imparted by the rough seas between the data sets recorded by receivers of two separate streamers. Robertsson describes the use of filter Fm, which can be computed by minimizing energy around an interpreted window around the first water bottom reverberations or which can be derived from other methods. *Id.* at 10:27–11:17. The Examiner has not provided adequate findings as to how the techniques described in Robertsson of employing filter Fm to accommodate for rough seas disclose the "establishing" and "solving" steps of the independent claims on appeal.

For these reasons, we do not sustain the rejection of claims 1–20 under 35 U.S.C. § 103(a) as unpatentable over Ziolkowski and Robertsson.

Rejection under 35 U.S.C. § 103(a) based on Sollner, AAPA, and Schuster

The Examiner found that Sollner discloses substantially all of the steps of the independent claims except that Sollner "implies but does not explicitly teach solving with an inversion procedure." Final Act. 11–14. The Examiner found that "AAPA teaches solving with an inversion procedure." *Id.* at 14. The Examiner determined that it would have been obvious to use an inversion procedure in Sollner for the solving step to apply time shifts to the data so that the traces appear to be generated and recorded, respectively, by sources and receivers related to a deeper datum. *Id.* (citing

Schuster 1 (Introduction), 4 sec. 1, 5 (Surface 3D CDP), 5 (Asymptotic Redatuming)).

Appellant argues that Sollner's equations relate the pressure data P and the particle velocity V to their corresponding up-going and down-going components, but not to general up-going and down-going wave fields U and D. Appeal Br. 23. Appellant contends that AAPA does not cure this deficiency because AAPA indicates that inversion methods are known in the art, but does not teach or suggest applying the inversion method to calculate up-going and down-going wave fields U and D. *Id.* Appellant argues that the Examiner's proposed reason to modify Sollner to use inversion to solve for U and D is "not germane" and is "confusing." *Id.* at 24.

Sollner's teaching is similar to the claimed invention. In particular, Sollner recognizes that in a realistic marine environment, the seismic receivers on a towed streamer do not form an ideally horizontal acquisition surface. Sollner ¶ 26 (acknowledging that in a realistic marine environment, the acquisition surface is not necessarily flat), ¶ 27 (showing in Figure 1B a smoothly shaped, non-flat acquisition surface). Sollner addresses this problem using an "arbitrary flat observation level 18" between non-flat acquisition level 14 and sea surface 13. *Id.*, Fig. 1B. However, Sollner appears to generate the image using flat observation level 18 via a different technique from the claimed method.

Sollner teaches that motion sensors on the streamers will sense a normal velocity wave field in a direction normal to the acquisition surface at that point. *Id.* ¶ 27. Sollner teaches decomposing the normal velocity wave field and the pressure wave field measured on non-flat acquisition surface 14 into up-going and down-going pressure components and up-going and

down-going particle velocity components on planar observation level 18. *Id.* ¶ 30, Fig. 2 (block 20). These components are then extrapolated iteratively in steps from observation level 18 toward sea surface 13. *Id.* ¶ 31, Fig. 2 (block 21). The extrapolated components are then used to determine an image point and a reflection coefficient of the sea surface at the image point. *Id.* ¶ 32, Fig. 2 (block 22).

As explained in further detail in Figures 3 through 5 of Sollner, rather than solving generally for U and D, Sollner determines individual up-going and down-going particle velocity components on planar observation level 18 and determines individual up-going and down-going pressure components on planar observation level 18. Thus, Sollner does not generate the image based on at least one of the desired up-going and down-going wave fields (U, D). Instead, Sollner extrapolates the individual components iteratively in steps from observation level 18 to the sea surface to determine an image point and a reflection coefficient. Thus, although Sollner is directed to solving the same problem as addressed by Appellant's claimed invention, Sollner appears to solve the problem in a different way.

We agree with Appellant that the Examiner has not explained adequately why one having ordinary skill in the art would have been led to modify Sollner in the manner claimed in view of AAPA and/or Schuster. As noted by Appellants, AAPA shows only that solving functions using inversion procedures was known in the art. In the prior Appeal Brief (March 4, 2016) relied on by the Examiner as the admitted prior art, Appellant acknowledges that inversion techniques are known techniques for solving equations. AAPA 17, 21. AAPA does not show that it was known to use

inversion techniques to solve the claimed functions to obtain the desired up-going and down-going wave fields (U, D).

Schuster teaches that it was known in the art to use redatuming to apply time shifts to seismic data so that the traces appear to be generated and recorded, respectively, by sources and receivers relocated to a deeper datum. Schuster 1 (Introduction). Schuster discloses applying, for example, Kirchoff extrapolation to introduce these time shifts to mitigate elevation-induced distortions in the data. *Id.*

Sollner, however, already teaches a technique for mitigating for elevation-induced distortions in the data. The Examiner has not explained adequately what would have prompted one having ordinary skill in the art to modify the technique of Sollner in the manner claimed in light of Schuster. The Examiner's reliance on Schuster's disclosure that redatuming is useful for correcting distortion due to irregular surface topography is not sufficient, without more, to suggest modifying Sollner's redatuming method to the method claimed.

For these reasons, we do not sustain the rejection of claims 1–20 under 35 U.S.C. § 103(a) as unpatentable over Sollner, AAPA, and Schuster.

DECISION

The decision of the Examiner rejecting claims 1–20 is reversed.

REVERSED