United States Court of Appeals for the Federal Circuit

05-1062

LIZARDTECH, INC.,

Plaintiff-Appellant,

and

REGENTS OF THE UNIVERSITY OF CALIFORNIA,

Plaintiffs

v.

EARTH RESOURCE MAPPING, INC., and
EARTH RESOURCE MAPPING PTY LTD. (now Earth Resource Mapping Ltd.),

Defendants- Appellees.

Philip P. Mann, Mann Law Group, of Seattle, Washington, argued for plaintiff-appellant. Of counsel on the brief were Robert J. Carlson and Kevan L. Morgan, Christensen O'Connor Johnson & Kindness PLLC, of Seattle, Washington.

Stewart M. Brown, DLA Piper Rudnick Gray Cary US LLP, of San Diego, California, argued for defendants-appellees. With him on the brief was Richard T. Mulloy.

Appealed from: United States District Court for the Western District of Washington

Judge John C. Coughenour

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DECIDED: October 4, 2005

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Before LOURIE, SCHALL, and BRYSON, <u>Circuit Judges</u>.

BRYSON, <u>Circuit Judge</u>.

LizardTech, Inc., appeals the final judgment of the United States District Court for the Western District of Washington in this patent case. On the motion of defendants Earth Resource Mapping, Inc., and Earth Resource Mapping Pty Ltd. (collectively "ERM"), the district court granted summary judgment, holding that ERM did not infringe U.S. Patent No. 5,710,835 ("the '835 patent"), and that the patent was invalid. <u>LizardTech, Inc. v. Earth Res. Mapping, Inc.</u>, No. C99-1602C (W.D. Wash. Mar. 14, 2004). We affirm.

I

A

The technology at issue in this case involves what are known as "wavelet transforms." Wavelet transforms allow digital images to be greatly compressed with very little loss of information. In particular, they help in the image compression process because they can be used to transform image data into a form in which it is easier to determine what information in the data is relevant, so that irrelevant and redundant data can be filtered out. See Pankaj N. Topiwala, Introduction to Compression, in Wavelet Image and Video Compression 61, 61-63 (Pankaj N. Topiwala ed., 1998).

For purposes of digital image compression, the most useful type of wavelet transform is what is called a discrete wavelet transform ("DWT"). The DWT of the image can be calculated by repeatedly applying two algorithms to the image using functions known as high-pass and low-pass finite impulse response filters. See A. Jensen & A. la Cour-Harbo, Ripples in Mathematics: The Discrete Wavelet Transform 69 (2001). The high-pass filter contains certain values that change as a function of the distance from the center of the filter, where that distance is measured in terms of the pixels of the to-be-filtered image. Thus, the filter has one value at a distance of one pixel from the center, another value at a distance of two pixels from the center, and so on. The values of the high-pass filter are chosen so that when the filter is applied to the image the small, high-frequency information in the image is retained, while the large, low-frequency information is filtered out. The reverse is true for the low-pass filter. See Pankaj N. Topiwala, Time-Frequency Analysis, Wavelets and Filter Banks, in Wavelet Image and Video Compression 33, 50.

While the task of choosing the high-pass and low-pass filters may be complicated, their application to the image is not. See Time-Frequency Analysis, Wavelets and Filter Banks, supra, at 51-57. The high-pass filter (or, more precisely, the mirror image of what is normally referred to as the high-pass filter) is initially centered on the first pixel in the image. The value of the filter at each pixel along the row of the image that contains the first pixel is then multiplied by the data value of the digital image of each pixel in that row. The resulting products are added together, and the sum, called the DWT coefficient, is assigned to the original first pixel. The filter is then shifted to be centered on the next pixel in the row, the entire process is repeated, and the second coefficient is derived. That process is repeated to derive coefficients for the entire row of pixels and then for all the pixel rows constituting the image. The same operation is then applied to the original image using the low-pass filter (that is, the mirror image of the low-pass filter) instead of the high-pass filter.

This process generates two coefficients for each pixel. Since no new information is created as a result of this oversampling, the coefficients from every other pixel can be discarded with no loss of information. After completing this "down-sampling," the same high-pass and low-pass filtering is performed on the down-sampled coefficients in the column direction. Finally, upon down-sampling the results of the filtering in the column direction, three types of coefficients are obtained: those multiplied by a high-pass filter in both directions ("the high-high decomposition"), those multiplied by low-pass filters in both directions ("the low-low decomposition"), and those multiplied by a low-pass filter in one direction and a high-pass filter in the other. Those coefficients can then be easily compressed, resulting in a minor loss of information relating to the original image, but

using much less storage space than was necessary to store that image. In practice, the low-low decomposition has most of the relevant information, which is the reason that compression of the image is easier to perform after applying a DWT on the image. See Pankaj N. Topiwala, Wavelet Still Image Coding: A Baseline MSE and HVS Approach, in Wavelet Image and Video Compression 95, 96. However, the fact that the low-low decomposition contains most of the data also means that the entire process can be rerun on the low-low decomposition with a different set of filters, creating three more sets of data. The low-low decomposition of that set can in turn be selected and decomposed. Furthermore, the processes of filtering and down-sampling can be inverted with no loss of information. By using both the final, uncompressed coefficients from the transform and the original filters, the original image can be recreated. Only if the coefficients are compressed is there a loss of information. Additionally, if a low-low decomposition is inverted, it will produce an image that retains all the low-bandpass information of the original image, but is one quarter the size of the original image (or 1/16, 1/64, etc., of the original size depending on how many times transforms have been applied to the low-low decompositions and which of those low-low decompositions is inverted). Therefore, by choosing the appropriate low-low decomposition to invert, images with different resolutions can be created.

One problem with this method of calculating a DWT is that an image has edges, while the filter functions do not.[1] That means that for distances beyond the edge of the

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[1]   In practice, of course, the filters have a finite length, called the number of "taps." That has no bearing on our discussion, however, because unless there is only one tap, the filter will extend over the edge of the image at least some of the time for the calculation of coefficients within the image.

image, the product of the filter function and the image data must be set to an artificial value, usually zero. When the coefficients produced by using those artificial values are inverted, the recreated image will often have "defects," since fake information was used in the process of calculating the DWT.

A second problem with this method of calculating a DWT on a computer is that the entire image must be placed in the computer's memory, which can be difficult in the case of very large images. Therefore, prior art computer programs broke up the image into pieces, or "tiles," and calculated the DWT of each tile separately so that only the data within a single tile needed to be in the computer's memory at once. However, breaking the image into tiles creates boundaries between the tiles within the image. If the outside of the tiles is artificially set to zero during the DWT process, the product of the filter function and the image data outside the tile will be zero, and a large number of edge artifacts may be created. Reducing edge artifacts while performing a DWT on individual tiles of an image for compression purposes is the object of the '835 patent.

The '835 patent solves the boundary problem by taking account of the fact that the values of the image pixels outside a given tile are known. See '835 patent, col. 2, ll. 53-57. That is, breaking the image into tiles is simply a useful means of making the DWT calculation practical on a computer with limited memory; the rest of the image outside the tile is not lost even if it is temporarily set to zero for the purpose of calculating the DWT of the tile. The '835 patent uses this fact by calculating DWT coefficients outside the boundary of the tile. See id., col. 7, ll. 42-45 ("Note that DWT 120 effects an expansive transform, that is, the number of non-zero coefficients emanating from the routine is generally greater than the number of pixels that are input

to it.") For pixels outside the tile that are set to zero, the high-pass and low-pass filters are still shifted to be centered on those pixels, multiplied by the value of the pixels in the row or column direction, and added together. That process results in non-zero DWT coefficients because, even though the filters are centered over a zeroed pixel, the filters still have a non-zero value within the tile where the pixels have not been zeroed. The coefficients in the zeroed region are then saved. See id., col. 7, ll. 54-57. Later, when the DWT is performed on the adjoining tile, and the pixels within that tile are no longer zeroed, the resulting DWT coefficients of the pixels in that tile are added to the previously saved coefficients corresponding to those pixels. See id., col. 7, ll. 46-51. That summation results in final DWT coefficients for those pixels that are exactly the same as if there had never been any tiling or zeroing of those pixels at all. That is, the process produces a "seamless" DWT. See id., col. 6, ll. 6-13 (it "effectively produces the same output as the DWT routine would output if applied to the entire image").

B

LizardTech, the exclusive licensee of the '835 patent, brought this action alleging that ERM's geospatial imaging software product, ER Mapper, infringed claims 1, 13, 21, 22, 23, 24, 25, 27, and 28 of the '835 patent. The record owner of the patent, the University of California, was subsequently added as a party on LizardTech's motion. After construing the claim term "tile" in the '835 patent, the district court granted ERM's motion for summary judgment of noninfringement. LizardTech, Inc. v. Earth Res. Mapping, Inc., No. C99-1602C (W.D. Wash. Dec. 12, 2000). This court reversed the district court's construction of the word "tile" and remanded the case for further

proceedings. <u>LizardTech, Inc. v. Earth Res. Mapping, Inc.</u>, 35 Fed. Appx. 918 (Fed. Cir. 2002).

On remand, the district court requested that a special master reconsider the court's claim construction. Based on the construction suggested by the special master, the district court held on summary judgment that ERM did not infringe claims 1 and 13 of the '835 patent. The district court also held that claim 21 was invalid for obviousness. Finally, the district court held that claim 21 and its dependent claims (claims 22-25, 27, and 28) were invalid for failing to satisfy the written description requirement of 35 U.S.C. § 112. LizardTech appeals each of those rulings.

II

Claim 1 of the '835 patent recites the following, in relevant part:

> A method for selectively viewing areas of an image at multiple resolutions in a computer . . . comprising the steps of:
> storing a complete set of image data array $I(x,y)$ representing said image . . . ;
> defining a plurality of discrete tile image data $T_{ij}(x,y)$ subsets, where said complete set of image data $I(x,y)$ is formed by superposition of said discrete tile image data $T_{ij}(x,y)$;
> performing one or more discrete wavelet transformation (DWT)-based compression processes on each said tile image data $T_{ij}(x,y)$ in a selected sequence to output each said discrete tile image data $T_{ij}(x,y)$ as a succession of DWT coefficients . . . ;
> maintaining updated sums of said DWT coefficients from said discrete tile image $T_{ij}(x,y)$ to form a seamless DWT of said image and storing said sums in a first primary memory location of said computer;
> periodically compressing said sums and transferring said compressed sums to a second secondary memory . . . ;
> selecting a viewing set of said image data array $I(x,y)$ to be viewed at a desired resolution; . . . .

Claim 13 of the '835 patent recites the following, in pertinent part:

> A method for compressing a large digital image for storage in a computer memory, the method comprising the steps of:
> storing a complete set of image data array $I(x,y)$ representing said image . . . ;

defining a plurality of discrete tile image data $T_{ij}(x,y)$ subsets of said $I(x,y)$, where said $I(x,y)$ is formed by superposition of said $T_{ij}(x,y)$;

performing on a computer one or more discrete wavelet transformation (DWT)-based compression processes over each said tile image data $T_{ij}(x,y)$ in a selected sequence to output each said $T_{ij}(x,y)$ as a succession of DWT coefficients . . . ;

maintaining updated sums of said DWT coefficients from said discrete tile image $T_{ij}(x,y)$ to form a seamless DWT of said $I(x,y)$ and storing said sums in a second memory location of said computer.

The district court's noninfringement ruling with respect to claims 1 and 13 was predicated on its interpretation of the "maintaining updated sums" limitation in the two claims, which addresses how a seamless DWT of the image is formed. The district court construed that limitation to mean "summing the DWT coefficients of one tile together with overlapping DWT coefficients from one or more adjacent tiles." Both parties agreed with that construction.

As explained by the district court, the ER Mapper fails to meet the "maintaining updated sums" limitation when it forms a seamless DWT of an image because overlapping DWT coefficients are never added together. Instead, the ER Mapper uses the fact that wavelet transforms are linear. The ER Mapper forms a seamless transform of the image by first calculating the DWT coefficients in the row direction for all the pixels in that row. That process is then repeated for all the rows in the image. After the DWT coefficients are calculated for the rows, the ER Mapper proceeds to take the DWT of those coefficients for the columns. The result is the full set of two-dimensional DWT coefficients for the entire image. The ER Mapper solves the memory problem faced by the prior art because it only needs to load one row or column of the image into memory at once. Furthermore, the method used by the ER Mapper creates no edge artifacts because it uses no artificial internal boundary conditions in creating the DWT coefficients.

LizardTech maintains that after it agreed to the district court's claim construction, the court materially altered that construction by changing the meaning of the word "overlapping." According to LizardTech, the court's "new" construction does not comport with the '835 patent's specification and is incorrect. Specifically, LizardTech argues that the only place the term "overlapping" is used in the district court's claim construction order is where the court agreed with the special master that "in the context of the '835 patent [maintaining updated sums] includes summing overlapping DWT coefficients from two adjacent tiles [where] the adjacent tiles would be abutting, or side by side, but their respective DWT coefficients overlap because of the expansive nature of the transform explained earlier." LizardTech contends that the district court changed that definition of overlapping in its order granting summary judgment of noninfringement when it adopted the position that overlapping meant "that certain tile coefficients overlap those of a neighboring tile; in other words, image data from both tiles (or at least some data near the border) contribute to the DWT coefficients."

Contrary to LizardTech's assertions, we discern no change in the district court's claim interpretation. In the context of the '835 patent, "maintaining updated sums" means "summing the DWT coefficients of one tile together with overlapping DWT coefficients from one or more adjacent tiles." Overlapping in that context can only mean that the DWT coefficient at a given position, obtained from the data in one tile, is added to the DWT coefficient at the same position, obtained from the data in an adjacent tile. As explained above, that process is the basis for forming a seamless DWT in the '835 patent, see '835 patent, col. 6, ll. 6-13, and that process was clearly encompassed by the court's claim construction from the start. LizardTech agreed to the district court's

construction at the time, and it cannot now argue against that claim construction simply because it resulted in an adverse ruling on summary judgment. See ArthroCare Corp. v. Smith & Nephew, Inc., 406 F.3d 1365, 1376 (Fed. Cir. 2005).

Furthermore, the district court's construction of the "maintaining updated sums" limitation comports with the claim language and the specification. Claim 1 specifically provides that "DWT coefficients from said discrete tile image $T_{ij}(x,y)$" are added together to "form a seamless DWT of said image." '835 patent, col. 11, ll. 54-56. Claim 13 similarly provides that "DWT coefficients from said discrete tile image $T_{ij}(x,y)$" are added together to "form a seamless DWT of said $I(x,y)$." That is the equivalent of saying that DWT coefficients derived from one tile are added together with overlapping DWT coefficients from one or more adjacent tiles or, as the district court put it, "image data from both tiles (or at least some data near the border) contribute to the DWT coefficients." Claims 5-8, which depend on claim 1, further support the district court's claim construction. Those dependent claims specify exactly which tiles are the source of the DWT coefficients that are added together. For instance, claim 5 requires "retrieving updated sums of DWT coefficients from $T_{i-1j}(x,y)$ and $T_{ij-1}(x,y)$ and adding to coefficients for $T_{ij}(x,y)$." The specification also supports the court's construction of the "maintaining updated sums" limitation. In the summary of the invention, the patent states:

> A seamless wavelet-based compression process is effected on $I(x,y)$ that is comprised of successively inputting the tiles $T_{ij}(x,y)$ in a selected sequence to a DWT routine, adding corrections that are passed from previous invocations of the DWT routine on other $T_{ij}(x,y)$, . . . [which] can be viewed as an "overlap-add" realization of the DWT.

Id., col. 2, ll. 51-63. In other words, the DWT coefficients from one tile are added to the DWT coefficients calculated from another tile to create the seamless DWT.

In response, LizardTech argues that the special master's original construction contemplated that if DWT coefficients were generated from adjacent tiles, the DWT coefficients necessarily "overlapped." According to LizardTech, that meant that when ER Mapper calculates DWT coefficients in the row-wise direction, the resulting coefficients "necessarily" overlap with the DWT coefficients of the adjacent row. That argument, however, fails as a matter of logic. In the '835 patent, the reason that the DWT coefficients derived from two tiles overlap is because the patented method calculates DWT coefficients beyond the boundary of the tile, creating an "expansive transform." '835 patent, col. 7, ll. 42-44. That does not necessarily have to be the case. In fact, the ER Mapper calculates DWT coefficients only for locations within the tile, which in the case of the ER Mapper happens to be a single row or column. See LizardTech, 35 Fed. Appx. at 926. As one expert noted, in most cases DWT coefficients are calculated only for positions within the image, and it is readily apparent how to do so: in calculating DWT coefficients, the center of the filter is always placed within the boundary of the image. While the algorithm described in the '835 patent corrects boundary effects by calculating DWT coefficients outside the tile based on information inside the tile, that does not imply that DWT coefficients are always calculated outside the tile in every algorithm. In sum, merely because the coefficients between tiles in the '835 patent "necessarily" overlap does not mean that coefficients calculated by ER Mapper necessarily overlap.

Alternatively, LizardTech contends that ERM infringes even under what it considers the district court's erroneous claim construction. LizardTech's argument is based on the fact that after the ER Mapper calculates the DWT of the image rows, it

then calculates the DWT of the resulting coefficients of the image columns. As explained above, what that means is that the DWT coefficients derived from the rows are multiplied against the low-pass and high-pass filters and are then summed together. According to LizardTech, that process falls within the district court's construction of "summing the DWT coefficients of one tile together with overlapping DWT coefficients from one or more adjacent tiles," while "image data from both tiles (or at least some data near the border) contribute to the DWT coefficients." In other words, the summation that is inherent in taking a DWT satisfies the "maintain updated sums" limitation of the '835 patent.

The problem with LizardTech's argument is that "the ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art." Phillips v. AWH Corp., 415 F.3d 1303, 1313 (Fed. Cir. 2005). In this case, there is no evidence that a person of skill in the art would consider the limitation of maintaining updated sums of DWT coefficients to include the altogether distinct process of taking a DWT; the two are entirely different concepts and procedures. As ERM's expert explained, "[t]he adding required by the 'maintaining updated sums' step claimed in the '835 patent should not be confused with the mathematics inherent in the prior art DWT process."

The claim language bears out that distinction. Claim 1 states that part of the claimed process is "performing one or more discrete wavelet transformation (DWT)-based compression processes on each said tile image." The claim then sets forth the entirely separate process of "maintaining updated sums of said DWT coefficients." Claim 13 contains similar language. Other portions of the patent also delineate the

difference between taking a DWT and maintaining updated sums of DWT coefficients. For example, in Figure 5, which depicts a flow chart for the patented algorithm, the DWT is placed in one block while the procedure for maintaining updated sums is assigned a separate block. See also '835 patent, col. 7, ll. 31-53. The distinction between adding coefficients and performing a DWT is maintained throughout the specification as well. See, e.g., id., col. 2, ll. 54-57. In conclusion, the patent clearly uses the terms "DWT" and "maintaining updated sums of said DWT coefficients" differently. Simply because the DWT procedure entails the process of addition does not mean that a person of skill in the art would refer to the two processes interchangeably. Because the ER Mapper does not add overlapping DWT coefficients from one or more adjacent tiles together to form a seamless DWT, we affirm the district court's grant of summary judgment of noninfringement with respect to claims 1 and 13.

III

Claim 21 of the '835 patent is identical to claim 1 except that it does not contain the "maintaining updated sums" and "periodically compressing said sums" limitations. The term "seamless" does not appear in claim 21. For that reason, the district court held that the process in claim 21 did not lead to a seamless set of DWT coefficients for the entire image. Because the specification did not describe a nonseamless DWT algorithm, the district court held that claim 21 and its dependent claims were unsupported by the written description and thus were invalid. In response to that ruling, LizardTech maintains that because claim 21 does not explicitly state that the claimed DWT-based compression processes do not form a seamless DWT, claim 21 covers algorithms that result in a seamless DWT.

LizardTech is correct in arguing that a person of skill in the art, upon reading the entire patent and prosecution history, would understand the DWT-based compression processes recited in claim 21 to create a seamless DWT of the image. As the patent makes clear, prior art tile-based DWT processes would create "wavelet transform boundary conditions in the interior of the image data which could potentially result in compression artifacts," and "implementation of a local multiscale retrieval routine is complicated by these interior boundaries." '835 patent, col. 2, ll. 4-9. Therefore, "in accordance with the present invention, a method is provided for the seamless wavelet-based compression of very large contiguous images and for accessing arbitrary locations in the image at a variety of resolutions." Id., col. 2, ll. 9-12. Throughout the patent, the wavelet-based compression process is referred to as seamless. See, e.g., id., col. 2, ll. 51-52; id., col. 2, ll. 61-62. While it is true that not every advantage of the invention must appear in every claim, see Phillips, 415 F.3d at 1327, it would be peculiar for the claims to cover prior art that suffers from precisely the same problems that the specification focuses on solving.

The prosecution history also makes clear that the DWT-based compression process recited in claim 21 creates a seamless DWT. In arguing that claims 1, 14, and 21 were not obvious, the prosecuting attorney stated that the applicant "is compressing the tile data and then processing the tile data in a selected sequence so that the resulting stored DWT coefficients represent the entire image, not tile images, and without any artifacts at tile boundaries." In other words, the prosecuting attorney was saying that the independent claims recite algorithms that result in a seamless DWT. Furthermore, the prosecuting attorney argued that the claims that depended on claim 21

also contain a "method for combining the DWT tile data to produce a seamless data array." In fact, the prosecuting attorney stated that "the invention claimed by applicant as a whole" is to "provide a seamless stored array of compressed DWT coefficients." Those arguments were not lost on the examiner. The examiner noted in the reasons for allowance that claims 1, 13, and 21 "form a seamless discrete wavelet transformation of the image." Thus, a person of skill in the art would recognize the DWT-based compression processes recited in claim 21 as creating a seamless DWT of the image.

The fact that claim 21 is directed to creating a seamless DWT does not mean that the claim is valid, however. The problem is that the specification provides only one method for creating a seamless DWT, which is to "maintain updated sums" of DWT coefficients. That is the procedure recited by claim 1. Yet claim 21 is broader than claim 1 because it lacks the "maintain updated sums" limitation. Thus, a person of ordinary skill in the art would understand that claim 21 is directed to a seamless DWT. But because there are no limitations in claim 21 as to how the seamless DWT is accomplished, claim 21 refers to taking a seamless DWT generically. It is also clear that claim 21 cannot be directed to creating a seamless DWT only in the way that claim 1 recites, i.e., by maintaining updated sums of DWT coefficients. To do so would impermissibly read a limitation into claim 21 and would make it essentially redundant of claim 1.

The trouble with allowing claim 21 to cover all ways of performing DWT-based compression processes that lead to a seamless DWT is that there is no support for such a broad claim in the specification. The specification provides only a single way of creating a seamless DWT, which is by maintaining updated sums of DWT coefficients.

There is no evidence that the specification contemplates a more generic way of creating a seamless array of DWT coefficients.

Paragraph one of section 112 of the Patent Act requires a patent specification to set forth the "best mode" contemplated by the inventor "of carrying out his invention," and to contain "a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art . . . to make and use the same." 35 U.S.C. § 112, para. 1. That obligation, which forms an essential part of the quid pro quo of the patent bargain, "requires the patentee . . . to describe [the invention] in such terms that any person skilled in the art to which it appertains may construct and use it after the expiration of the patent." Permutit Co. v. Graver Corp., 284 U.S. 52, 60 (1931).

The "written description" clause of section 112 has been construed to mandate that the specification satisfy two closely related requirements. First, it must describe the manner and process of making and using the invention so as to enable a person of skill in the art to make and use the full scope of the invention without undue experimentation. See Tyler v. City of Boston, 74 U.S. 327, 330 (1868); AK Steel Corp. v. Sollac & Ugine, 344 F.3d 1234, 1244 (Fed. Cir. 2003). Second, it must describe the invention sufficiently to convey to a person of skill in the art that the patentee had possession of the claimed invention at the time of the application, i.e., that the patentee invented what is claimed. See O'Reilly v. Morse, 56 U.S. (15 How.) 62, 112-13 (1853) (denying a claim for use of "electro-magnetism, however developed for marking or printing intelligible characters . . . at any distances" because others "may discover a mode of writing or printing at a distance . . . without using any part of the process or combination

set forth in the plaintiff's specification"); <u>Moba, B.V. v. Diamond Automation, Inc.</u>, 325 F.3d 1306, 1320-21 (Fed. Cir. 2003).

Those two requirements usually rise and fall together. That is, a recitation of how to make and use the invention across the full breadth of the claim is ordinarily sufficient to demonstrate that the inventor possesses the full scope of the invention, and vice versa. This case is no exception. Whether the flaw in the specification is regarded as a failure to demonstrate that the patentee possessed the full scope of the invention recited in claim 21 or a failure to enable the full breadth of that claim, the specification provides inadequate support for the claim under section 112, paragraph one.

Claim 21 is directed to creating a seamless array of DWT coefficients generically. The specification, however, is directed at describing a particular method for creating a seamless DWT, as opposed to using the disfavored, nonseamless prior art, and it teaches only that method of creating a seamless array. While the embodiment in LizardTech's specification covers only one way of creating a seamless DWT, claim 21 is not invalid simply for that reason. A claim will not be invalidated on section 112 grounds simply because the embodiments of the specification do not contain examples explicitly covering the full scope of the claim language. <u>See</u> <u>Union Oil Co. v. Atl. Richfield Co.</u>, 208 F.3d 989, 997 (Fed. Cir. 2000). That is because the patent specification is written for a person of skill in the art, and such a person comes to the patent with the knowledge of what has come before. <u>In re GPAC Inc.</u>, 57 F.3d 1573, 1579 (Fed. Cir. 1995). Placed in that context, it is unnecessary to spell out every detail of the invention in the specification; only enough must be included to convince a person of skill in the art that the inventor possessed the invention and to enable such a person to make and use

the invention without undue experimentation. In this case, however, LizardTech has failed to meet either requirement. After reading the patent, a person of skill in the art would not understand how to make a seamless DWT generically and would not understand LizardTech to have invented a method for making a seamless DWT, except by "maintaining updating sums of DWT coefficients."

The inadequacy of the specification in this case is similar to the failing identified in Tronzo v. Biomet, Inc., 156 F.3d 1154 (Fed. Cir. 1998). In Tronzo, the patent at issue pertained to an artificial hip socket that included cup implants adapted for insertion into a hip bone. Id. at 1156. In describing the shape of the cup implants, the specification distinguished prior art shapes as inferior and "tout[ed] the advantage of the conical shape." Id. at 1159. However, the claims spoke of the shape of the cups generically. Id. On appeal, this court assessed whether the patent disclosure was sufficiently detailed to enable a person of skill in the art to recognize that Tronzo had invented what he claimed, i.e., cup implants with a generic shape. Id.; see also Turbocare Div. of Demag Delaval Turbomachinery Corp. v. Gen. Elec. Co., 264 F.3d 1111 (Fed. Cir. 2001). This court recognized that there was nothing in the patent's specification "to suggest that shapes other than conical are necessarily a part of the disclosure." Tronzo, 156 F.3d at 1159. Therefore, the court held that the patent failed to provide the written description necessary to support the claims. Id. at 1160.

LizardTech responds that section 112 requires only that each individual step in a claimed process be described adequately. Because a process of creating a seamless DWT is described, LizardTech argues that claim 21 is not invalid. However, that approach is at odds with the analysis this court employed in Tronzo, and it would lead to

sweeping, overbroad claims because it would entitle an inventor to a claim scope far greater than what a person of skill in the art would understand the inventor to possess or what a person of skill in the art would be enabled to make and use.

By analogy, suppose that an inventor created a particular fuel-efficient automobile engine and described the engine in such detail in the specification that a person of ordinary skill in the art would be able to build the engine. Although the specification would meet the requirements of section 112 with respect to a claim directed to that particular engine, it would not necessarily support a broad claim to every possible type of fuel-efficient engine, no matter how different in structure or operation from the inventor's engine. The single embodiment would support such a generic claim only if the specification would "reasonably convey to a person skilled in the art that [the inventor] had possession of the claimed subject matter at the time of filing," Bilstad v. Wakalopulos, 386 F.3d 1116, 1125 (Fed. Cir. 2004), and would "enable one of ordinary skill to practice 'the full scope of the claimed invention,'" Chiron Corp. v. Genentech, Inc., 363 F.3d 1247, 1253 (Fed. Cir. 2004), quoting In re Wright, 999 F.2d 1557, 1561 (Fed. Cir. 1993); PPG Indus., Inc. v. Guardian Indus. Corp., 75 F.3d 1558, 1564 (Fed. Cir. 1996). To hold otherwise would violate the Supreme Court's directive that "[i]t seems to us that nothing can be more just and fair, both to the patentee and the public, than that the former should understand, and correctly describe, just what he has invented, and for what he claims a patent." Merrill v. Yeomans, 94 U.S. 568, 573-74 (1876); see also Phillips, 415 F.3d at 1321 ("The patent system is based on the proposition that the claims cover only the invented subject matter."); AK Steel Corp., 344 F.3d at 1244 ("as part of the quid pro quo of the patent bargain, the applicant's

specification must enable one of ordinary skill in the art to practice the full scope of the claimed invention"). Thus, a patentee cannot always satisfy the requirements of section 112, in supporting expansive claim language, merely by clearly describing one embodiment of the thing claimed. For that reason, we hold that the description of one method for creating a seamless DWT does not entitle the inventor of the '835 patent to claim any and all means for achieving that objective.

Finally, LizardTech argues that it is significant that claim 21 is part of the original disclosure and was not added at a later point. While it is true that an originally filed claim can provide the requisite written description to satisfy section 112, see Union Oil Co., 208 F.3d at 998 n.4, nothing in claim 21 or the specification constitutes an adequate and enabling description of all seamless DWTs. Therefore, we affirm the district court's judgment that claims 21-25 and 27-28 are invalid for failure to satisfy the requirements of section 112. In light of that holding, it is unnecessary for us to consider the district court's ruling that claim 21 is invalid for obviousness under 35 U.S.C. § 103.

<div align="center">AFFIRMED.</div>