IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Review of:)
U.S. Patent No. 8,398,236)
Issued: Mar. 19, 2013)
Application No.: 12/815,179)
Filing Date: June 14, 2010)

For: **Image-Guided Docking for Ophthalmic Surgical Systems**

FILED VIA E2E

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,398,236

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Page(s)

CASES

STATUTES

REGULATIONS

Exhibit List

Ex.	Description
1001	U.S. Patent No. 8,398,236 ("'236 patent")
1002	File History for '236 patent ("'236 FH")
1003	Declaration of Robert Huber in Support of Petition for *Inter Partes* Review Of U.S. Patent No. 8,398,236 ("Huber")
1004	Curriculum vitae – Robert Huber
1005	U.S. Patent Application Publication No. 2007/0088865 A1 ("Breyer")
1006	National Instruments, Reconfigurable I/O, NI 786*x*R User Manual (June 2006) ("RIO Manual")
1007	National Instruments, *Transferring Data Between the FPGA and the Host VI (FPGA Module) – LabVIEW FPGA Module 8.5 Help* (Aug. 2007), https://web.archive.org/web/20080828210122/ http://zone.ni.com/reference/en-XX/help/371599C-01/lvfpgaconcepts/pfi_data_transfer/ ("LabVIEW Help")
1008	Teoman E. Ustun et al., *Real-time Processing for Fourier Domain Optical Coherence Tomography Using a Field Programmable Gate Array* 79 Review of Scientific Instruments 114301 (2008) ("Ustun")
1009	Daniel Hammer et al., *Three-dimensional Tracker for Spectral Domain Optical Coherence Tomography*, 6429 Proceedings of SPIE 642913 (2007) ("Hammer")
1010	United States Patent Application Publication No. 2009/0012507 A1 ("Culbertson")
1011	Manish Kankaria, *Design and Construction of a Fast Spectrometer for Fourier Domain Optical Coherence Tomography* (May 2006) (Master's thesis, University of Texas) ("Kankaria")
1012	Mitchell P. Weikert & Anne Bottros, *The Femtosecond Laser: A New Tool for Refractive and Corneal Surgery*, *Ch. 7 in Cataract and Refractive Surgery* (Thomas Kohnen & Douglas D. Koch eds. 2006) ("Weikert")

Ex.	Description
1013	United States Reissued Patent No. RE41,228 ("Kodosky")
1014	Alcon's Objections and Responses to J&J's First Set of Interrogatories (Nos. 1-17) *AMO Development LLC v. Alcon LenSx, Inc.* No. 1:20-cv-00842-CFC (D. Del. Feb. 4, 2021)
1015	United States Patent Application Publication No. 2009/0171327 A1 ("Kurtz")
1016	National Instruments, *Writing to DMA FIFOs from Host VIs (FPGA Interface) – LabVIEW FPGA Module 8.5 Help* (August 2007), https://web.archive.org/web/20091011114613/http://zone.ni.com/reference/en-XX/help/371599C-01/lvfpgahosthelp/fpga_writing_dma/
1017	Affidavit of Duncan Hall, Records Request Processor at the Internet Archive, with authenticated printouts of the Internet Archive's records of certain files archived at web.archive.org
1018	National Instruments, *Using DMA FIFO to Develop High-Speed Data Acquisition Applications for Reconfigurable I/O Devices* (Sept. 26, 2006), https://web.archive.org/web/20081031194430/ http://zone.ni.com:80/devzone/cda/tut/p/id/4534
1019	*Newton's Telecom Dictionary* (Harry Newton ed., 25th ed. 2009) (excerpt)
1020	Declaration of John Breyer in Support of Petition for *Inter Partes* Review Of U.S. Patent No. 8,398,236 ("Breyer Decl.")
1021	Declaration of Ingrid Hsieh-Yee ("Hsieh-Yee Decl.")
1022	Wiley Electrical and Electronics Engineering Dictionary (Steven M. Kaplan ed. 2004) (excerpt)

I. Introduction

Johnson & Johnson Surgical Vision ("J&J Vision") requests *inter partes* review of claims 1-3, 6-13, 15-19, 21, 23, 26-32, 34-38, and 40 of U.S. Patent No. 8,398,236, titled "Image-Guided Docking for Ophthalmic Surgical Systems" ("'236 patent") (Ex. 1001) and assigned to Alcon LenSx, Inc. ("Alcon").

Ophthalmic laser surgery systems may require a stable connection with the eye to ensure precision in the surgical procedure. '236 patent, 1:14-22. That can be achieved by "docking" the system on the eye. *Id.* As shown in the figure at right, a docking unit is lowered onto the eye and securely connected by suction. Weikert (Ex. 1012), at 86. To achieve satisfactory docking, the patient's eye must be properly aligned with the docking unit. '236 patent, 1:37-39.

Fig. 7.2 Femtosecond laser docking of the applanation lens to the suction ring

Imaging systems can be used to help the surgeon better visualize patient alignment during the docking process. *Id.*, 6:4-5. The '236 patent notes that it is directed to electronics used to control the imaging system during this process. *Id.*, Abstract. It is particularly concerned with the control electronics for a type of imaging known as optical coherence tomography (OCT). *Id.*, 6:30-41.

The broadest claims of the ’236 patent are directed to OCT imaging controller circuitry. *See, e.g.*, ’236 patent, claims 27 and 35. Thus, despite the lengthy discussion of docking in the patent specification, the broadest claims have nothing to do with docking or patient alignment. Instead, they focus on the control electronics for OCT imaging, using standard components such as a processor, memory controller, buffer, and digital-analog converter. *Id.*, 19:45-59. As this Petition demonstrates, these off-the-shelf components were used in the same way, long before Alcon filed its application for the ’236 patent.

The ’236 patent also includes narrower claims directed to a method of docking a laser system to an eye, using the more broadly claimed imaging control electronics. *See, e.g.*, ’236 patent, claim 1. But again, the ’236 patent offers nothing new. Imaging-assisted docking was known in the prior art. As shown below, it would have been obvious to use standard components, each performing the same function they were known to perform in the prior art, to control the imaging system for docking.

Thus, J&J Vision requests that the Board institute *inter partes* review and cancel the challenged claims.

II. Identification of Challenges (37 C.F.R. § 42.104(b))

Ground 1a: Claims 27-32, 35-38, and 40 are obvious over Ustun (Ex. 1008) in combination with LabVIEW Help (Ex. 1007) and Breyer (Ex. 1005).

Ground 1b: Claims 35-38 and 40 are obvious over Ustun in combination with LabVIEW Help, Breyer, and RIO Manual (Ex. 1006).

Ground 2: Claim 34 is obvious over Ustun in combination with LabVIEW Help, Breyer, and Hammer (Ex. 1009).

Ground 3: Claims 1-3, 6-7, 9-13, 15, 18-19, 21, 23, and 26 are obvious over Culbertson (Ex. 1010) in combination with Ustun, LabVIEW Help, and Breyer

Ground 4: Claim 8 is obvious over Culbertson in combination with Ustun LabVIEW Help, Breyer, and Kankaria (Ex. 1011).

Ground 5: Claims 16-17 are obvious over Culbertson in combination with Ustun, LabVIEW Help, Breyer, and Hammer.

III. Background

A. The ’236 Patent (Ex. 1001)

The ’236 patent claims priority to U.S. Patent Application No. 12/815,179, filed June 14, 2010.

As described in the Background section of the ’236 patent, it was known in the prior art that ophthalmic laser systems can be docked, where the connection to the eye "is established by lowering a docking module or unit onto the eye." '236 patent, 1:14-22.

OCT imaging systems were also known in the prior art. As the patent admits, "principles of the operation of OCT imaging systems are well known and documented." *Id.*, 11:42-43. OCT systems scan an imaging beam (such as a laser beam) across the eye, collect the interference pattern, and process the data to generate an image of the eye. *Id.*, 12:3-17, 12:43-46.

The '236 patent asserts that in some OCT systems, it can be a challenge for a single processor to both control the movement of the OCT scanners and analyze the received OCT data. '236 patent, 12:51-13:12. To do both things simultaneously, the system may need to "multitask and perform more than one function in an interleaved, parallel or overlapping manner." *Id.,* 12:51-53. That may require the system to "perform an 'interrupt' by switching from e.g. the task of scanning the beam to another task and back." *Id.*, 12:53-55. "Such interrupts, however short, can cause problems, since during the time when the scanning is stopped or frozen by the interrupt, the [OCT] laser beam may remain pointed to the same position." *Id.*, 12:56-59. Further, delays can be introduced if instructions are sent to the OCT scanners via the same communication path (e.g., a system bus) that is shared among other system sub-components. *Id.*, 12:66-13:3. These interrupts and delays can slow down system performance and lead to "scanning-freeze." *Id.*, 12:59-63, 13:10-12.

The ’236 patent purports to provide a system that solves these difficulties (’236 patent, 12:47-50) “by employing an efficient design.” ’236 patent, 13:13-15. This design is shown in Figure 10 of the patent:

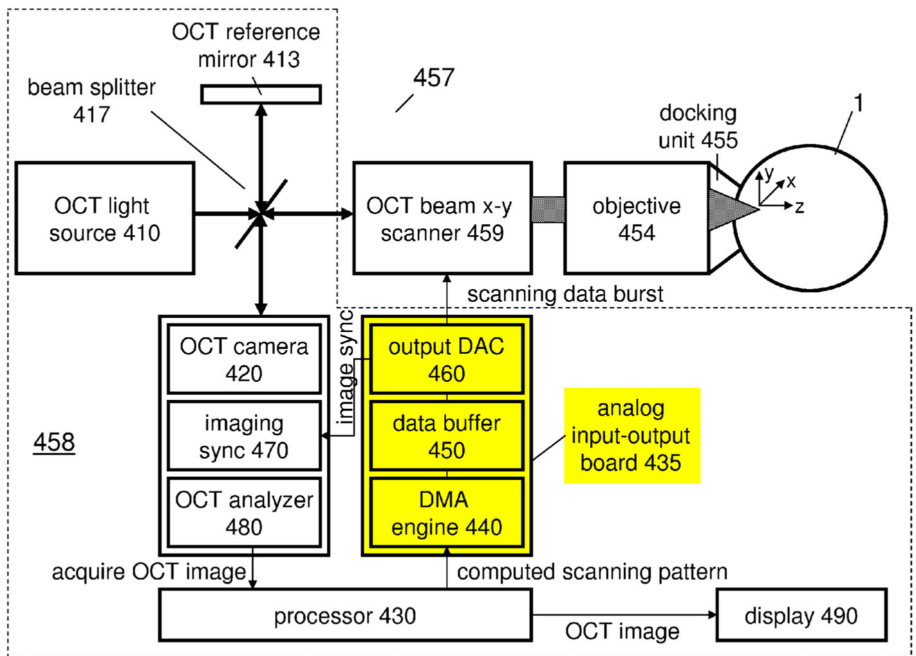


FIG. 10

’236 patent, Fig. 10 (highlighted). The design includes an “analog input-output board 435” (highlighted in yellow above). This board has three components. First, it includes a local or dedicated memory controller 440, also called “DMA [direct memory access] engine 440.” *Id.*, 13:30-32. Next, the board includes “data buffer 450,” which can be “e.g., a first-in-first-out (FIFO) memory.” *Id.,* 13:49-51. Finally, the board includes an “output DAC [digital-analog converter] 460.” *Id.*, 13:35-41. Analog signals from the DAC are used to control x- and y-axis galvanometer mirrors

(OCT x-y scanner 459), which scan the OCT imaging beam across the target tissue. *Id.*, 14:19-27.

This analog input-output board operates as follows:

1. Processor 430 determines where the OCT imaging beam will scan. It generates digital "scanning data," which is a "sequence of x-y coordinates" in the target tissue "where the OCT imaging beam will be directed." '236 patent, 13:15-21.
2. DMA engine 440 (local memory controller) transfers the scanning data to data buffer 450.
3. Data buffer 450 outputs the scanning data to output DAC 460 (digital-analog converter).
4. Output DAC 460 converts the scanning data to analog signals for the x-y galvanometers in the scanner 459.

'236 patent, 13:13-14:25; Huber [1]¶¶ 13-19 (Ex. 1003). Claims 27 and 35 and their dependent claims focus on these components and steps. Claim 1 recites steps to use these standard electronic components to improve alignment of a docking unit with the eye.

[1] This Petition is supported by the declaration of Dr. Robert Huber ("Huber").

B. Prosecution History

As originally submitted during prosecution, claim 1 was directed to a docking method with an imaging system to improve alignment. Ex. 1002 ("'236 FH"), 449. It did not recite the control electronics used for imaging. *Id.*

The Examiner rejected the claims as anticipated and obvious in view of a patent publication (Gertner), which disclosed OCT imaging and docking an ophthalmic system to the eye. '236 FH 194-202. In response, the Applicant argued, *inter alia*, that the invention "introduc[ed] a dedicated analog input-output board that includes the dedicated memory controller, and the dedicated and fast data buffer, such as a FIFO." '236 FH 184-85. The Applicant asserted that the Examiner was wrong to "assume the implicit presence" of a dedicated data buffer in Gertner "without proof." *Id.* at 16.

Following Applicant's response, the Examiner initiated an interview and obtained Applicant's permission to amend the claims to place them in condition for allowance. '236 FH 9. Claim 1 was amended to incorporate features from dependent claim 7, adding the same control electronics requirements found in claims 27 and 35, including:

> computing scanning data by a processor corresponding to a scanning pattern;
>
> storing the scanning data in a dedicated data buffer;

> transferring the scanning data by the dedicated data buffer to an output module partially under the control of a dedicated memory controller;
>
> outputting scanning signals by the output module to one or more scanners based on the scanning data; and
>
> scanning an imaging beam with the one or more scanners according to the scanning signals;

236 FH 9, 16-19. With that amendment, the Examiner allowed the claims. '236 FH 10-14; *see also* Huber ¶¶ 20-22. None of the prior art relating to control electronics for OCT imaging discussed in this Petition was before the Examiner.

IV. Person of Ordinary Skill in the Art

A person having ordinary skill in the art at the time of the purported invention in or about June 2010, ("POSA") would have had at least a Bachelor's degree in electrical engineering, computer science, or a related field, and three to four years of industry experience, or a Master's degree in computer science or electrical or a related field, and one to two years of industry experience. The POSA would have been familiar with the electronics and software tools discussed in this Petition. The POSA also would have been familiar with the ophthalmic laser surgery systems or would have worked with an ophthalmologist. Huber ¶¶ 23-27.

V. Claim Construction

All terms should be given their ordinary and customary meaning.[2] *See* Huber ¶¶ 28-30. J&J Vision reserves the right to respond to any constructions that may be offered by Alcon or adopted by the Board.

VI. Ground 1a: Claims 27-32, 35-38, and 40 Are Obvious Over Ustun in Combination with LabVIEW Help and Breyer

Three independent claims are challenged in this Petition: claims 1, 27, and 35. We start with claims 27 and 35 because they are broader than claim 1. Claim 1 includes limitations found in claim 27 and 35, and recites further elements relating to alignment of a docking unit with an eye. Claim 1 is discussed separately below. *See* Section IX.C, *infra*.

Claims 27 and 35 are respectively directed to an "imaging controller" and a "method of controlling an ophthalmic imaging." As explained below, Ustun discloses control electronics for OCT imaging in ophthalmic laser surgery systems, including for patient alignment. *See also* Huber ¶¶ 36-37. To the extent that specific circuitry or configuration details are not explicitly disclosed in Ustun, they are found in product manuals and publications for the off-the-shelf components discussed in Ustun.

---

[2] J&J Vision reserves the right to argue alternative constructions in other proceedings, and where such a defense is available, that the claims are indefinite.

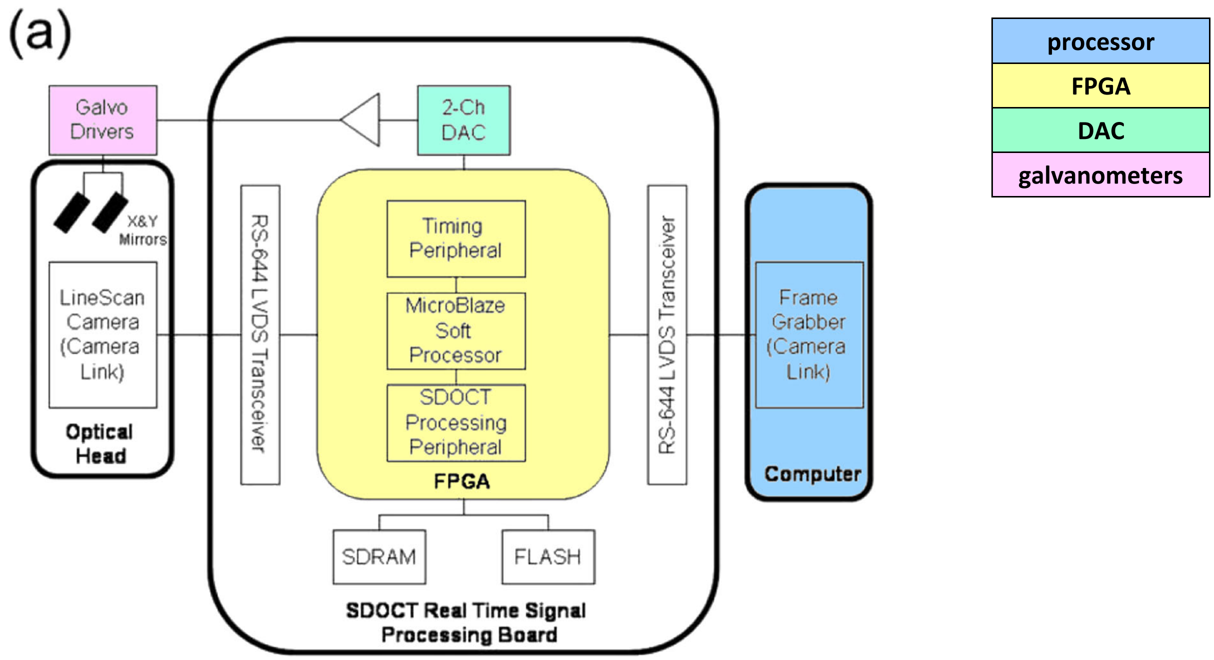
A. The Prior Art

1. Ustun (Ex. 1008)

Ustun is an article published in the November 2008 issue of the journal Review of Scientific Instruments. Ex. 1008. It is prior art under pre-AIA 35 U.S.C. § 102(b) because it was published on November 3, 2008, more than one year before the application for the '236 patent. Ustun, at 1 (showing copyright and online publication date); Hsieh-Yee Decl. (Ex. 1021) ¶¶ 19-35 (testifying that Ustun was publicly available, indexed, and catalogued at a library by no later than February 2009). Ustun was not cited during prosecution.

Ustun describes an OCT imaging system for ophthalmic and other applications. Ustun, at 1. Like the '236 patent, Ustun recognizes that control and processing for an OCT imaging system can be taxing and "usually exceed[] the capabilities of most computers." *Id.* That is particularly true when used for "real-time display of processed images," as is required when used for patient alignment during docking. *Id.* at 1, 2 ("In ophthalmology, it is desirable to have real-time feedback to aid in patient alignment.").

Ustun solves these challenges by using a host processor together with a field programmable gate array (FPGA), to take some of the processing load away from the host processor. Ustun, at 2. An FPGA is an integrated circuit that can be programmed, using commercially-available programming tools, to include standard features such as a local memory controller and data buffer. Huber ¶ 40. In Ustun, the FPGA is plugged into a circuit board that includes a DAC. Ustun, at 3-4. The DAC controls the galvanometers that scan the OCT imaging beam. These components are shown in Figure 1(a) of Ustun:



Ustun, Fig. 1(a) (highlighted, legend added on right); Huber ¶¶ 38-41.

For its FPGA, Ustun "used a Virtex-4 FPGA." Ustun, at 3, 9. Ustun also suggests using the next generation "Virtex 5 FPGAs with higher performance and more optimized hardware architecture." *Id*. at 9. To program the FPGA, Ustun uses two common graphical programming software platforms,[3] "LabVIEW (National

[3] Graphical software platforms enable writing source code using graphical tools rather than conventionally through text. Breyer Decl. ¶ 7.

Instruments, Inc.)" and "MATLAB SIMULINK." *Id.* at 5, 6. As explained below, these off-the-shelf tools are used to program FPGAs to include a DMA engine (local memory controller) and FIFO (data buffer).

Just like the '236 patent's preferred embodiment, the OCT imaging system of Ustun operates as follows:

1. Ustun's host processor generates scanning data that indicates where the OCT imaging beam will be scanned. Ustun, at 6.
2. The FPGA is programmed to transfer the scanning data to BlockRAM memory of the FPGA, which is a FIFO buffer. *Id.* at 7.
3. BlockRAM memory outputs the scanning data to the DAC. *Id.*
4. The DAC converts the scanning data to analog scanning signals for the galvanometers in the scanner. *Id.*

Huber ¶ 42.

A POSA, reading Ustun, would have known to use a DMA engine (local memory controller) to transfer scanning data to the buffer. LabVIEW from National Instruments is the leading graphical programming environment to program FPGAs, including the Virtex FPGA found in Ustun. Huber ¶ 43. Ustun specifically identifies LabVIEW. Ustun, at 6 ("The host processor software and graphical user interface were developed with LABVIEW (National Instruments, Inc.)."). LabVIEW provides a simple tool for transferring data to a FIFO buffer under control of a DMA engine. Ex. 1007 (describing the commands to transfer data between the host computer and the FPGA using a DMA FIFO); Huber ¶ 43. A publication by National Instruments explains that a DMA controlled FIFO improves the speed of data transfers "by up to 20X." Ex. 1018. Similarly, a National Instruments patent taught a "data path optimization technique" of using "DMA for high speed transfers" with FIFOs. Ex. 1013 ("Kodosky"), 46:44-51; Huber ¶ 43.

2. LabVIEW Help (Ex. 1007)

National Instruments published an August 2007 product reference manual called "LabVIEW FPGA Module 8.5 Help." The prior art referenced herein as "LabVIEW Help" is a chapter from that manual, entitled "Transferring Data Between the FPGA and the Host VI (FPGA Module)." Ex. 1007. It is prior art under pre-AIA 35 U.S.C. § 102(b) because it was published no later than August 28, 2008, more than one year before the application for the '236 patent.[4] LabVIEW Help was not cited during prosecution.

---

[4] The published version of LabVIEW Help is archived on the Wayback Machine, a service provided by the Internet Archive that permits searches of its digital library of archived Internet webpages. Ex. 1017, ¶¶ 1-8, pp. 026-027. The Wayback Machine's archives are regularly relied on as probative evidence of public accessibility. *See, e.g.*, *In re Bhagat*, 726 F. App'x 772, 775 (Fed. Cir. 2018) (non-

LabVIEW Help was freely available on the Internet, specifically on National Instruments' popular website, www.ni.com. Breyer Decl. (Ex. 1020) ¶¶ 16. A POSA interested in programming an FPGA in Ustun or in more information on the LabVIEW product used by Ustun would have known to browse the National Instruments website, where LabVIEW help files were found in the "Support" section. *Id.* ¶ 12. It was the standard practice of National Instruments to publish specifications, product user manuals, and release notes on its website, and to distribute them to customers and potential customers with no expectation of secrecy or confidentiality. *Id*. ¶ 13. National Instruments maintained an online repository of such documents at www.ni.com, and this website was routinely accessed by thousands of customers and prospects to learn more about National Instruments products and how to operate and program them. *Id.* ¶ 16. Indeed, the National Instruments website was among the most popular sources of information for a POSA

---

precedential); *BMW of N. Am., LLC v. Stragent, LLC*, IPR2017-00677, Paper 32 at 45-46 (PTAB June 13, 2018) (Final Written Decision). As explained by Duncan Hall, a Records Request Processor at the Internet Archive, LabVIEW Help (Ex. 1007) was archived on August 28, 2008. Ex. 1017, ¶¶ 4-5 (explaining that date strings translate into "[Year in yyyy][Month in mm][Day in dd][Time code in hh:mm:ss]" on which the webpage was "automatically stor[ed]" by the Wayback Machine), pp. 026-027.

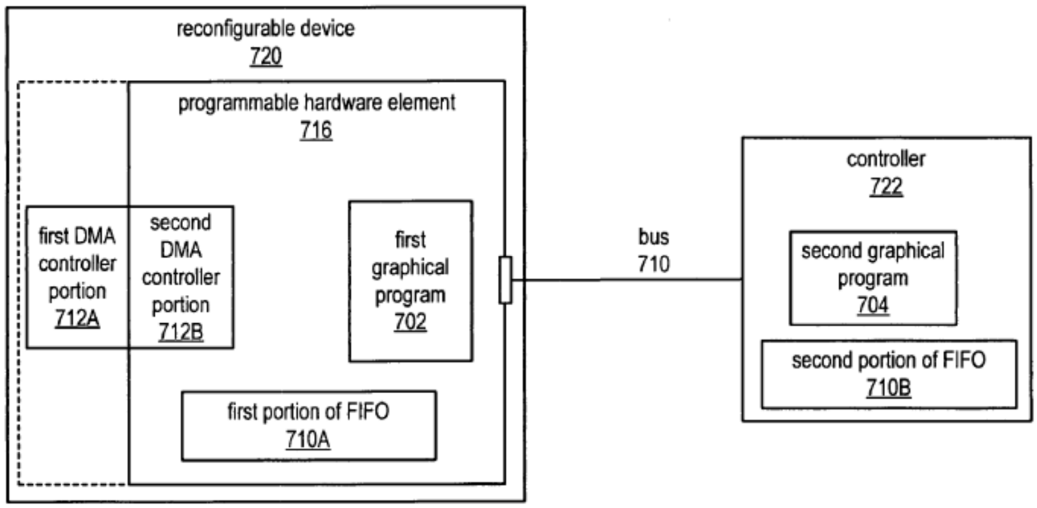
interested in the art of custom computer memory boards or programming such boards. *Id.* ¶¶ 12-16.

LabVIEW Help teaches the use of "Direct Memory Access (DMA)" for "streaming large amounts of data at a time" between a host computer and an FPGA. LabVIEW Help, at 1; Huber ¶¶ 44-45. LabVIEW uses a "DMA Engine to transfer DMA FIFO data between the FPGA and the host computer." LabVIEW Help, at 1. When "the DMA Engine runs, it automatically transfers data between the DMA FIFO memory on the FPGA and the DMA FIFO memory on the host computer so they act as one FIFO array." *Id.*

3. Breyer (Ex. 1005)

Breyer (US 2007/0088865 A1) is a published patent application assigned to National Instruments. Ex. 1005. It is prior art under pre-AIA 35 U.S.C. § 102(b) because it was published on April 19, 2007, more than one year before the application for the '236 patent. Breyer was not cited during prosecution.

Breyer is assigned to National Instruments and describes techniques used in its LabVIEW programming environment to program an FPGA. Breyer Decl. ¶¶ 8-9. Breyer points out a shortcoming of the prior art, that communication between a host processor and an FPGA "has generally been performed via either interrupts or register accesses," which can be slow. Breyer, [0011]. Breyer solves this problem by using a DMA FIFO—a first-in-first-out buffer controlled by a DMA engine—to transfer data between a host processor ("controller 722") and an FPGA ("reconfigurable device 720"), as shown in Figure 7:



Breyer, Fig. 7, Abstract.

Breyer teaches that its disclosure can be applied not just to LabVIEW, but also to other graphical programming environments, such as SIMULINK. Breyer, [0067]; Huber ¶¶ 46-48.

B. Motivation to Combine Ustun with LabVIEW Help and Breyer

A POSA had ample motivation to combine the teachings of Ustun with LabVIEW Help and Breyer. This combination is merely an arrangement of old elements to perform the same functions they were known to perform—Ustun uses an FPGA that can be programmed with LabVIEW, and LabVIEW Help and Breyer explain how LabVIEW programming of an FPGA was conventionally implemented. Huber ¶¶ 49-50.

Ustun explicitly teaches programming its FPGA with graphical programming software such as LabVIEW and SIMULINK. Ustun, at 5, 6. LabVIEW Help provides instructions on how to implement LabVIEW programming. LabVIEW Help, at 1-2. In particular, it describes LabVIEW FPGA module's DMA FIFO feature. *Id.* Breyer provides more detail about the same DMA FIFO feature. *See, e.g.,* Breyer, Abstract, Fig. 7, [0014]-[0027]; Huber ¶ 51. Like LabVIEW Help, Breyer provides guidance about how to program an FPGA using graphical programming software (including LabVIEW), and specifically how to implement DMA-controlled FIFOs. *See e.g.,* Breyer, [0124]-[0137]. Both LabVIEW Help and Breyer teach that using a DMA-controlled FIFO will significantly improve data transfer speeds. LabVIEW Help, at 1; Breyer, [0011]-[0012], [0135].

Given these disclosures, a POSA would have been motivated to combine these disclosures to implement a DMA-controlled FIFO in Ustun to optimize the scanning data path, with a reasonable expectation of success. Huber ¶¶ 49-52. These references were all analogous prior art as they were reasonably pertinent to the particular problem that the '236 patent inventors were trying to solve: obtaining efficient and high performance electronics to generate, process, and output scanning OCT signals without slowing down or interrupting a host processor. *Id.* ¶ 52. Further reasons to combine are discussed below in connection with Element 27/35[b].

C. Claims 27 and 35

Claim 27 recites an imaging controller to compute and transfer scanning data to a scanner, and claim 35 recites a corresponding method. As described above, the prior art discloses the entirety of the claims. The correspondence between the patent and Ustun can be shown as follows:

<table>
<tr><th>Claim 27</th><th>Disclosures</th></tr>
<tr><td>27. An imaging controller for an ophthalmic system, comprising:

a processor that computes scanning data for a scanning pattern of an optical coherence tomographic imaging system:

a local memory controller that partially manages a transfer of the computed scanning data from the processor to a dedicated data buffer, wherein
the dedicated data buffer is configured to store the scanning data and to output the scanning data; and

an output digital-analog converter, coupled to the dedicated data buffer that converts selected scanning data to analog scanning signals and

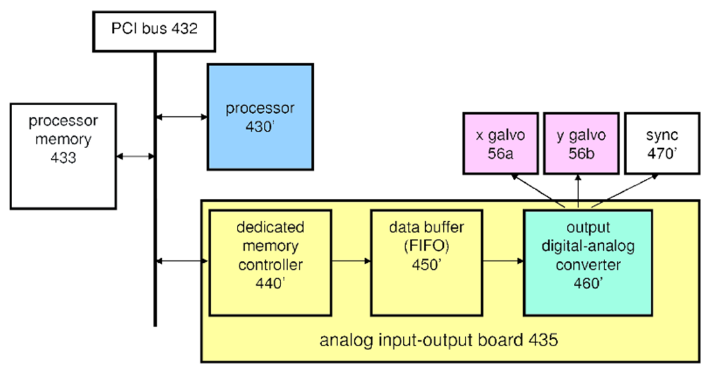
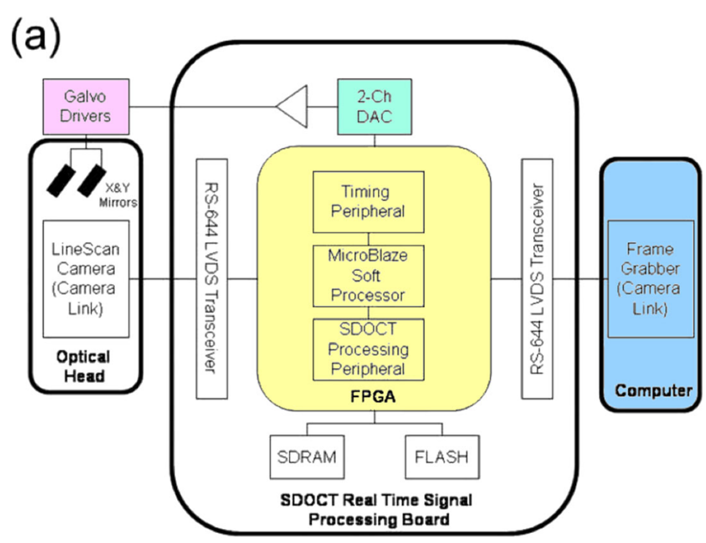
outputs the scanning signals to the optical coherence tomographic imaging system.</td><td>**’236 patent**, Fig. 11 (highlighted):


FIG. 11

Ustun, Fig. 1(a) (highlighted):

</td></tr>
</table>

Huber ¶ 53.

1. Preamble

"An imaging controller for an ophthalmic system" (claim 27)

"A method of controlling an ophthalmic imaging" (claim 35)

To the extent the preambles are limiting, Ustun discloses such a system and method. Ustun's system provides "rapid imaging speeds" "for ophthalmic applications," with "real-time feedback to aid in patient alignment" for ophthalmic procedures. Ustun, Abstract, 1-2, 7; Huber ¶¶ 54-55.

2. Element 27/35[a]: computing scanning data

"a processor that computes scanning data for a scanning pattern of an optical coherence tomographic imaging system" (claim 27)

"computing scanning control data by a processor for an optical coherence tomographic imaging system" (claim 35)

Ustun discloses a host processor that computes scanning [control] data[5] (x and y galvanometer waveforms) to drive scanning controllers (x-y galvanometers) for an OCT imaging system. Ustun, at 6-7; Huber ¶ 56.

---

[5] The '236 patent uses the terms "scanning data" and "scanning control data" interchangeably. Huber ¶ 56. They will generally be referred to as "scanning data" in this Petition.

The ’236 patent states that the scanning data includes “a sequence of x-y coordinates where the OCT imaging beam will be directed in the target region in the course of scanning.” ’236 patent, 13:17-21. It is a digital form of the analog signals that ultimately control the OCT system’s galvo-scanners. *Id.*, 14:19-23; Huber ¶ 57.

Ustun’s “host processor” likewise computes a selected sequence of x-y coordinates (the galvanometer waveforms) that ultimately direct its OCT scanners. “During the initialization process (or when a new scan type is configured), the user selects” various parameters including the scan type and size. Ustun, at 6. Then “[t]he ***x-y galvanometer waveform array is calculated in the host processor*** software during initialization and downloaded to the FPGA BlockRAM memory and output to the galvanometers via the DAC IC.” *Id.* at 6-7.[6] This “x-y galvanometer waveform array” computed by the “host processor software” is the “scanning data” used to control Ustun’s x-y galvanometers after it is converted to analog form in the next steps. Huber ¶¶ 58.

Ustun thus discloses a processor that computes scanning data as recited in this claim element. Huber ¶¶ 56-59.

3. Element 27/35[b]: storing scanning data

“a local memory controller that partially manages a transfer of the computed scanning data from the processor to a dedicated

[6] All emphasis added unless otherwise noted.

> *data buffer, wherein the dedicated data buffer is configured to store the scanning data ...”* (claim 27)
>
> *“storing the scanning control data into a dedicated data buffer partially under the control of a memory controller”* (claim 35)

The only exemplary “dedicated data buffer” in the ’236 patent that stores scanning data is FIFO 450/450′, and the only memory controller mentioned is DMA engine 440/440′. ’236 patent, 13:30-14:16, Figs. 10-11, claims 10, 29, 40; Huber ¶ 60. This claim element is thus implemented in the ’236 patent by a DMA FIFO. Huber ¶ 60.

Ustun uses an FPGA that, when programmed by a POSA, has a DMA FIFO as recited in this claim element. Huber ¶ 61. LabVIEW Help and Breyer specifically instruct a POSA to program a FPGA such as the one in Ustun to include a FIFO buffer (dedicated data buffer) partially under the control of a DMA engine (memory controller[7]), which partially manages the transfer.[8] *Id.* ¶¶ 61.

---

[7] The “memory controller” should not be construed under § 112(6), but even if it is, the patent and the art both describe the identified structure: a DMA engine that partially controls a FIFO buffer. Huber ¶ 61.

[8] The ’236 patent uses the term “partially . . . controls” (or “partially . . . transfers”) in the sense of “***at least*** partially” controlling/transferring. ’236 patent, 15:61-63; Huber ¶ 67. In any event, the DMA engine in LabVIEW Help and Breyer

Ustun discloses transferring scanning data into a dedicated buffer on its FPGA. Ustun's "x-y galvanometer waveform array is calculated in the host processor software during initialization and ***downloaded to the FPGA BlockRAM memory*** and output to the galvanometers via the DAC IC." Ustun, at 7. The "x-y galvanometer waveform array" is scanning data, and the BlockRAM memory is a dedicated data buffer.[9] Huber ¶ 62.

A POSA would have understood that Ustun's buffer is to be implemented as a DMA FIFO—a FIFO buffer partially under the control of a DMA engine. Huber ¶ 63. Such a design was routinely implemented with off-the-shelf tools, including LabVIEW, which Ustun identifies for programming its FPGA. Ustun, at 6; Huber ¶ 63. Reference materials for LabVIEW explain that it included a feature to create a DMA FIFO for "high speed data transfer" from the host to the FPGA (or vice

---

only partially manages the data transfer and only partially controls the FIFO buffer, as the host and FPGA perform the writing and reading on each side. LabVIEW Help, at 1; Breyer, Abstract, [0138]-[0151]; Huber ¶ 67.

[9] A "buffer" is "a temporary storage location for information being sent or received, and serves the purpose of flow control." *See* Ex. 1019, 214. Ustun's BlockRAM is a buffer because it is used to temporarily store scanning data before it is "output to the galvanometers via the DAC IC." Ustun, at 7; Huber ¶ 62.

versa). *See* LabVIEW Help, at 1 ("LabVIEW uses a ***DMA Engine*** to transfer DMA FIFO data between the FPGA and the host computer.… When the ***DMA Engine*** runs, it automatically transfers data between the ***DMA FIFO memory*** on the FPGA and the DMA FIFO memory on the host computer so they act as one FIFO array."). This was known to be particularly appropriate for large amounts of data. LabVIEW Help, at 1 ("[Y]ou can wait for a large amount of data to accumulate and ***use a DMA FIFO to transfer the data efficiently.***"); *see also* Breyer, [0135] ("[T]he ***DMA controller*** may on the same circuit board as the programmable hardware element [FPGA], and may be communicatively coupled thereto to facilitate direct memory access by the ***DMA FIFO.***").

Thus, a POSA would have implemented a "DMA FIFO" under the control of a DMA engine in the Ustun's FPGA. Huber ¶ 64. They would have been motivated to do so because the tools were readily available in LabVIEW, the programming environment identified in Ustun. *Id.* A POSA would have known that DMA FIFO was particularly appropriate for transferring large amounts of data, such as the scanning data for OCT in Ustun. *Id.* Ustun specifically indicates that the scanning data is downloaded to BlockRAM memory (a FIFO buffer), Ustun, at 7, and a POSA would have known that this is the very memory in which DMA FIFO is implemented by LabVIEW. *See* Ex. 1018 (explaining that LabVIEW "uses ***block RAM*** on the FPGA device" to implement the DMA FIFO); Huber ¶ 64.

Ustun (in light of LabVIEW Help and Breyer) thus discloses a DMA FIFO where the local memory controller (DMA engine) partially manages the transfer of computed scanning data (x-y galvanometer waveform array) from the processor to a dedicated data buffer (FIFO) where it is stored, as recited in this claim element. Huber ¶¶ 60-68.

A "dedicated data buffer" under the control of a "memory controller" would have been obvious not only because of the specific LabVIEW documentation cited in this Petition. Rather, the relevant question is "whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole." *Uber Techs., Inc. v. X One, Inc.*, 957 F.3d 1334, 1341 (Fed. Cir. 2020). Here, the teachings of Breyer are broader than LabVIEW FPGA's specific implementation of a DMA FIFO. Breyer's teachings apply not just to LabVIEW, but to any type of graphical programming techniques used to program FPGAs, including using Simulink. Breyer, [0067]. A POSA was thus well-equipped to implement the claimed, commonplace, DMA-controlled functionality based on Breyer's teachings, either in LabVIEW or in other graphical programming environments such as Simulink. Huber ¶ 66.

4. Element 27/35[c]: transferring scanning data

"wherein the dedicated data buffer is configured … to output the scanning data" (claim 27)

"transferring the scanning control data from the dedicated data buffer to a signal converter through a dedicated channel" (claim 35)

Ustun discloses this claims element, as explained below. Huber ¶ 69.

a. Outputting/transferring scanning data

Ustun explains that the "x-y galvanometer waveform array" (scanning data) is "downloaded to the FPGA BlockRAM memory" (dedicated data buffer), and output "to the galvanometers via the DAC IC" (signal converter). Ustun, at 7; *see also id*. at 3-4 (describing Task (5), Ustun's "timing peripheral" driving the DAC IC); Huber ¶¶ 70-71. Ustun uses a data buffer to output the scanning data. Ustun, at 6. It outputs scanning data since a FIFO buffer is "first-in-first-***out*** (FIFO)." Huber ¶ 70.

Ustun's DAC is a signal converter, as recited by claim 35. Huber ¶ 71. As a "digital-to-analog converter (DAC)," it converts a digital signal to an analog one. Ustun, at 3. Indeed, the only signal converter disclosed in the '236 patent is also a DAC. '236 patent, 13:38-14:30; Huber ¶ 71.

b. Through a dedicated channel (claim 35 only)

Claim 35 recites transferring the data "through a dedicated channel." The '236 patent explains that this "dedicated link" allows the processor 430 to perform other functions during the transfer. '236 patent, 13:5-12. The processor is "not slowed down by an interrupt by the processor 430 or another system agent either since the output proceeds from the data buffer 450′ through a dedicated channel on the analog input-output board 435 instead of the shared [PCI] bus 432," as shown below:

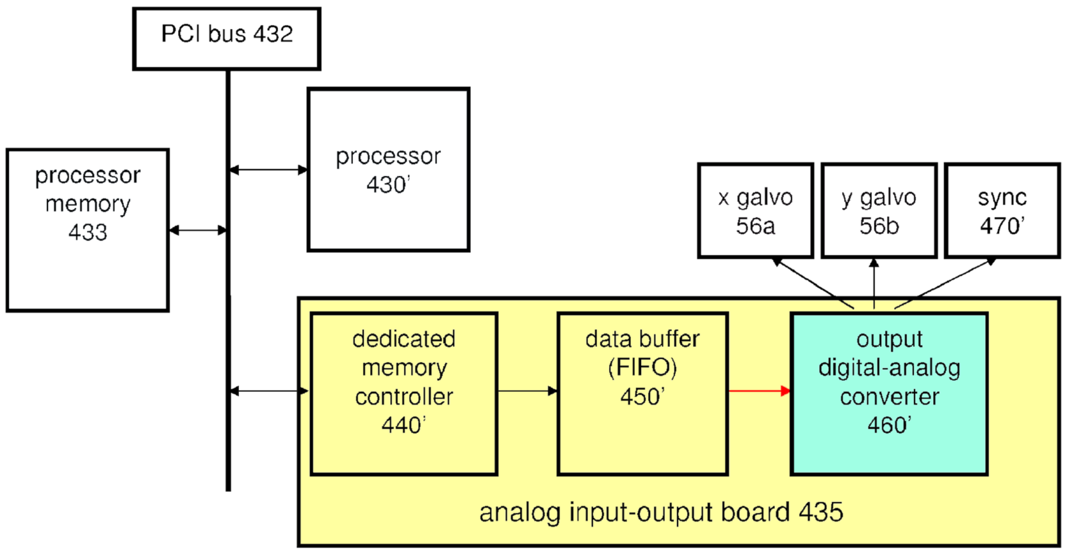
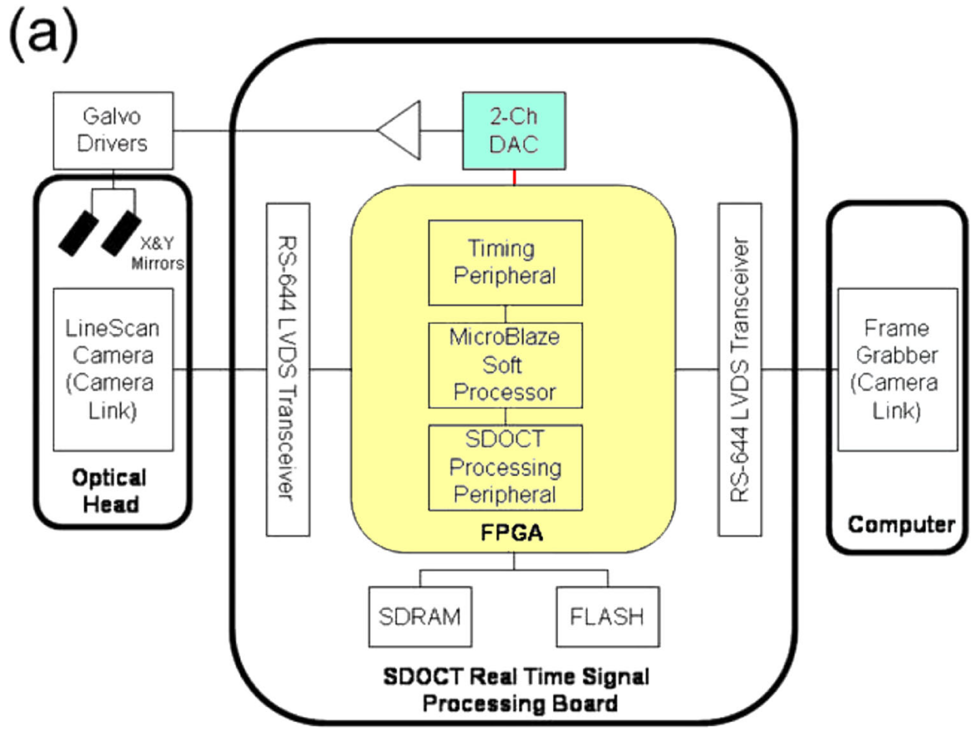


FIG. 11

Id., Fig. 11 (highlighted), 14:11-16; Huber ¶ 72.

Ustun similarly discloses a "dedicated channel" (red) from the dedicated data buffer (FIFO on FPGA, yellow) to a signal converter (DAC, green):



Ustun, Fig. 1(a) (highlighted); Huber ¶ 73.

Ustun explains that the DAC IC is driven by the "timing peripheral" that "reside[s] in the FPGA fabric." Ustun, at 3-4. This indicates that the scanning data (waveform array) is sent directly from the FIFO on the FPGA through a dedicated channel established between the FIFO and the DAC IC. Huber ¶ 74. As in the '236 patent, the scanning data need not and does not travel through the host processor or a shared channel. *Id.* ¶ 74.

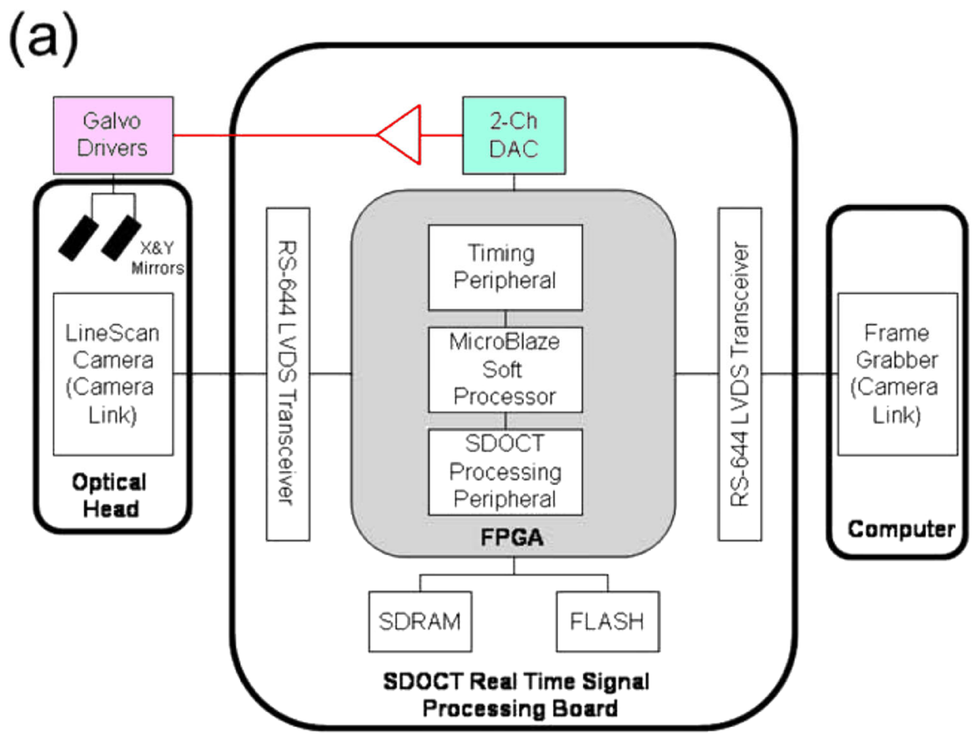
5. Element 27/35[d]: converting and sending scanning signals

"an output digital-analog converter, coupled to the dedicated data buffer that converts selected scanning data to analog

> *scanning signals and outputs the scanning signals to the optical coherence tomographic imaging system"* (claim 27)
>
> *"sending scanning signals to a scanning controller by an output module, wherein the scanning signals are converted from the scanning control data by the signal converter"* (claim 35)

In the '236 patent, the digital "scanning data" are converted to analog "scanning signals" by the DAC, to drive the galvanometers (scanning controllers) of the OCT system. *See* '236 patent, 14:19-23 ("[T]he output DAC 460′ can convert the received digital scanning data into analog scanning signals and output the scanning signals to x and y galvo-controllers 56 *a* and 56 *b*."). Huber ¶ 75 .

Ustun discloses this claim element. As discussed for claim elements 27/35[a]-[c], Ustun computes and stores scanning data ("x-y galvanometer waveform array") in a dedicated data buffer (BlockRAM memory implemented as a DMA FIFO), which is output to a signal converter (DAC). *See* Sections VI.C.2-4, *supra.* Ustun's DAC converts the digital scanning data into analog scanning signals, as confirmed by the name of the device itself: "digital-to-analog converter (DAC)." Huber ¶ 76. Those signals are then output to the OCT system's galvanometers to control the OCT scanning. Ustun, at 7 ("x-y galvanometer waveform array is … downloaded to the FPGA BlockRAM memory and ***output to the galvanometers via the DAC IC***"). This output is shown by the red highlighted connection between the DAC (green) and galvanometers (pink):



Ustun, Fig. 1(a) (highlighted); Huber ¶ 76.

*   *   *

In sum, claims 27 and 35 are obvious over Ustun in view of LabVIEW Help and Breyer. Huber ¶ 77.

D. Dependent Claims

The following dependent claims are obvious for the same reasons as the claims from which they depend, and as discussed below.

1. Claims 28/40

Claim 28 recites that the local memory controller comprises a *"direct memory access engine."* Claim 40 includes a similar feature, and further recites that the dedicated buffer is a FIFO. These are taught by Ustun in view of LabVIEW Help and Breyer, as discussed for Element 27/35[b] above. Huber ¶ 79.

2. Claim 29

Claim 29 recites that the dedicated buffer is a FIFO and *"outputs the stored scanning data in a fast data transfer mode."* The '236 patent does not elaborate on this element, other than to say that "the transferring the scanning control data from the data buffer 450/450′ can be performed in a fast transfer mode, such as a burst mode, or a page mode, or any similarly fast transfer modes." '236 patent, 16:15-18; *see also id*., 13:63-64 ("[T]he output mode can be a fast data transfer mode, such as a burst mode.").

Ustun teaches a fast transfer mode because its DMA FIFO, by design, transfers data in a first-in-first out manner, as a burst. Huber ¶ 82. For example, LabVIEW Help explains that DMA-based FIFO leads to "[h]igher" throughput. LabVIEW Help, at 1. Likewise, Breyer explains that absent DMA FIFO, communication between an FPGA and a host computer is slow because of interrupts. Breyer, [0011]. Implementing DMA FIFO allows a large set of data to be quickly transferred at once, with no interrupts. *Id.*, [0011]-[0012]; *see also* Kodosky, 46:42-50 (DMA-based FIFOs prompt "high speed transfers"); Ex. 1018 (improved the speed of data transfers "by up to 20X"); Breyer Decl. ¶ 9.

Ustun (in view of LabVIEW Help and Breyer) thus discloses a fast data transfer mode as recited in these claims. Huber ¶¶ 80-83.

3. Claims 30/36

Claim 30 recites the imaging controller of claim 27, further comprising:

> *"a processor memory; and a bus, coupled to the processor, the local memory controller and the processor memory, [w]herein*
> *the processor is configured to output the computed scanning data to the processor memory through the bus; and*
> *the local memory controller is configured to transfer the scanning data from the processor memory to the dedicated data buffer through the bus."*

Claim 36 similarly recites that the "storing" step in claim 35 comprises:

> *"storing the computed scanning control data in a processor memory; and moving the scanning control data from the processor memory to the dedicated data buffer."*

The host processor of Ustun has its own memory, which is used to store the waveform array (scanning data) before outputting it to the FPGA BlockRAM memory (FIFO buffer). Ustun, at 6 ("computer internal memory"); Huber ¶ 86.

As explained for Element 27/35[b], Ustun would have used a DMA FIFO. *See* Section VI.C.3, *supra.* The DMA engine (local memory controller) transfers the waveform data (scanning data) from the rear (write-portion) of the FIFO implemented in the processor to the front (read-portion) of the FIFO implemented in the FPGA BlockRAM memory. *See* LabVIEW Help, at 1 ("When the DMA Engine runs, it automatically transfers data between the DMA FIFO memory on the FPGA and the DMA FIFO memory on the host computer so they act as one FIFO array."); *see also* Ex. 1016 ("You can create Direct Memory Access (DMA) FIFOs to transfer data from host VIs to FPGA VIs."); Huber ¶ 87.

This transfer takes place through a bus that connects the processor, processor memory, and DMA engine (local memory controller). Huber ¶ 88. For example, Breyer shows bus 710 (red) between the host computer processor and the DMA FIFO on the FPGA:

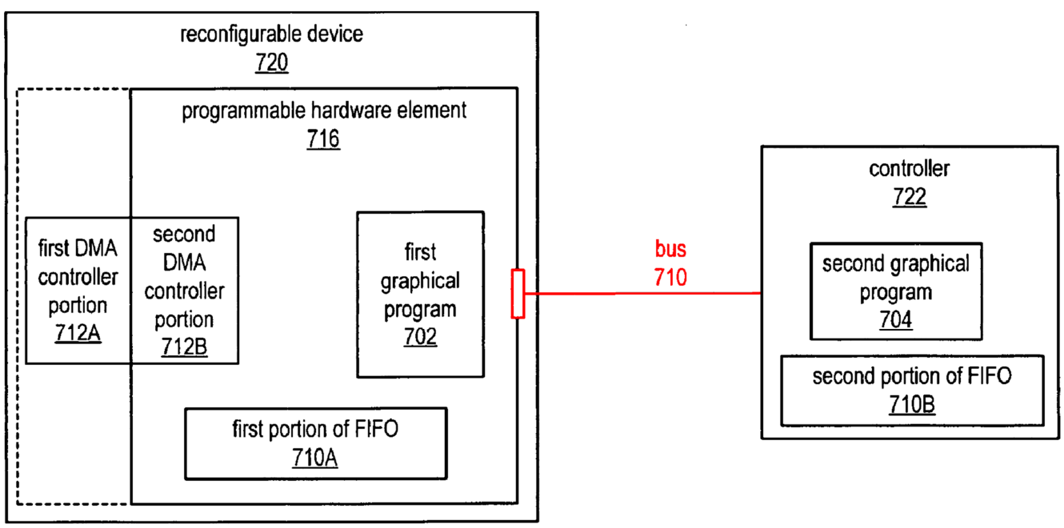


Figure 7

Breyer, Fig. 7 (highlighted); *see also id.*, [0114] ("[T]he reconfigurable device 720 is coupled via ***bus 710*** to computer system 82."); Huber ¶ 88.

Ustun (in view of LabVIEW Help and Breyer) thus discloses outputting data from the processor to data buffer through a bus as recited in these claims. Huber ¶¶ 84-89.

4. Claims 31/37

Claim 31 depends from claim 30, and further recites:

> *"the dedicated data buffer is configured to output the scanning data without sending the scanning data through at least one of the bus, the processor memory, or the processor."*

Claim 37 similarly depends from claim 36, and further recites that the transferred scanning data is not sent through at least one of *"a bus connecting the local memory controller and the processor, the processor memory, or the processor."*

This element is discussed above for Element 27/35[c] and is disclosed for the same reasons. Huber ¶¶ 90-92.

5. Claims 32/38

Claim 32 depends from claim 27, and further recites that *"the processor is configured to perform at least one of processing an image and computing scanning data, while the dedicated data buffer outputs the scanning data."* Claim 38 depends from claim 35, and similarly recites *"transferring the scanning data in parallel with the processor performing at least one of"* the two above tasks.

Ustun discloses that its processor is configured to (and performs) "at least one" of the two tasks, "processing an image." The host processor software of Ustun performs image processing. Ustun, at 6 ("The ***image processing*** performed by the host software includes 16–8 bit scaling, logarithmic scaling, and image rotation prior to display.").

Ustun provides a "real-time display of FDOCT images," achieving frame rates of 19.5 and 27 fps. Ustun, at 1-2, 7-8. This "real-time" image processing by the host processor is performed while the FIFO buffer outputs the scanning data. Huber ¶ 95.

Ustun thus discloses processing an image as recited in these claims. Huber ¶¶ 93-96.

VII. Ground 1b: Claims 35-38 and 40 Are Obvious Over Ustun in Combination with LabVIEW Help, Breyer, and RIO Manual

Alcon may argue that Ustun does not disclose transferring scanning data through a "dedicated channel," as recited by Element 35[c]. Even if Alcon's argument were accepted, these claims would have been obvious over the Ustun combination in Ground 1a, in view of RIO Manual. Huber ¶ 97.

A. RIO Manual (Ex. 1006)

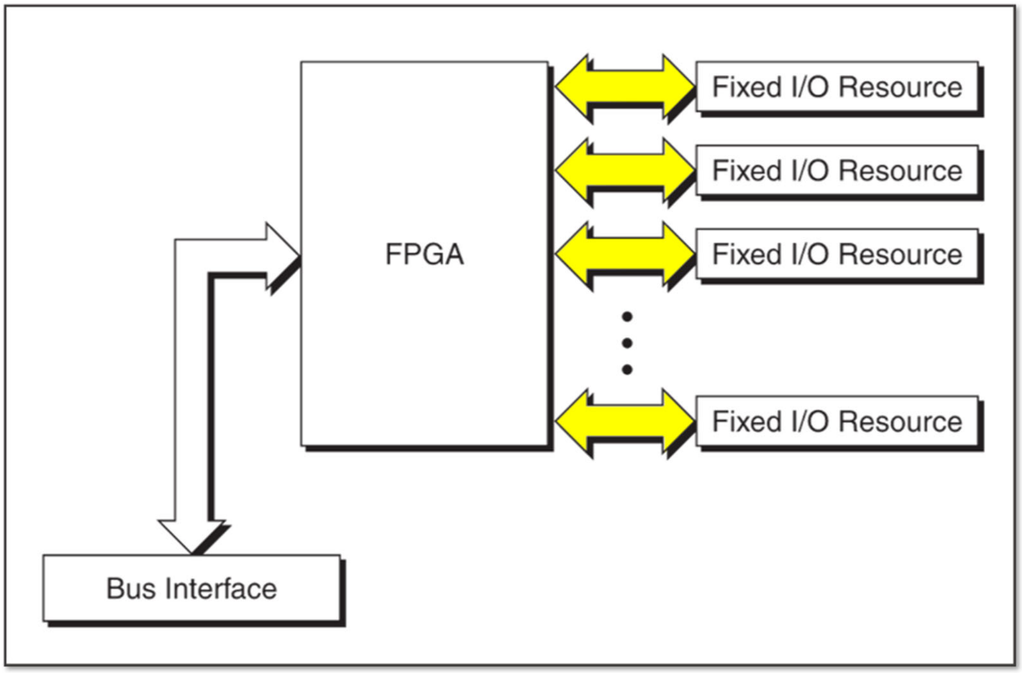
RIO Manual (Ex. 1006) is the manual for National Instruments devices (RIO boards) with Virtex 4 or Virtex 5 FPGAs, the same kind of FPGA found in Ustun. Breyer Decl. ¶ 10. It is prior art under pre-AIA 35 U.S.C. § 102(b) because it was published in June 2006, more than one year before the application for the '236 patent.

RIO Manual, cover; Breyer Decl. ¶¶ 14-17, 19. RIO Manual was not cited during prosecution.

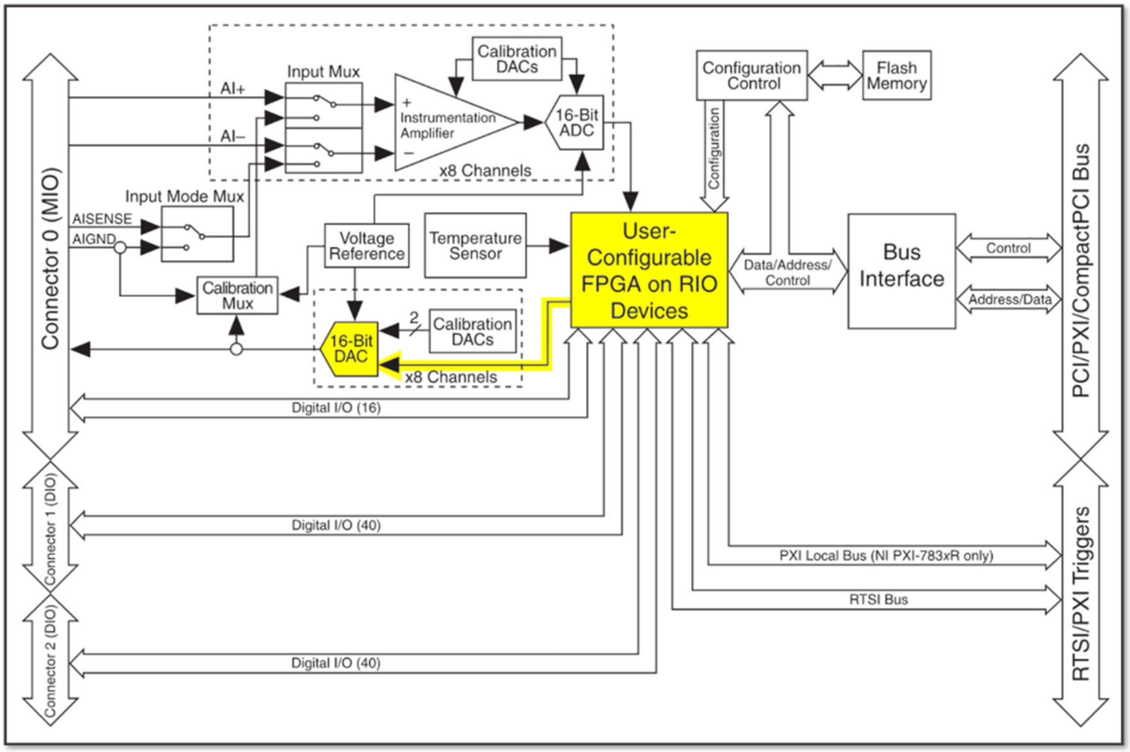
RIO Manual was freely available on the Internet on the National Instruments website. Breyer Decl. ¶ 16. For the same reasons that a POSA would have referenced LabVIEW Help, a POSA would have known to look to the National Instruments website for this reference. *See* Section VI.A.2, *supra*, at 14; *see also* Huber ¶¶ 98-99. Indeed, the copyright page of RIO Manual includes a link to the National Instruments website (ni.com). RIO Manual, at 002. It was the practice of National Instruments to provide user manuals with the sale of its products, and RIO Manual would have been provided to thousands of customers who purchased these products. Breyer Decl. ¶¶ 12-16.

B. RIO Manual Discloses a Dedicated Channel

The RIO 7831R board has 8 analog inputs, 8 analog outputs, and 96 digital I/O lines. RIO Manual at 1-1. The FPGA in the RIO board is connected to these fixed I/O resources through a dedicated channel (highlighted in yellow) for digital and analog output:



RIO Manual, Fig. 1-1 (highlighted); Huber ¶ 100. The RIO Manual shows this in more detail for different models, confirming that its fixed I/O resources output data through dedicated channels. For example, the block diagram for RIO 7831R shows:



Rio Manual, Fig. 2-1 (highlighted). As shown by the highlighted figure, there is a dedicated channel from the FPGA to DAC. Huber ¶ 100. As implemented in the Ustun system, the galvanometers would be driven either by the 16-Bit DAC identified in Figure 2-1, or an external DAC connected through one of the identified direct channels to the FPGA. *Id.* RIO Manual thus discloses that scanning data would be transferred from the FIFO buffer to a DAC through a dedicated channel as recited by Element 35[c]. *Id.*

C. Motivation to Combine RIO Manual

RIO Manual describes off-the-shelf devices with an FPGA and DAC, programmable with LabVIEW. Huber ¶ 101. Indeed, Breyer identifies the very same RIO 7831R board with FPGA that is the subject of the RIO Manual. *Compare* Breyer, [0010] ("NI PXI-7831R FPGA board"), *with* RIO Manual, at 1-1.

A POSA would have used an off-the-shelf device, such as the RIO 7831R board identified in Breyer and described in RIO Manual, to implement Ustun's OCT system. Huber ¶ 102. At the very least, a POSA would have recognized such RIO boards as suitable options. *Id.* That provides a motivation to combine. *See Par Pharm., Inc. v. TWi Pharms., Inc.*, 773 F.3d 1186, 1197-98 (Fed. Cir. 2014) ("Our precedent … does not require that the motivation be the best option, only that it be a suitable option from which the prior art did not teach away.").

A POSA would have been motivated to use one of the RIO boards identified in RIO Manual (or a similar board from another vendor) because they include both the FPGA as well as analog and digital I/O and development resources. Huber ¶ 103. For example, the Virtex-5 FPGA on the RIO boards was fully supported in the LabVIEW development environment, including the LabVIEW FPGA and Real-Time modules. RIO Manual, at 1-3 to 1-6; *id.* at 1-4 ("You can implement LabVIEW logic and processing in the FPGA of the R Series device."); Huber ¶ 103. Such capabilities track Ustun's teaching to use a Virtex 4 or Virtex 5 FPGA that can be programmed in the LabVIEW environment. *Id.* ¶ 103.

It would have been obvious to arrive at claims 35-38 and 40, including the claimed "dedicated channel," using Ustun (in view of LabVIEW Help and Breyer) in combination with RIO Manual. Huber ¶ 104.

VIII. Ground 2: Claim 34 Is Obvious Over Ustun in Combination with LabVIEW Help, Breyer, and Hammer

Claim 34 depends from claim 27 and further recites:

> *"the output digital-analog converter is configured to output the scanning signals to x and y scanning controllers to scan an imaging beam; and synchronizing signals to an imaging camera to record a returned imaging beam synchronously with the scanning."*

As explained for the independent claims, Ustun's digital-analog converter (DAC) sends scanning signals to galvanometers (x and y scanning controllers) to scan an OCT imaging beam. *See* Section VI.C.5, *supra.*

Ustun also discloses synchronizing its imaging camera to record a returned imaging beam synchronously with the scanning, as recited in claim 34. For example, Ustun teaches that its "timing peripheral" synchronizes Ustun's x and y scanning controllers with its signals to an imaging camera:

> The timing peripheral is used to synchronize all external components, which are slaved to the FPGA. External components include the linear array detector, the frame grabber, and the lateral scanning

> galvanometers. The FPGA generates the line and frame synchronization signals for the frame grabber and the linear array detector operating in external trigger mode.

Ustun, at 4.

It would have been obvious to send these synchronization signals from the DAC. Indeed, that was disclosed in an earlier paper, Hammer (Ex. 1009), which shares the same authors as Ustun. Hammer is an article published in the Proceedings of SPIE (Society of Photo-optical Instrumentation Engineers). It is prior art under pre-AIA 35 U.S.C. § 102(b) because it was published no later than February 7, 2007, more than one year before the application for the '236 patent. Hsieh-Yee Decl. ¶¶ 52-69.

Hammer, like Ustun, discloses an OCT system implemented using a Virtex-4 FPGA. Hammer, at 5. Hammer explains that its "real-time image processing board"—like Ustun's board—"controls all Cameralink camera timing signals … and synchronization between these timing signals and the OCT galvanometer control signals." *Id.* Hammer specifically states that its image processing board has "2 DAC channels" to control "***the OCT galvanometer pair and a Cameralink interface***." *Id.* Thus, the DAC of Hammer outputs synchronizing signals to an imaging camera to record a returned imaging beam synchronously with the scanning as recited by claim 34. Huber ¶¶ 105-109.

Outputting synchronization signals from the DAC (as done by Hammer) in Ustun's OCT system simply employs an old element to perform the same functions it was known to perform in the prior art. Huber ¶ 110. A POSA would have understood that using the DAC to output the synchronization signals (as disclosed in Hammer) was a suitable option in Ustun. *Id.*

IX. Ground 3: Claims 1-3, 6-7, 9-13, 15, 18-19, 21, 23, and 26 Are Obvious Over Culbertson in Combination with Ustun, LabVIEW Help, and Breyer

The claims challenged in this ground are directed to a "docking method for an ophthalmic system" that, like claims previously discussed, computes scanning data, stores data in a buffer, transfers data to an output module, and outputs signals to OCT scanners. These claims add the steps of: aligning a docking unit, generating an image of the eye using OCT, improving alignment, and docking the docking unit.

These additional steps do not render claim 1 patentably non-obvious. Docking units for ophthalmic surgery systems were known in the prior art. '236 patent, 1:14-22 (Background), 4:59-62. A docking unit is disclosed in Publication No. US 2009/0012507 A1 ("Culbertson," Ex. 1010), a published U.S. patent application. Culbertson discloses a docking unit in an ophthalmic laser surgery system for cataract surgery and aligning the docking unit in the manner required by the claims. Culbertson, [0048]-[0049]. Ustun discloses an ophthalmic OCT imaging system used "to aid in patient alignment," through "real-time feedback."

Ustun, at 2. For the reasons explained below, it would have been obvious to use Ustun's real-time OCT imaging system in Culbertson's ophthalmic laser surgery system. Huber ¶¶ 111-113.

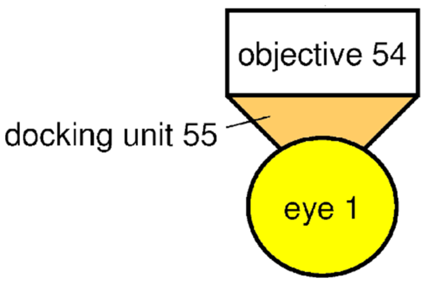
A. Culbertson (Ex. 1010)

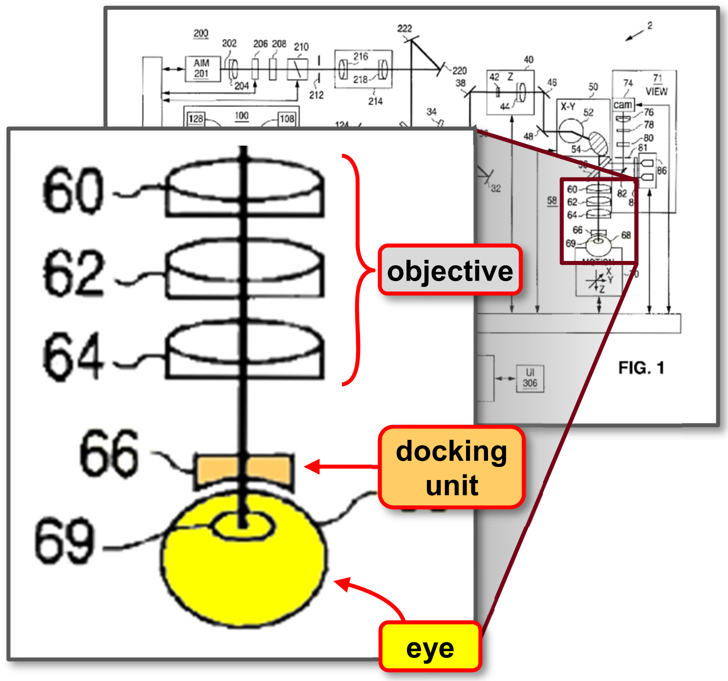
Culbertson is the only reference not previously discussed in this Petition. It is prior art under pre-AIA 35 U.S.C. § 102(b) because it was published on January 8, 2009, more than one year before the application for the '236 patent. Culbertson was cited but not substantively discussed during prosecution.

Culbertson discloses a laser-based system for "treating a lens of a patient's eye" in cataract surgery. Culbertson, [0007]. It makes "a plurality of cuts in the lens … to break the lens up into a plurality of pieces," so that the cataractous lens can be removed from the patient's eye. *Id.*

Culbertson includes a docking unit to help "stabilize eye position" during laser delivery. Culbertson, [0036]. The docking unit is brought into contact with the eye through a "***docking procedure***," which "preferably takes in account patient motion" as the docking unit (contact lens 66) approaches and ultimately contacts the eye. *Id.*, [0049]. Once docked, a "vacuum suction subsystem" can be used to help stabilize the eye. *Id.*, [0050].

The docking unit of Culbertson corresponds to the ’236 patent, as shown in this side-by-side comparison:



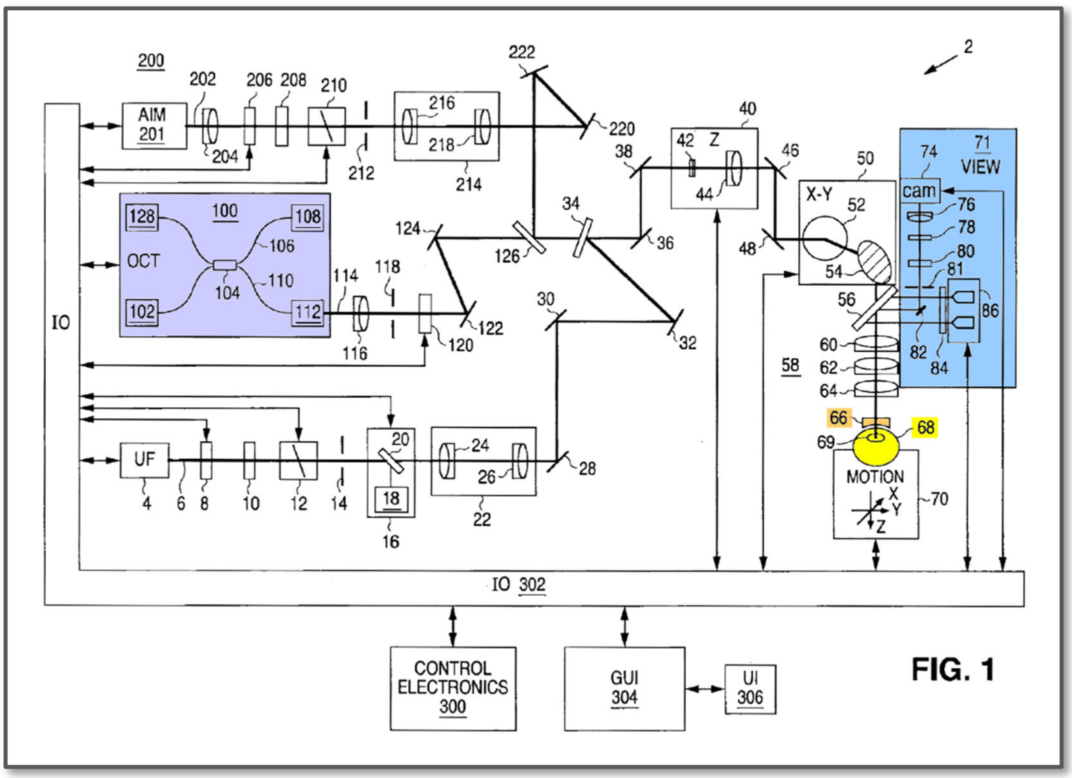


<u>’236 Patent</u> **<u>Culbertson</u>**

’236 patent, Fig. 2 (cropped, highlighted); Culbertson, Fig. 1 (inset cropped, highlighted, labeled); Huber ¶¶ 114-119. The docking unit of the ’236 patent may include a “contact lens” or “applanation lens” that makes contact or is in close proximity with the eye. ’236 patent, 8:23-33. Culbertson has “contact lens 66” for docking. Culbertson, [0049]. In the ’236 patent, the imaging beam is directed through an objective, “which may include several lenses.” ’236 patent, 8:35-36. Culbertson likewise discloses an objective. Culbertson, [0034] (lenses 60, 62, 64).

Culbertson’s ophthalmic laser surgery system includes two imaging systems: imaging system 71 and OCT device 100, as shown in the highlighted figure below.

Both are configured to image the eye. Imaging system 71 (highlighted in blue) includes camera 74 and guides alignment of contact lens 66 to the eye during docking. Culbertson, [0047], [0050]. OCT device 100 (highlighted in purple) images internal structures of the eye, such as the lens and lens capsule. *Id.*, [0037]. Contact lens 66 and eye 68 are highlighted in orange and yellow, respectively.



Id., Fig. 1 (highlighted).

In Culbertson, docking is performed under image guidance. "The ***alignment*** of eye 68 to system 2 via contact lens 66 ***may be accomplished while monitoring the output of imaging system 71***, and performed manually or automatically by analyzing the images produced by imaging system 71 electronically by means of control electronics 300 via IO 302." Culbertson, [0050].

B. Motivation to Combine

It would have been obvious to combine Culbertson with Ustun. Culbertson discloses image-guided patient alignment with a camera, for docking an ophthalmic laser surgery system to the eye. Culbertson, [0049]-[0050]; Huber ¶ 120. It would have been obvious to improve Culbertson's docking by using Ustun's real-time OCT imaging system—which likewise was designed "to aid in patient alignment" (Ustun, at 2).[10] Huber ¶¶ 120-125.

First, it would have been obvious to combine Culbertson and Ustun to provide real-time feedback during docking. Huber ¶ 122. Image-guided docking, as disclosed in Culbertson, requires accurate real-time information about the relative position of the docking unit and the eye. *Id.* Ustun explains that its OCT imaging system is particularly useful for providing "***real-time feedback*** to aid in ***patient***

---

[10] The real-time feedback for the patient alignment process involves transferring large amounts of data. Huber ¶ 121. Therefore, the OCT imaging system would be configured as described in Ustun with LabVIEW Help and Breyer, including a DMA controlled FIFO as described for Elements 27/35[a]-[d] and other previously discussed dependent claims. *Id.*

alignment." Ustun, at 2; *see also id.* at 1 ("important for applications that require instant feedback of image formation"). It would have been obvious to use Ustun's OCT imaging system for image-guided docking in Culbertson, which involves the very same "patient alignment" process. Huber ¶ 122. This combination uses the OCT imaging system for "performing the same function it had been known to perform and yields no more than one would expect from such an arrangement." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007) (citation omitted); *see* Huber ¶ 122.

Second, a POSA would have been motivated to use Ustun's OCT imaging system in Culbertson to better visualize anatomical structures of the eye in three-dimensions during docking. Huber ¶ 123. Culbertson explains that imaging system 71 is used to provide "centering about ***or within*** a predefined structure." Culbertson, [0047]. But a traditional two-dimensional camera can only provide limited information about structures in the interior of the eye. Huber ¶ 123. On the other hand, the OCT imaging system of Ustun is readily able to provide three-dimensional information about internal structures of the eye, such as the lens and retina. *Id.*; Ustun, at 1 ("cross-sectional images of living human tissues"), 8 (retina). Thus, a POSA would have recognized that Ustun's OCT imaging system better serves the purpose of aligning the eye during docking, particularly when seeking to center the dock relative to internal structures of the eye. Huber ¶ 123. The combination of Culbertson with Ustun is thus no more than an "adaptation of an old idea" (image-guided docking in Culbertson) "using newer technology that is commonly available and understood in the art" (three-dimensional, real-time OCT imaging in Ustun). *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007).

Third, a POSA understood that docking, upon initial contact with the eye, may change the "shape of the eye in a not well defined way." Kurtz,[11] [0208]; Huber ¶ 124. Under those circumstances, "referencing and fixating the ***surface*** of the eye such as the anterior surface of the cornea or limbus does not work well when performing precision laser microsurgery inside the eye." Kurtz, [0208]. That would have motivated a POSA to use the three-dimensional imaging device of Ustun, which can provide real-time feedback about the position of the ***internal*** structures on which laser surgery will be performed. Huber ¶ 124.

A POSA would have had reasonable expectation of success in combining Culbertson with Ustun. Huber ¶ 125. Culbertson already incorporates an OCT

---

[11] It is permissible to rely on the prior art to corroborate the knowledge of a POSA. *See Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337-38 (Fed. Cir. 2020). US 2009/0171327 A1 ("Kurtz," Ex. 1015) is pre-AIA § 102(e)(1) prior art because was filed on December 23, 2008, before the '236 patent.

imaging system (albeit for other purposes, *see* Culbertson, Fig. 1 (OCT device 100)), and Ustun's OCT imaging system is specifically designed to be used for patient alignment in ophthalmology. Ustun, at 2. The use of Ustun's OCT imaging system in Culbertson is simply "the predictable use of prior art elements according to their established functions." *KSR*, 550 U.S. at 417.

C. Claim 1

1. Preamble

"A docking method for an ophthalmic system, the method comprising"

To the extent the preamble is limiting, Culbertson discloses the claimed docking method. Huber ¶ 126. Culbertson describes a "docking procedure" and how it is performed ("contact lens" comes in contact with "the patient's eye"). Culbertson, [0049], Fig. 1 (contact lens 66, eye 68).

2. Element 1[a]: aligning docking unit

"aligning a docking unit of the ophthalmic system and an eye"

As the '236 patent admits, docking units for ophthalmic applications were well known. '236 patent, 4:59-62 ("Many ophthalmic surgical systems include a docking unit."). The '236 patent explains that a docking unit makes "contact with a surgical eye and keep[] it effectively immobile relative to an objective of the surgical system during an ophthalmic procedure." *Id.*, 4:59-63.

Culbertson discloses a docking unit. *See* Section IX.A, *supra,* at 43. Culbertson explains that its "docking procedure" involves bringing the ophthalmic laser system to the eye so that there can be "contact between the patient's eye 68 and the ***contact lens 66***." Culbertson, [0049]. The "contact lens 66, which can be any suitable ophthalmic lens, can be used to help further focus the optical beam 6 into the patient's eye 68 ***while helping to stabilize eye position***." Culbertson, [0036]. In addition, "a vacuum suction subsystem and flange may be incorporated into system 2, and ***used to stabilize eye 68***." *Id.*, [0050]. Culbertson's docking unit thus comprises a contact lens and/or vacuum and flange elements. Huber ¶ 128. In fact, the '236 patent discloses that the docking unit "may contain a ***contact lens*** or applanation lens which may make contact with the eye or can be disclosed close to the eye" ('236 patent, 5:66-6:3), just as done with contact lens 66 in Culbertson. Culbertson, [0049], Fig. 1 (contact lens 66).

Culbertson also discloses aligning the docking unit and an eye. Culbertson teaches that "***alignment*** of eye 68 to system 2 via contact lens 66 may be accomplished while monitoring the output of imaging system 71." Culbertson, [0050]; Huber ¶¶ 127-129.

3. Element 1[b]: generating an image

"generating an image of an internal structure of the eye by an optical coherence tomographic imaging system after aligning the docking unit and the eye"

Culbertson teaches that its imaging system 71 creates images of internal structures of the eye. It explains that its imaging system creates images of "the target tissue on ***or within the eye***," which may be given patterning information "within a predefined structure." Culbertson, [0047]; *see also id.*, [0049] ("The viewing system 71 is configured so that the depth of focus is large enough such that the patient's eye 68 and other salient features may be seen before the contact lens 66 makes contact with the eye."); Huber ¶ 130.

The images are generated after aligning the docking unit and the eye. Following initial alignment, imaging system 71 continues to generate images for analysis. Huber ¶ 131. The images guide the docking procedure, "which preferably takes into account patient motion ***as the system approaches*** the contact condition." Culbertson, [0049]; Huber ¶ 131. A POSA would have known that "***refinements*** in docking can be achieved" under image guidance. Weikert, at 86; Huber ¶ 131.

As explained above, it would have been obvious to use Ustun's OCT imaging system for the image-guided docking of Culbertson. *See* Section IX.B, *supra*. Ustun generates images of internal structures of the eye by OCT imaging. Ustun, at 1, 2, 8; Huber ¶ 132. In particular, Ustun discloses that its OCT images can provide "real-time feedback to aid in patient alignment." Ustun, at 2. Such "real-time feedback" would generate images throughout the alignment procedure, including the initial alignment and further refinements for docking. Huber ¶ 132.

4. Element 1[c]: improving alignment

"improving an alignment of the docking unit with the internal structure of the eye in relation to the generated image"

Culbertson discloses that a "motion control system 70 is integrated into the overall control system 2, and may move the patient, the system 2 or elements thereof, or both, to achieve accurate and reliable contact between contact lens 66 and eye 68." Culbertson, [0050]. The '236 patent confirms that alignment can be improved by moving the patient or the laser system. '236 patent, 9:49-57. Improving alignment is done under image guidance. Culbertson, [0047]; Huber ¶ 133.

5. Element 1[d]: docking the docking unit

"docking the docking unit to the eye with the improved alignment the generating the image step comprising"

After improving alignment as described above, Culbertson's docking unit is docked to the eye (i.e., "contact between the patient's eye 68 and the contact lens 66"). Culbertson, [0036], [0049]; Huber ¶ 134.

6. Element 1[e]: computing scanning data

"computing scanning data by a processor corresponding to a scanning pattern"

In the combination of Culbertson and Ustun, the processor must compute scanning data corresponding to a scan pattern for the OCT imaging system. Huber

¶ 135. Thus, this element is substantively the same as Element 27/35[a] discussed above and is disclosed for the same reasons. *Id.*

7. Element 1[f]: storing scanning data

"storing the scanning data in a dedicated data buffer"

This element is substantively the same as Element 27/35[b] discussed above and is disclosed for the same reasons. Huber ¶ 136. It would have been obvious to combine Culbertson's laser cataract surgery system with Ustun's FPGA-based OCT system, as programmed with a FIFO buffer under the control of a dedicated DMA controller (as disclosed by LabVIEW Help and Breyer) to enable Ustun's "real-time feedback" in patient alignment during docking. Ustun, at 2; Huber ¶ 136.

8. Element 1[g]: transferring scanning data

"transferring the scanning data by the dedicated data buffer to an output module partially under the control of a dedicated memory controller"

This element is substantively the same as Element 27/35[c] discussed above and is disclosed for the same reasons. Huber ¶ 137.

9. Element 1[h]: outputting scanning data

"outputting scanning signals by the output module to one or more scanners based on the scanning data"

This element is substantively the same as Element 27/35[d], except this claim element specifies that the scanning signals are output by the DAC to "one or more scanners." This claim element is disclosed by Ustun for the reasons discussed above. The scanning signals are output to "scanning galvanometers" in Ustun (Ustun, at 3-4), which qualify as "one or more scanners." Huber ¶ 138.

10. Element 1[i]: scanning an imaging beam

"scanning an imaging beam with the one or more scampers [sic] according to the scanning signals"

As described above (*see* Section VI.C.5, *supra*), Ustun discloses outputting the scanning signals from the DAC to the "scanning galvanometers" for scanning. Ustun, at 3-4, 7. The scanning galvanometers of the OCT imaging system scan an imaging beam according to the scanning signals as recited by this claim element. Huber ¶ 139.

*   *   *

In sum, claim 1 is obvious over Culbertson in view of Ustun, LabVIEW Help, and Breyer. Huber ¶ 140.

D. Dependent Claims

The following dependent claims are obvious for the same reasons as the claims from which they depend, and as discussed below. Huber ¶ 141.

1. Claim 2

Claim 2 recites that the aligning the docking unit step comprises *"using a first imaging system to align a target pattern of the ophthalmic system in relation to a feature of the eye."*

As explained for Element 1[b], Culbertson discloses using an imaging system to align the docking unit (contact lens 66) in relation to a feature of the eye. Culbertson, [0036], [0049]. Culbertson teaches that its "imaging system 71 gathers images which may be used by the system controller 300 for ***providing pattern centering about or within a predefined structure***" of the eye. Culbertson, [0047]. Thus, Culbertson discloses this element. Huber ¶¶ 142-143.

2. Claim 3

Claim 3 recites the method of claim 2, wherein:

> *"the first imaging system is one of a microscope or a video microscope;*
> *the target pattern of the ophthalmic system includes at least one of a center of a contact lens, a center of the docking unit, a docking circle, or a docking cross-hair; and*
> *the feature of the eye is at least one of a center of a region of an iris, a pupil, a cornea, a limbus, or a lens; or a circular formation related to a region of the iris, the pupil, the cornea, the limbus or the lens."*

Ustun's OCT imaging system can use two types of microscopes for imaging, a "dual-beam Doppler FDOCT microscope" and a "swept source-based FDOCT microscope." Ustun, at 8.

Culbertson discloses that the target pattern of its system includes a "contact lens 66" that "comes into contact with the cornea." Culbertson, [0049]. Huber ¶

146. Thus, Culbertson's target pattern includes a center of a contact lens, and the feature of the eye includes the cornea. Huber ¶¶ 144-146.

3. Claim 6

Claim 6 recites that the computing the scanning data step comprises:

> *"implementing a scanning pattern that includes at least one of a linear pattern, a circular pattern, an oval pattern, a loop pattern, an arc pattern, a raster pattern, an x-y pattern, a crosshair pattern, a star pattern, a spiral pattern, and a pattern with outlying points."*

Ustun discloses that the scan patterns may include "standard (point, line, circle, raster, radial) and custom scans." Ustun, at 4. Thus, Ustun discloses the claimed scanning patterns. Huber ¶¶ 147-148.

4. Claim 7

Claim 7 recites that the computing the scanning data step comprises *"including synchronizing signals into the scanning data by the processor."* Ustun teaches that its "timing peripheral" synchronizes Ustun's x and y scanning controllers with its "synchronization signals" to an imaging camera:

> The timing peripheral is used to synchronize all external components, which are slaved to the FPGA. External components include the linear array detector, the frame grabber, and the lateral scanning galvanometers. The FPGA generates the line and frame synchronization signals for the frame grabber and the linear array detector operating in external trigger mode.

Ustun, at 4. Although these synchronization signals are generated by the FPGA, a POSA would understand that either the host processor or FPGA of an OCT system can generate synchronization signals. Huber ¶ 149. It is simply a design choice, and a POSA would have known that either processor or FPGA could be used to generate synchronization signals, with a reasonable expectation of success. *Id.* Indeed, there are only two options for generating synchronization signals (FPGA or host processor), and it would have been trivial and obvious to a POSA to generate the synchronization signals in the host processor. *Id.*

5. Claim 9

Claim 9 recites that the storing the scanning data step comprises:

> *"storing the scanning data in a processor memory; and transferring the stored scanning data from the processor memory to the dedicated data buffer partially under the control of the dedicated memory controller."*

This element is substantively the same as claims 30 and 36 discussed above and is disclosed for the same reasons. Huber ¶¶ 150-151.

6. Claim 10

Claim 10 depends from claim 9 and further recites that:

> *"the dedicated memory controller comprises a direct memory access engine; and the dedicated data buffer comprises a first-in-first-out memory."*

This element is substantively the same as claims 28 and 40 discussed above and is disclosed for the same reasons. Huber ¶¶ 152-153.

7. Claim 11

Claim 11 recites that the transferring the scanning data step comprises:

> *"outputting the scanning data by the dedicated data buffer to the output module in a fast data transfer mode."*

This element is substantively the same as claim 29 discussed above and is disclosed for the same reasons. Huber ¶¶ 154-155.

8. Claim 12

Claim 12 recites that the transferring the scanning data step comprises:

> *"outputting the scanning data from the dedicated data buffer without sending the scanning data through at least one of a bus connecting the dedicated memory controller and the processor, the processor memory, or the processor."*

This element is substantively the same as claims 31 and 37 discussed above and is disclosed for the same reasons. Huber ¶¶ 156-157.

9. Claim 13

Claim 13 recites that the transferring the scanning data step comprises:

> *"outputting the scanning data in parallel with the processor performing at least one of processing an image, computing scanning data corresponding to a scanning pattern, or performing a control function."*

This element is substantively the same as claims 32 and 38 discussed above and is disclosed for the same reasons. Huber ¶¶ 158-159.

10. Claim 15

Claim 15 recites that the outputting the scanning signal step comprises:

> *"converting the scanning data into analog scanning signals by the output module, wherein the output module includes a digital-analog converter."*

This element is substantively the same as Element 27/35[d] discussed above and is disclosed for the same reasons. Huber ¶¶ 160-161.

11. Claim 18

Claim 18 recites that:

> *"an integration time of an image recording device is a limiting factor of an operating speed of an imaging system."*

Ustun explains that "the camera and the FPGA hardware are working asynchronously from each other at different clock frequencies." Ustun, at 5. Ustun requires the use of a FIFO memory buffer because the data processing clock speed (100 MHz) is limited by the maximum data transfer clock rate of the camera (85 MHz). Ustun, at 5, 6; Huber ¶ 163. Thus, the integration time of the OCT camera (image recording device) is a limiting factor of the operating speed of the system. Huber ¶¶ 162-163.

12. Claim 19

Claim 19 recites that the outputting the scanning signals step comprises:

> *"outputting the scanning signals at a rate within one of the following ranges: 1 Hz-1 MHz, 100 Hz-1 MHz, or 1 kHz-100 kHz."*

Ustun discloses that scanning signals are sent to the galvanometers "by two channels of a four-channel, 16 bit, 200kS/s DAC IC." Ustun, at 4. Thus, Ustun outputs the scanning signals at a rate of 200 kHz. Huber ¶¶ 164-165.

13. Claim 21

Claim 21 recites that the improving the alignment step comprises at least one of:

> *"providing a verbal command to a patient to move his eye, moving the patient's head, moving a surgical bed the patient is resting on, moving the patient's eye, moving the docking unit via moving a gantry or an articulated arm, and using a gripper to move the eye, based on the image of the internal structure of the eye."*

Culbertson discloses "mov[ing] the patient, the system 2 or elements thereof, or both, to achieve accurate and reliable contact between contact lens 66 and eye 68." Culbertson, [0050]; Huber ¶ 167. Moving the patient includes moving the patient's head and/or the patient's surgical bed. Huber ¶¶ 166-167.

14. Claim 23

Claim 23 recites that the improving the alignment step comprises:

> *"starting the improving the alignment step before the docking unit makes contact with the eye, after the docking unit makes*

> *contact with the eye but before an application of a partial vacuum to the docking unit, or after an application of a partial vacuum."*

Culbertson discloses improving alignment of its contact lens docking unit and the eye "by analyzing the images produced by imaging system 71." Culbertson, [0050]. Following that, the system may "discern contact, as well as to initiate the vacuum subsystem." *Id.* Thus, Culbertson discloses improving alignment before the contact lens contacts the eye, and before application of a vacuum to the docking unit. Huber ¶¶ 168-169.

15. Claim 26

Claim 26 recites that the docking step comprises:

> *"bringing the docking unit into physical contact with the eye; and applying suction through a portion of the docking unit after the docking unit makes physical contact with the eye."*

This claim is disclosed for the reasons explained above for claim 23. Huber ¶¶ 170-171.

X. Ground 4: Claim 8 Is Obvious Over Culbertson in Combination with Ustun, LabVIEW Help, Breyer, and Kankaria

Claim 8 recites that the computing the scanning data step comprises "*computing homing data corresponding to a homing pattern connecting a starting point of the scanning pattern to a previously set point*."

Ustun teaches that "during initialization," the x-y galvanometer waveform (the scanning pattern) is calculated and output to the galvanometers. Ustun, at 7. "During the initialization process … the user selects certain imaging parameters" that are sent to the galvanometer. *Id.* at 6. These initialization parameters connect the starting point of the scanning patterns to a set point. Huber ¶ 173. Ustun's "real-time image processing" requires successive x-y galvanometer waveforms to be repeatedly sent to the galvanometers. *Id.* This means that the galvanometer returns to a previous set point after each scanning cycle, thereby requiring the use of a homing pattern and computing homing data. *Id.* Ustun thus discloses computing homing data as recited in claim 8. *Id.*

Claim 8 is also obvious in combination with Kankaria (Ex. 1011). Kankaria is a Master's thesis from the University of Texas, dated May 2006. It is prior art under pre-AIA 35 U.S.C. § 102(b) because it was published in May 2006, more than one year before the application for the '236 patent. Hsieh-Yee Decl. (Ex. 1021) ¶¶ 36-51. It was also indexed and catalogued at the University of Texas, Arlington Library by January 4, 2007, and was publicly available at that Library by no later than August 23, 2007. *Id*. Kankaria was not cited during prosecution.

Kankaria teaches that OCT imaging can be used "to provide high resolution cross-sectional tomographic images of highly scattering media" for "[r]eal time imaging … for retinal applications" in the field of ophthalmology. Kankaria, at 1-3.

Kankaria generates synchronization and scanning signals that drive the scanner. Huber ¶ 175. Kankaria describes a "Timing diagram" for movement of its galvanometers:

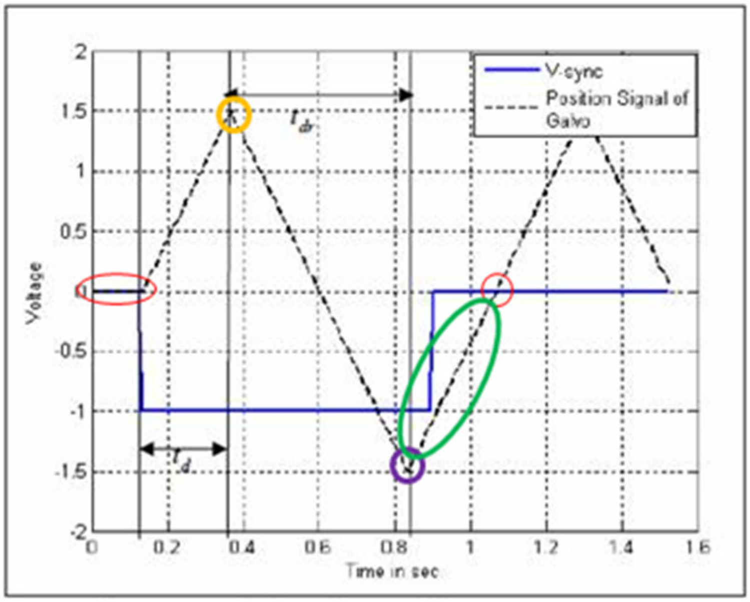


Figure 3.3: Timing diagram for X-Z or Y-Z B-scan.

Kankaria, Fig. 3.3 (annotated: colored circles added).

The start and end points of a scan are identified in **orange** and **purple** circles, respectively, and the **red** circles (0 voltage) show the home position of the scanner at rest. Kankaria, at 31 Huber ¶ 176. Kankaria's galvanometers (which are used for OCT) thus compute a homing pattern connecting a starting point of the scanning pattern (zero voltage) to a previously set point (in orange). Huber ¶ 176.

It would have been obvious to combine Ustun with Kankaria. Both references disclose high-speed, real-time OCT for ophthalmic imaging. *Compare* Ustun, at 2, *with* Kankaria, at 2-3. A POSA would have understood that Kankaria is describing a conventional scan control parameter, which was routinely implemented in the prior art. Huber ¶ 177. Thus, computing homing data in Kankaria would be recognized by a POSA as a suitable option and routine design choice to implement OCT imaging in Ustun. The combination is therefore obvious. *See Par Pharm.*, 773 F.3d at 1197-98.

Additionally, a POSA would understand that calculating the homing data (as disclosed by Kankaria) improves the safety of an ophthalmic OCT imaging system. Huber ¶ 178. If there is an error or system malfunction during a scan or set of scans, the galvanometers will return to its "home" (default) position and wait for the system to reset before the next set of scans. *Id.* This safety mechanism is particularly important to include in a real-time system like Ustun. *Id.* Thus, the combination of Ustun and Kankaria is simply the inclusion of an old element (homing) to perform the same function it had been known to perform (ensure safety) in OCT imaging. *Id.* ¶¶ 172-178. Such a combination would have been obvious. *KSR*, 550 U.S. at 417.

XI. Ground 5: Claims 16-17 Are Obvious Over Culbertson in Combination with Ustun, LabVIEW Help, Breyer, and Hammer

A. Claim 16

Claim 16 recites that the scanning an imaging beam step comprises:

> *"receiving the outputted scanning signals by a scanning controller and an imaging synchronizer, wherein the scanning signals comprise synchronizing signals;*

> *repeatedly adjusting the one or more scanners by the scanning controller according to the scanning signals to scan the imaging beam; and*
>
> *repeatedly synchronizing an imaging camera by the imaging synchronizer according to the synchronizing signals."*

As explained above and for Ground 2, the Ustun combination with Hammer teaches receiving the outputted scanning signals by a scanning controller. Ustun teaches that its "timing peripheral" synchronizes Ustun's x and y scanning controllers with its signals to an imaging camera:

> The timing peripheral is used to synchronize all external components, which are slaved to the FPGA. External components include the linear array detector, the frame grabber, and the lateral scanning galvanometers. The FPGA generates the line and frame synchronization signals for the frame grabber and the linear array detector operating in external trigger mode.

Ustun, at 4. Hammer, like Ustun, discloses an OCT system implemented using a Virtex-4 FPGA. Hammer, at 5. Hammer explains that its "real-time image processing board"—like Ustun's board—"controls all Cameralink camera timing signals … and synchronization between these timing signals and the OCT galvanometer control signals." *Id.* And Hammer specifically states that its image processing board has "2 DAC channels," to control "***the OCT galvanometer pair and a Cameralink interface***." *Id.* Hammer's imaging synchronizer therefore repeatedly synchronizes the OCT camera according to the synchronizing signals.

Huber ¶¶ 179-180. A POSA would have combined Ustun with Hammer for the same reasons discussed above for claim 35. *See* Section VIII, *supra*.

B. Claim 17

Claim 17 depends from claim 16 and further recites that:

> *"the scanning controller comprises at least one galvo-controller; and the imaging synchronizer comprises at least one ophthalmic coherence imaging camera controller."*

The "Galvo Drivers" shown in Ustun Figure 1(a) are galvo-controllers. Huber ¶ 182. Ustun also discloses an "FDOCT processing peripheral, which is connected … over a standard Camera Link interface" (Ustun, at 3-4), which is an imaging synchronizer with an ophthalmic OCT imaging camera controller. Huber ¶¶ 181-182.

XII. Secondary Considerations

There are no secondary considerations known to J&J Vision that affect, let alone overcome, this strong case of obviousness. In the district court, Alcon asserted that its LenSx® system practices the claims of the '236 patent, and that "[s]econdary considerations supporting non-obviousness include evidence of praise for the patented innovation and commercial success." Ex. 1014, at 35. These conclusory allegations are not anywhere near enough. Huber ¶ 183. Among other things, for "objective evidence of secondary considerations to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention." *ClassCo, Inc. v. Apple, Inc*., 838 F.3d 1214, 1220 (Fed. Cir. 2016). "[T]here is no nexus unless the evidence presented is reasonably commensurate with the scope of the claims." *Id*. (cleaned up).

Should Alcon proffer any relevant evidence to support its conclusory allegations of secondary considerations in its preliminary response, J&J Vision will request leave to file a reply.

XIII. The Board Should Reach the Merits of This Petition

The *Fintiv* factors confirm that discretionary denial is inappropriate. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential). Trial in the district court is scheduled well after the Board's decision is expected (factor 2). If instituted, the Final Written Decision would be expected in or about November 2022. That is at least three months ***before*** the trial in the district court, which is scheduled for February 2023.

J&J Vision filed this Petition shortly after learning which claims are being asserted against it in litigation, and well before any claim construction briefing or proceedings in the district court (factor 3). Because the parties are the same in the district court case, should the Board decline to invalidate all claims in its Final Written Decision, J&J Vision would be barred from advancing the same theories at trial (factor 5). Finally, the merits of this Petition are exceptionally strong as described above (factor 6).

Finally, 35 U.S.C. § 325(d) does not apply: none of the combinations used in the grounds above were considered during prosecution.

XIV. Mandatory Notices under 37 C.F.R. § 42.8

A. Real Parties-in-Interest

The real parties-in-interest Johnson & Johnson Surgical Vision, Inc., and its subsidiaries AMO Development, LLC, AMO Manufacturing USA, LLC, and AMO Sales and Service, Inc.

B. Related Matters

The '236 patent is asserted in the following case that may be affected by a decision in this proceeding: *AMO Development, LLC et al. v. Alcon LenSx, Inc. et al.*, No. 1:20-cv-00842-CFC (D. Del. filed June 23, 2020).

C. Grounds for Standing

J&J Vision certifies that the '236 patent is available for *inter partes* review and that J&J Vision is not barred or estopped from requesting *inter partes* review of the challenged claims of the '236 patent on the grounds above.

D. Lead and Backup Counsel and Service Information

Pursuant to 37 C.F.R. §§ 42.8(b)(3), 42.8(b)(4), and 42.10(a), J&J Vision designates the following lead counsel:

- Michael A. Morin (Reg. No. 40,734), michael.morin@lw.com, Latham & Watkins LLP; 555 Eleventh Street, NW, Ste. 1000; Washington, D.C. 20004-1304; 202.637.2298 (Tel.); 202.637.2201 (Fax).

J&J Vision also designates the following backup counsel:

- Roger J. Chin (*pro hac vice* to be filed), roger.chin@lw.com, Latham & Watkins LLP; 505 Montgomery Street, Ste. 2000, San Francisco, CA 94111-6538; 415.395.8122 (Tel.); 415.395.8095 (Fax).
- S. Giri Pathmanaban (Reg. No. 75,986), giri.pathmanaban@lw.com, Latham & Watkins LLP; 140 Scott Drive, Menlo Park, CA 94025; 650.470.4851 (Tel.); 650.463.2600 (Fax).
- Jonathan M. Strang (Reg. No. 61,724), jonathan.strang@lw.com, Latham & Watkins LLP; 555 Eleventh Street, NW, Ste. 1000; Washington, D.C. 20004-1304; 202.637.2362 (Tel.); 202.637.2201 (Fax).

Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney from J&J Vision is attached. J&J Vision consents to electronic service.

E. Fee for *Inter Partes* Review

The Director is authorized to charge the fee specified by 37 C.F.R. § 42.15(a) to Deposit Account No. 506269.

XV. Conclusion

For the reasons set forth above, J&J Vision respectfully requests *inter partes* review of the challenged claims of the '236 patent.

Respectfully submitted,

Dated: May 24, 2021

By: / Michael A. Morin /

Michael A. Morin (Reg. No. 40,734)
michael.morin@lw.com
Jonathan M. Strang (Reg. No. 61,724)
jonathan.strang@lw.com
Latham & Watkins LLP
555 Eleventh Street, NW, Ste. 1000
Washington, D.C. 20004-1304
Telephone: 202.637.2200
Fax: 202.637.2201

Roger J. Chin (*pro hac vice* to be filed)
roger.chin@lw.com
Latham & Watkins LLP
505 Montgomery St., Ste. 2000
San Francisco, CA 94111-6538
Telephone: 415.391.0600
Fax: 415.395.8095

S. Giri Pathmanaban (Reg. No. 75,986)
giri.pathmanaban@lw.com
Latham & Watkins LLP
140 Scott Drive
Menlo Park, CA 94025
Telephone: 650.328.4600
Fax: 650.463.2600

Counsel for Petitioner

CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains a total of 12,984 words, which is the sum of 12,955 words calculated by Microsoft Word's word-count feature and 29 words hand-counted in the figures. This total excludes the cover page, signature block, and the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1).

By: / Michael A. Morin /

Michael A. Morin (Reg. No. 40,734)
michael.morin@lw.com
Latham & Watkins LLP
555 Eleventh Street, NW, Ste. 1000
Washington, D.C. 20004-1304
Telephone: 202.637.2200
Fax: 202.637.2201

Counsel for Petitioner

CERTIFICATE OF SERVICE

The undersigned certifies that a complete copy of this Petition for *Inter Partes* Review of U.S. Patent No. 8,398,236 and all Exhibits and other documents filed together with this Petition were served on the official correspondence address for the patent shown in PAIR and a courtesy copy to Alcon Inc.'s current litigation counsel:

Kenneth Bassinger
Jason Finch
Russell Henrichs
Sheng-Hsin Hu
Steven Latimer
Alcon Inc.
C/O Alcon Research LLC
IP Legal
6201 South Freeway
Fort Worth, TX 76134

Jeannie Heffernan, Esquire
Joshua L. Simmons, Esquire
KIRKLAND & ELLIS LLP
601 Lexington Avenue
New York, NY 10022

via FEDERAL EXPRESS next business day delivery, on May 24, 2021.

By: / Michael A. Morin /

Michael A. Morin (Reg. No. 40,734)
michael.morin@lw.com
Latham & Watkins LLP
555 Eleventh Street, NW, Ste. 1000
Washington, DC 20004
Telephone: 202.637.2200
Fax: 202.637.2201

Counsel for Petitioner