

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. AND SAMSUNG ELECTRONICS
AMERICA, INC.,
Petitioner,

v.

OPTIMUM IMAGING TECHNOLOGIES LLC,
Patent Owner.

Case IPR2025-00461

Patent No. 7,612,805

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 7,612,805**

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TABLE OF EXHIBITS

Exhibit	Description
Ex-1001	U.S. Pat. No. 7,612,805 (“’805 Patent”)
Ex-1002	Prosecution History of the ’805 Patent Sans NPL
Ex-1003	Declaration of Expert Witness, Dr. Robert L. Stevenson
Ex-1004	Curriculum Vitae of Expert Witness, Dr. Robert L. Stevenson
Ex-1005	U.S. Patent App. Pub. No. 2002/0135688 (“Niikawa”)
Ex-1006	U.S. Pat. No. 6,323,934 (“Enomoto”)
Ex-1007	U.S. Patent No. 5,524,162 (“Levien”)
Ex-1008	U.S. Patent App. Pub. No. 2003/0071905 (“Yamasaki”)
Ex-1009	Dkt. No. 88, Claim Construction Memorandum Opinion and Order, <i>Optimum Imaging Technologies LLC v. Canon Inc.</i> , No. 2:19-cv-00246 (E.D. Tex. June 11, 2020) (“Canon Case”)
Ex-1010	Certified Translation of Japanese Pat. App. Pub. No. 2004266768 (“Matsutani”)
Ex-1011	Japanese Pat. App. Pub. No. 2004-266768 (“Matsutani-JP”)
Ex-1012	Certified Translation of Japanese Patent App. Pub. No. 2003158672 (“Endo”)
Ex-1013	Japanese Patent App. Pub. No. 2003-158672 (“Endo-JP”)
Ex-1014	U.S. Patent No. 8,849,964 (“Ralston”)
Ex-1015	Prosecution History of U.S. Pat. No. 8,451,339 (“’339 Patent”)
Ex-1016	U.S. Patent No. 9,063,982 (“Bestgen”)
Ex-1017	U.S. Patent No. 6,920,443 (“Cesare”)
Ex-1018	U.S. Pat. No. 7,245,319 (“Enomoto II”)

Exhibit	Description
Ex-1019	Dkt. No. 1, Complaint, <i>Optimum Imaging Technologies LLC v. Nikon Corporation</i> , Case No. 4-23-cv-00923 (E.D. Tex. Oct. 18, 2023)
Ex-1020	U.S. Pat. No. 5,477,264 (“Sarbadhikari”)
Ex-1021	English Translation of Japanese Pat. App. Pub. No. 11-205652 (“Ichiyama”)
Ex-1022	Japanese Pat. App. Pub. No. 11-205652 (“Ichiyama-JP”)
Ex-1023	U.S. Pat. No. 5,276,519 (“Richards”)
Ex-1024	U.S. Pat. No. 6,862,373 (“Enomoto III”)
Ex-1025	Certified Translation of Japanese Pat. App. Pub. No. H6-113309 (“Ito”)
Ex-1026	Japanese Pat. App. Pub. No. H6-113309 (“Ito-JP”)
Ex-1027	U.S. Patent No. 7,683,950 (“Kelly”)
Ex-1028	RESERVED
Ex-1029	Certified Translation of <i>Ricoh Technical Report No. 31</i> , RICOH (Apr. 20, 2006), https://web.archive.org/web/20060420051054/http://www.ricoh.co.jp/about/business_overview/report/31/ (“Ricoh”)
Ex-1030	<i>Ricoh Technical Report No. 31</i> , RICOH (Apr. 20, 2006), https://web.archive.org/web/20060420051054/http://www.ricoh.co.jp/about/business_overview/report/31/ (“Ricoh-JP”)
Ex-1031	U.S. Patent No. 10,873,685 (“’685 Patent”)
Ex-1032	Certified Translation of Japanese Pat. App. Pub. No. H5-3568 (“Shiomi”)
Ex-1033	Japanese Pat. App. Pub. No. H5-3568 (“Shiomi-JP”)

LIST OF CHALLENGED CLAIMS

Identifier	Claim Language
[1pre]	A digital imaging system for image filtration comprising:
[1A-1]	a digital camera mechanism,
[1A-2]	an optical lens mechanism,
[1A-3]	a digital sensor,
[1A-4]	a microprocessor,
[1A-5]	a digital signal processor,
[1A-6]	an application specific integrated circuit,
[1A-7]	system software,
[1A-8]	a database management system and
[1A-9]	a memory storage sub-system;
[1B]	wherein the optical lens mechanism is a fixed focal length;
[1C]	wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor;
[1D]	wherein the microprocessor is used to provide digital and optical data to the digital signal processor;
[1E]	wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;
[1F]	wherein the system software forwards the data from the digital sensor to the digital processor;
[1G]	wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;

Identifier	Claim Language
[1H]	wherein the data are forwarded from the digital sensor to the digital signal processor by an application specific integrated circuit;
[1I]	wherein the digital signal processor applies a fast Fourier transform to a data file in order to satisfy a user specified special effects function;
[1J]	wherein the digital signal processor modifies the data file by applying the special effects function; and
[1K]	wherein the modified data file consisting of the digital data optimized from the aberrations that are corrected from the original optical image is stored in memory.
[2]	The system of claim 1: wherein the special effects function is a color enhancing function.
[3]	The system of claim 1: wherein the special effects function is a diffusion function of soft effect.
[4pre]	A digital imaging system for image filtration comprising:
[4A-1]	a digital camera mechanism,
[4A-2]	an optical lens mechanism,
[4A-3]	a digital sensor,
[4A-4]	a microprocessor,
[4A-5]	a digital signal processor,
[4A-6]	an application specific integrated circuit,
[4A-7]	system software,
[4A-8]	a database management system and
[4A-9]	a memory storage sub-system;
[4B]	wherein the optical lens mechanism is a fixed focal length;

Identifier	Claim Language
[4C]	wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and digital signal processor;
[4D]	wherein the microprocessor is used to provide digital and optical data to the digital signal processor;
[4E]	wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;
[4F]	wherein the system software forwards the data from the digital sensor to the digital processor;
[4G]	wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;
[4H]	wherein the data are forwarded from the digital sensor to the digital signal processor:
[4I]	wherein a data file is analyzed by the microprocessor to separate specific objects in the image using the differentiation of the depth-of-field;
[4J]	wherein the digital signal processor applies filtration only to specific objects in the image;
[4K]	wherein the aberrations of the specific objects are corrected; and
[4L]	wherein the digital signal processor forwards the modified date file to storage in memory.
[5]	The system of claim 4: wherein the subject is isolated by focusing on the subject and narrowing the depth of field range by manipulating the aperture.
[6]	The system of claim 4: wherein filtration is applied only to the background of an image exclusive of specific selected objects.

Identifier	Claim Language
[7]	The system of claim 4: wherein specific color filtration is applied to objects.
[8]	The system of claim 4: wherein specific filtration applied to specific objects is soft effects.
[9pre]	A digital imaging system for image filtration comprising:
[9A-1]	a digital camera mechanism,
[9A-2]	an optical lens mechanism,
[9A-3]	a digital sensor,
[9A-4]	a microprocessor,
[9A-5]	a digital signal processor,
[9A-6]	an application specific integrated circuit,
[9A-7]	system software,
[9A-8]	a database management system and
[9A-9]	a memory storage sub-system;
[9B]	wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor;
[9C]	wherein the microprocessor is used to provide digital and optical data to the digital signal processor;
[9D]	wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;
[9E]	wherein the system software forwards the data from the digital sensor to the digital processor;

Identifier	Claim Language
[9F]	wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;
[9G]	wherein the lens type is a zoom lens;
[9H]	wherein the lens focal length alternates from specific fixed focal length lens settings in a succession of steps;
[9I]	wherein optical aberrations are corrected with digital filtration to modify multiple images from different focal lengths in a succession of data files; and
[9J]	wherein the modified data file consisting of the digital data optimized from the aberrations that are corrected from the original optical image is stored in memory.
[18pre]	A method of image filtration which comprises:
[18A-1]	a digital camera mechanism,
[18A-2]	an optical lens mechanism,
[18A-3]	a digital sensor,
[18A-4]	a microprocessor,
[18A-5]	a digital signal processor,
[18A-6]	an application specific integrated circuit,
[18A-7]	system software,
[18A-8]	a database management system and
[18A-9]	a memory storage sub-system;
[18B]	wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor,

Identifier	Claim Language
[18C]	the method consisting of; forwarding the data from a digital sensor to a digital signal processor by an application specific integrated circuit;
[18D]	providing digital and optical data to the digital signal processor;
[18E]	identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations:
[18F]	selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations:
[18G]	applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations:
[18H]	applying a fast Fourier transform to a data file in order to satisfy a user specified special effects function;
[18I]	modifying the data file by applying the special effects function using the digital signal processor; and
[18J]	storing the data file in memory.
[19]	The method of claim 18 further comprising the step of: applying the special effects function as a color enhancing function.
[20]	The method of claim 18 further comprising the step of: applying the special effects function as a diffusion function of soft effect.
[21pre]	A method of image filtration which comprises:
[21A-1]	a digital camera mechanism,
[21A-2]	an optical lens mechanism,
[21A-3]	a digital sensor,
[21A-4]	a microprocessor,

Identifier	Claim Language
[21A-5]	a digital signal processor,
[21A-6]	an application specific integrated circuit,
[21A-7]	system software,
[21A-8]	a database management system and
[21A-9]	a memory storage sub-system;
[21B]	wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and digital signal processor,
[21C]	the method consisting of; forwarding the data from a digital sensor to a digital signal processor;
[21D]	analyzing a data file by the microprocessor to separate specific objects it the image using the differentiation of the depth-of-field:
[21E]	providing digital and optical data to the digital signal processor;
[21F]	identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations;
[21G]	selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations;
[21H]	applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations:
[21I]	correcting the aberrations of the specific objects in the image by applying the digital signal processor filtration; and
[21J]	forwarding the modified data file from the digital signal process to storage in memory.
[22]	The method of clam 21 further comprising the step of: applying specific color filtration to objects.

Identifier	Claim Language
[23]	The method of claim 21 further comprising the step of: applying soft effects filtration to specific objects.
[24pre]	A method of image filtration comprising:
[24A-1]	a digital camera mechanism,
[24A-2]	an optical lens mechanism,
[24A-3]	a digital sensor,
[24A-4]	a microprocessor,
[24A-5]	a digital signal processor,
[24A-6]	an application specific integrated circuit,
[24A-7]	system software,
[24A-8]	a database management system and
[24A-9]	a memory storage sub-system;
[24B]	wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and digital signal processor,
[24C]	the method consisting of; alternating the lens focal length of a zoom lens from specific fixed focal length lens settings in a succession of steps;
[24D]	creating data files corresponding to each focal length lens setting;
[24E]	forwarding the data from a digital sensor to the digital signal processor;
[24F]	providing digital and optical data to a digital signal processor;
[24G]	identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations;

Identifier	Claim Language
[24H]	selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations;
[24I]	applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations;
[24J]	correcting optical aberrations with digital filtration to modify multiple images from different focal lengths in a succession of data files; and
[24K]	storing the modified data files in memory.

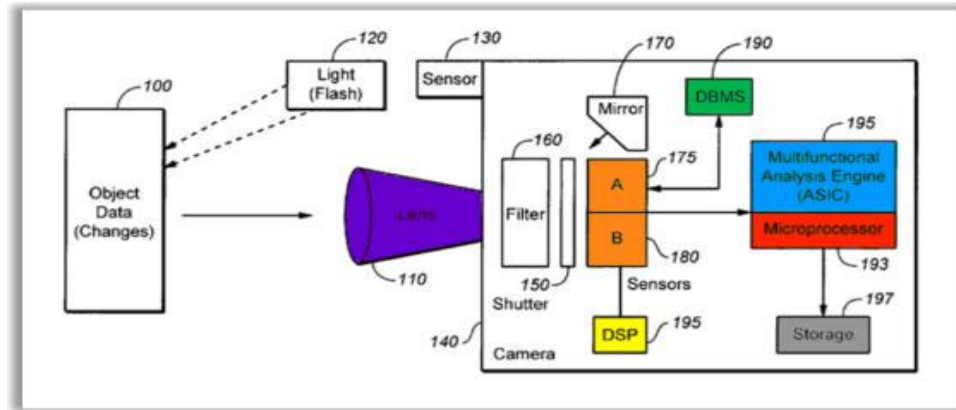
I. Relation to Earlier-Filed IPR Proceeding

This Petition presents the same arguments and evidence presented in IPR2024-01373. Should trial be instituted in that proceeding, Petitioner intends to file a motion for joinder to simplify matters.

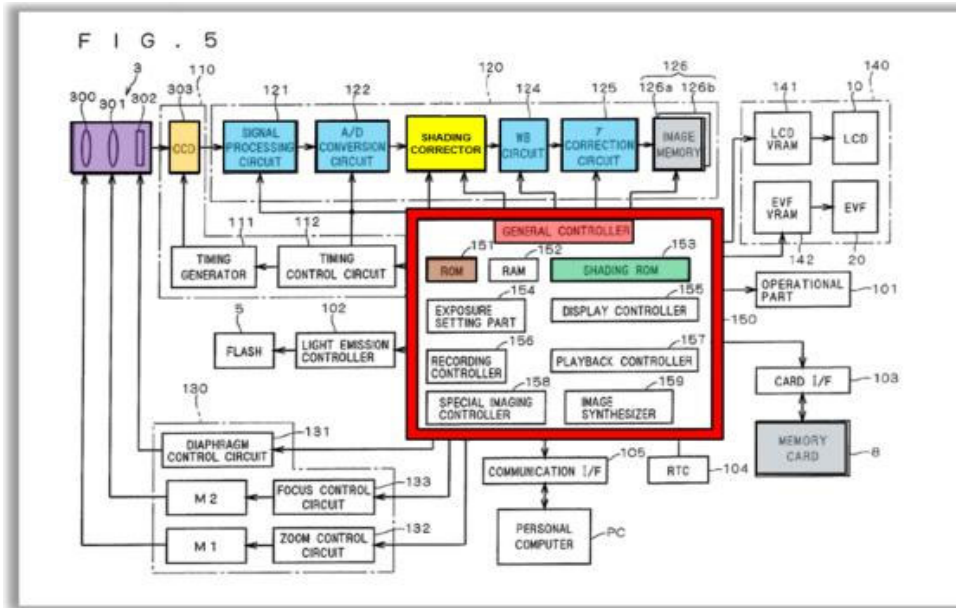
II. Introduction

Digital cameras capture images by an image sensor receiving light that passes through a lens, processing the data from the image sensor, and storing the image in memory. The image quality of the stored image may be adversely affected by distortions and artifacts caused by lenses. These adverse effects are known as “aberrations.” Such aberrations include “vignetting,” where less light is received at the edge of the image, causing the edges to be shaded.

Techniques for correcting aberrations were well known. Acknowledging that correcting aberrations post-production (e.g., using Photoshop on a computer) was well known (Ex-1001, 6:32-37), the '805 Patent describes and claims using well-known aberration correcting techniques in the camera itself utilizing the components of a camera, including (i) a lens (purple), (ii) a digital sensor (orange), (iii) a digital signal processor (yellow), (iv) an application specific integrated circuit (blue), (v) a microprocessor (red), (vi) software, (vii) a database management system (green), and (viii) a memory (grey).



But correcting aberrations in-camera had been known for years. For example, Niikawa discloses a digital camera that corrects vignetting using the components of the camera. Like the '805 Patent, Niikawa discloses correcting aberrations in a camera using a (i) lens (purple), (ii) CCD image sensor (orange), (iii) shading corrector processor (yellow), (iv) signal processor (blue), (v) general controller (red), (vi) programs stored in the general controller's memory (brown), (vii) correction tables stored in the general controller's shading ROM (green), and (viii) memory (grey).



As detailed herein, correcting aberrations in camera was not novel as taught by Niikawa and many other references. And implementing well-known aberration techniques in camera was certainly obvious. Thus, trial should be instituted and claims 1-9 and 18-24 (“Challenged Claims”) should be cancelled.

III. Requirements for IPR

A. Standing

Petitioner certifies that the '805 patent is available for IPR, and that Petitioner is not barred or estopped from requesting this review.

B. Challenge and Relief Requested

Petitioner relies on the following references that qualify as prior art under 35 U.S.C. §102(b):

- Niikawa (Ex-1005) published on September 26, 2002.
- Enomoto (Ex-1006) issued on November 27, 2001.

- Levien (Ex-1007) issued on June 4, 1996.
- Yamasaki (Ex-1008) published on April 17, 2003.

Petitioner requests that the Challenged Claims be determined unpatentable and cancelled on the following grounds:

Ground 1(a): Claims 9 and 24 obvious over Niikawa.

Ground 1(b): Claims 9 and 24 are obvious over Niikawa in view of Enomoto.

Ground 2(a): Claims 1-3 and 18-20 are obvious over Niikawa in view of Levien.

Ground 2(b): Claims 1-3 and 18-20 are obvious over Niikawa in view of Enomoto and Levien.

Ground 3: Claims 4-8 and 21-23 are obvious over Niikawa in view of Enomoto and Yamasaki.

This Petition is supported by the Declaration of Dr. Robert L. Stevenson (Ex-1003).

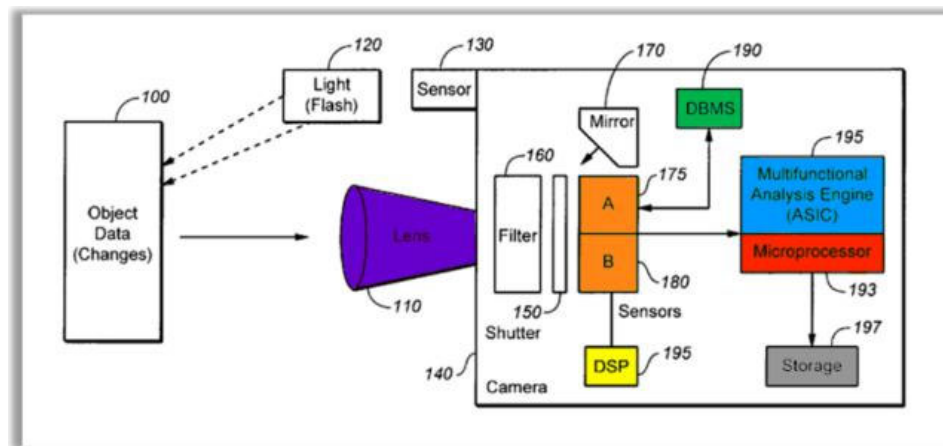
IV. Overview Of The '805 Patent

A. Summary

The '805 Patent discloses in-camera digital corrections to aberrations. Ex-1001, 8:3-4. The '805 Patent admits that existing optical technologies reliably corrected for imaging aberrations, asserting that those technologies lacked “in-camera modification capabilit[ies] for each specific image problem.” *Id.*, 6:54-58;

see also, 1:36-44, 2:37-55, 3:25-26, 3:40-53, 4:25-38, 5:7-36, 6:19-31.

The patent describes a digital camera capable of identifying and correcting for optical image aberrations. *Id.*, claim 9. The camera includes (i) an optical lens mechanism (e.g., lens 110, purple), (ii) a digital sensor (e.g., digital sensor 175 or 180, orange), (iii) a digital signal processor (e.g., DSP 195, yellow), (iv) an application specific integrated circuit (e.g., ASIC 195, blue), (v) a microprocessor (e.g., microprocessor 193, red), (vi) a database management system (e.g., DBMS 190, green), and (vii) a memory storage sub-system (e.g., storage 197, grey). *See id.*, claim 9; Ex-1003, ¶¶70-71.



Ex-1001, Fig. 1.

B. Relevant Prosecution History

In the first office action, the Examiner objected to application claims 3 and 7 as being dependent on rejected claims. Ex-1002, 190. Patent Owner (“PO”) rewrote those claims as independent claims and they were allowed as patent claims 1 and 9, respectively. *Id.*, 76.

The '805 Patent issued on November 3, 2009.

Niikawa, Enomoto, Yamasaki, and Levien were not cited during prosecution of the '805 Patent.

C. Priority Date

For purposes of this proceeding only, Petitioner assumes that the provisional application's filing date, July 11, 2006, is the priority date ("Priority Date"). This is before March 16, 2013, so the pre-AIA statute applies.

D. Level of Ordinary Skill in the Art

A person having ordinary skill in the art ("POSA") would have had a bachelor's degree in electrical engineering, physics, or a related field, with at least two years of industry experience and/or research, both concerning digital camera system design and image processing. Ex-1003, ¶¶48-50.

E. Claim Construction

The district court in the Canon Case construed the term "using the application specific integrated circuit and the digital signal processor" in [1C], [4C], [9B], [18B], [18G], [21B], [21H], [24B], and [24I], to have its plain and ordinary meaning, finding that "the claims include only the requirement that each [of the ASIC and DSP] play a role, and the details of how responsibilities are assigned are not part of the claim limitation." Ex-1009, 38.

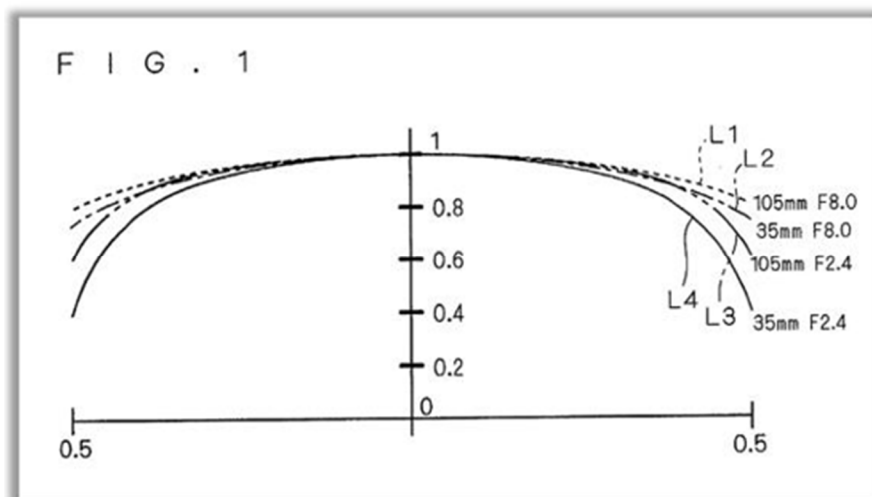
Petitioner believes that the plain and ordinary meanings suffice and no further constructions are needed to resolve the issues presented herein. Ex-1003, ¶¶51-52.

V. Prior Art Overview

A. Niikawa

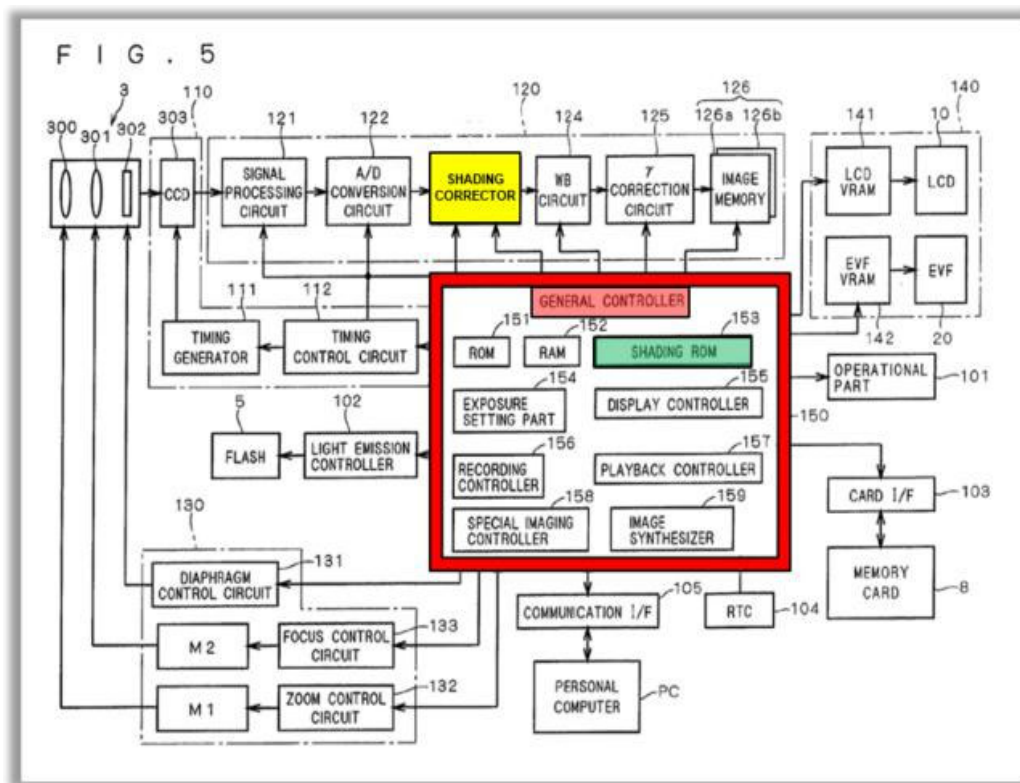
Niikawa discloses an image processing apparatus, e.g., a digital camera, having a lens 3 and CCD sensor 303, that performs shading correction on images, which is a form of image aberration correction. *See, e.g.*, Ex-1005, Abstract, [0067]. “When an image is captured via a lens in a digital camera or the like, so-called ‘shading’ [occurs meaning] that the level of image data decreases with distance from the center of the image to the periphery.” *Id.*, [0012], *see also id.*, [0056].

Figure 1 depicts an example of how shading can influence an image captured using a digital camera with lenses at different focal lengths and “f-numbers.” *Id.*, [0057]-[0060]. As shown in Figure 1, focal length (represented in mm) and f-number influence shading. *Id.*, [0060].



Ex-1005, Fig. 1.

Niikawa teaches a signal processor 120 with a shading corrector that corrects shading due to optical conditions. Ex-1005, [0082], Claims 1, 2, 4, 5. The shading corrector works with general controller 150 (red) and shading ROM 153 (green) to correct the shading aberration in each image. Niikawa discloses that the shading corrector may be implemented as a hardware circuit, as in shading correction circuit 123 (of original Figure 5), or the shading corrector may be implemented using a processor (shown in yellow in amended Figure 5 below). *Id.*, [0030], [0078]-[0079], [0082], [0108], [0110], [0122], Figs. 5-6, Claims 1, 2, 4, 5.



Ex-1005, Fig. 5 (with shading corrector processor).

Specifically, claim 1 of Niikawa recites a “shading corrector.” Ex-1005, Claim 1. Claim 2 of Niikawa, which is dependent on claim 1, recites that the

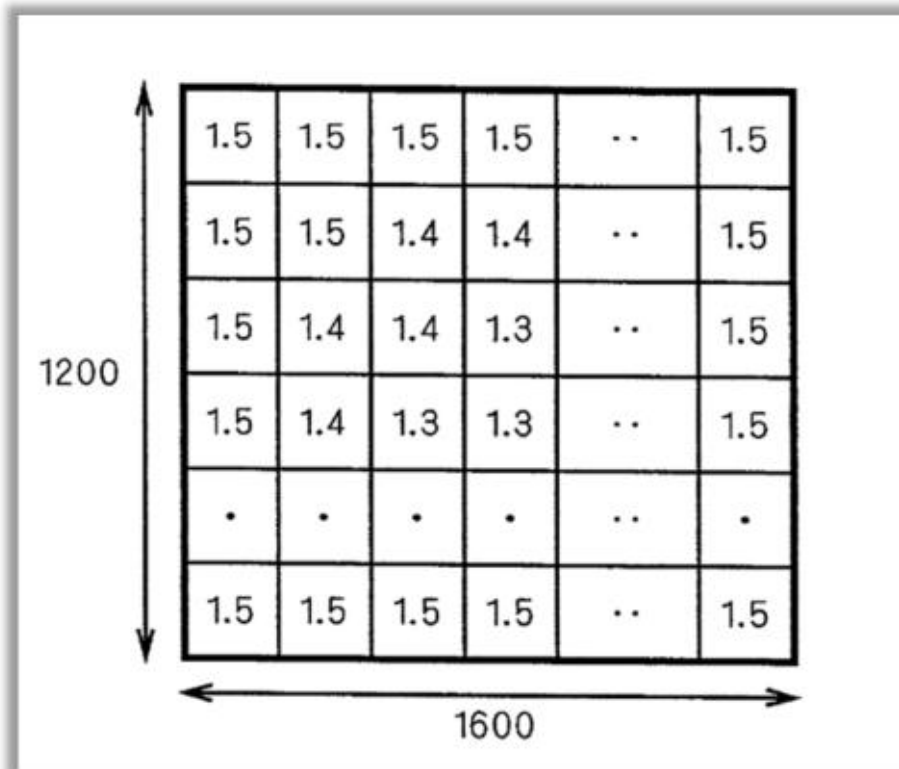
“shading corrector” can be implemented as a “coefficient processing hardware circuit.” *Id.*, Claim 2. Alternatively, claim 5 of Niikawa, which is dependent on claim 4, which depends from claim 1, recites that the “shading corrector” can be implemented as a “processor.” *Id.*, Claims 4, 5. Thus, Niikawa discloses that the shading corrector can be implemented as either a hardware circuit or a processor. Ex-1003, ¶80.

Although the implementation depicted in Figure 5 of Niikawa discloses the hardware circuit implementation, a POSA reading Niikawa would have understood that the embodiment of Figure 5 could equally be implemented using the disclosed processor implementation. Ex-1003, ¶81. At a minimum, it would have been obvious to a POSA to use a processor to perform the shading correction functionality. *Id.* Such motivation is provided by Niikawa’s claims themselves. *Id.* Additional motivations are explained further below.

The general controller 150 includes programs for controlling camera functions and the components of the digital camera 1. Ex-1005, [0096]. Based on the optical conditions of the lens, such as focal length and f-number, the general controller 150 selects a “correction table” with inverse correction coefficients from shading ROM 153 to send to the shading corrector. *Id.*, [0082], [0084], [0108].

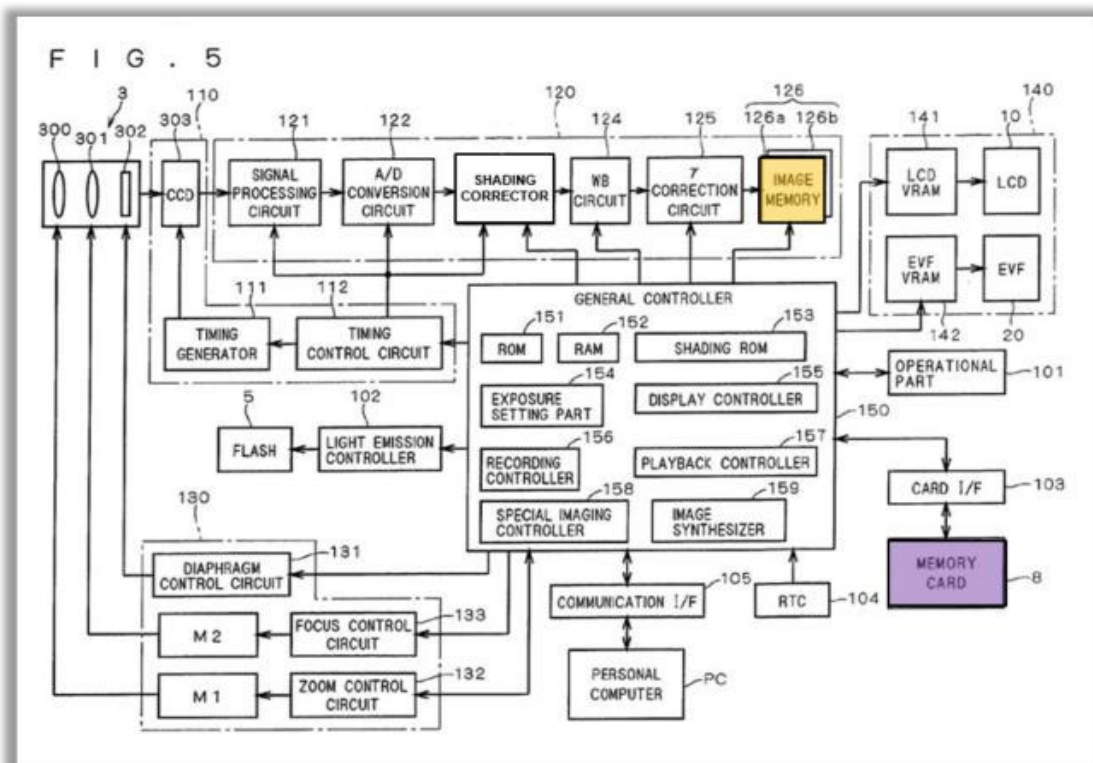
Figure 7 shows an example correction table used for shading correction. *Id.*, [0031], [0083]. “As shown in [Figure 7], the correction table has 1,920,000

correction coefficients (actually, inverses of correction coefficients) for corresponding to the respective 1,920,000 pixels of 1,600 pixels×1,200 pixels of the [image pickup device] CCD 303.” *Id.*, [0056], [0083]. “Each correction coefficient corresponds to the rate of decrease in level of each pixel data shown in FIG. 1, and the inverse of the correction coefficient is held in the correction table in advance.” *Id.* “When each pixel shown in the curve of FIG. 1 is multiplied by the inverse of the correction coefficient, the curve is converted to a straight line in which the levels of image data are constantly 1. That is, by subjecting every pixel data to the multiplication by the inverse of the correction coefficient (coefficient process), the shading can be corrected.” *Id.*



Ex-1005, Fig. 7.

After signal processor 120 finishes processing the image, the signal processor forwards the image data to image memory 126 (orange) for temporary storage. Ex-1005, [0087], [0092]. The image data is stored in image memory 126 (orange) and/or memory card 8 (purple). *Id.*, [0093], [0100]; *see also id.*, Fig. 8 (depicting a recording method of image files onto the memory card 8), Fig. 15 (depicting a configuration example of an image file stored in memory card 8), [0032], [0040], [0095] (disclosing that general controller 150 is connected to memory card 8 via card interface 103), [0101] (describing Fig. 8), [0149] (describing Fig. 15).



Ex-1005, Fig. 5 (with shading corrector processor).

Niikawa is analogous art at least because it is in the same field of endeavor as the '805 Patent, i.e., digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:15-32 *with* Ex-1005, Abstract, [0003], [0065]. Niikawa also is reasonably pertinent to the problem to be solved: correcting image aberrations in-camera. *Id.* Niikawa and the '805 Patent both list the H04N subclass under the International Classification. Ex-1003, ¶¶77-85.

B. Enomoto

Enomoto discloses an image processing apparatus with a storage section for storing lens characteristics associated with the type of lens and a correcting section which receives the corresponding lens characteristics from the storage section and corrects at least one aberration selected from among lateral chromatic aberration, distortion, decrease in brightness of the edge of image field, and image blurring. Ex-1006, Abstract, 1:5-19. Enomoto also discloses that the image processing apparatus 14, “which obtains input image data from an image recorded optically with a taking lens,” can comprise the image reading apparatus 12, e.g., a digital camera. *Id.*, 11:35-52, Figs. 1, 2, 5, 8, 10, 12, Claims 11, 31, 34. The storage section can include a database, and the lens information stored in the database may be either correction functions/equations and/or coefficients for correcting lateral chromatic aberration and distortion. *Id.*, 14:4-49.

Enomoto is analogous art at least because it is in the same field of endeavor as the '805 Patent, i.e., digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:15-32 *with* Ex-1006, Abstract, 1:5-19. Enomoto also is reasonably pertinent to the problem to be solved: correcting image aberrations in-camera. Specifically, Enomoto corrects various aberrations for specific lens characteristics used with digital cameras. Ex-1006, Abstract, 1:5-19, 11:35-52. Enomoto and the '805 Patent both list H04N under the International Classification. Ex-1003, ¶¶86-87.

C. Levien

Claims 1-3 and 18-20 of the '805 Patent recite applying “a fast Fourier transform to a data file in order to satisfy a user specified special effects function.” Levien discloses using an FFT to control the amount of blur and sharpening in an image. Ex-1007, Abstract, 1:7-9, 1:54-55, 2:7-26, 3:36-46, 4:27-35. Specifically, Levien teaches a sharpening transfer function 20 to process and sharpen an image. *Id.*, 3:5-10, Fig. 2. Sharpening transfer function 20 uses the FFT to determine the maximum frequency (FMAX) of the image energy content of each sub-area image and to determine the coefficients to control the amount of blur and sharpening. *Id.*, 2:7-26, 3:36-67, 4:12-15, 4:27-35, Fig. 7.

Levien is analogous art at least because it is in the same field of endeavor as the '805 Patent, i.e., digital signal processing techniques, such as aberration

correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:15-32 *with* Ex-1007, 1:7-9. Levien also is reasonably pertinent to the problem to be solved: correcting image aberrations in-camera. *Id.* Specifically, Levien discloses a technique for blurring and sharpening an image that may be applied in the camera. Ex-1003, ¶¶88-89.

D. Yamasaki

Claims 4-8 and 21-23 of the '805 Patent recite analyzing a data file “by the microprocessor to separate specific objects in the image using the differentiation of the depth-of-field” and correcting the aberrations of the specific objects in the image by applying the digital signal processor filtration. Yamasaki discloses an image processing apparatus, such as a digital camera, and method to generate an image with a blur effect. Ex-1008, [0001], [0106]. Using the image processing apparatus and method, the depth of field can be changed by variously selecting the combinations of apertures and shutter speeds and, as a result, the blur effect of objects other than a principal object can be freely controlled. *Id.*, [0003]; *see also id.*, Abstract, [0088], [0095], [0103], [0109], [0115], Figs. 14A, B. Like the '805 Patent, Yamasaki refers to this as “digital portrait mode.” *Compare* Ex-1001, 13:7-10, 13:37-48, 14:39-43, 15:8-24, 32:17-67 (describing using soft effect or blurring and depth of field for portraiture), *with* Ex-1008, [0109]. The blur effect is added by convolving 9x9 blur filter matrices with image data. *Id.*, [0095]-[0097], [0114]-

[0115]. Yamasaki discloses storing this program in ROM 407 of the central controller 404, which is connected to digital signal processor 403. *Id.*, [0107], [0111].

Yamasaki (like Niikawa) is analogous art at least because it is in the same field of endeavor as the '805 Patent, i.e., digital signal processing techniques, such as aberration correction, for imaging systems like digital and video cameras. *Compare* Ex-1001, 1:16-19, *with* Ex-1008, [0001]. Yamasaki also is reasonably pertinent to the problem to be solved: correcting image aberrations in-camera. *Id.* Yamasaki and the '805 Patent both list H04N under the International Classification. Ex-1003, ¶¶90-91.

VI. The Challenged Claims Are Unpatentable

A. Grounds 1(a) and 1(b)

1. Independent Claim 9¹

[9pre] A digital imaging system for image filtration comprising:

Niikawa discloses a digital imaging system, e.g., an image processing apparatus or camera, that performs shading correction on images. *See, e.g.*, Ex-1005, Abstract, [0012], [0056], [0079], [0082]. A decrease in light farther away from a center of a lens is known as vignetting. Ex-1003, ¶93. The '805 Patent discloses that vignetting or shading correction is a form of filtration. Ex-1001, 30:28-37, 30:44-

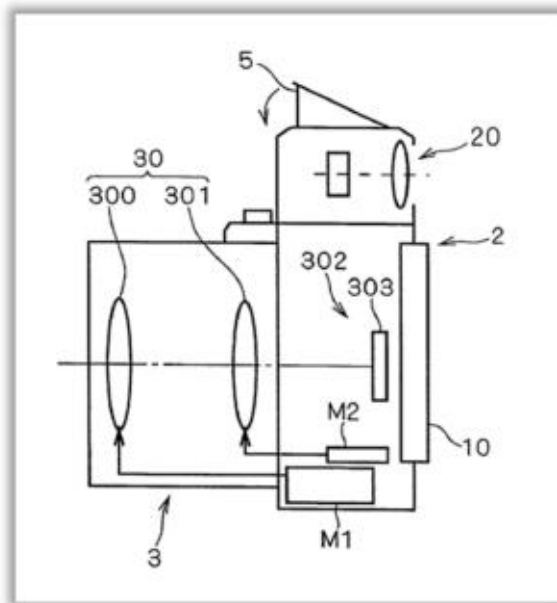
¹ This petition begins with claim 9 as it is obvious over Niikawa alone.

50. A POSA would have also understood that multiplying digital image data with correction coefficients for shading correction is a form of digital filtration. Ex-1003, ¶93.

Niikawa discloses a digital imaging system (digital camera 1) for image filtration (shading aberration correction). *Id.*, ¶94.

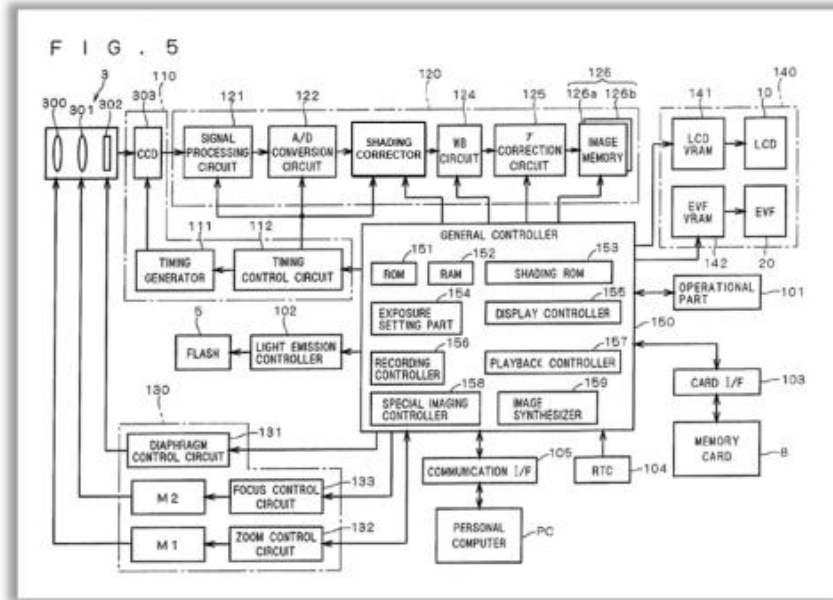
[9A-1] a digital camera mechanism,

Niikawa discloses digital camera 1. Ex-1005, Abstract, [0065], [0075], Figs. 2-5. Figure 3 depicts a cross-section view of digital camera 1 with imaging lens 3, including zoom lens 300 and focus lens 301, and camera main body 2. *Id.*, [0027], [0065], [0067], [0069], [0088]; Ex-1003, ¶97.



Ex-1005, Fig. 3.

Figure 5 depicts the internal configuration of digital camera 1. Ex-1005, [0029], [0075], Fig. 5; Ex-1003, ¶98.

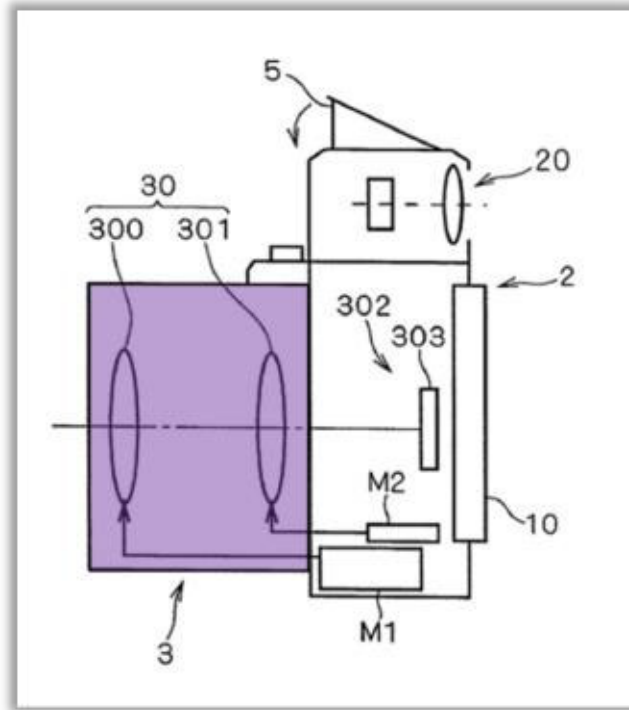


Ex-1005, Fig. 5 (with shading corrector processor).

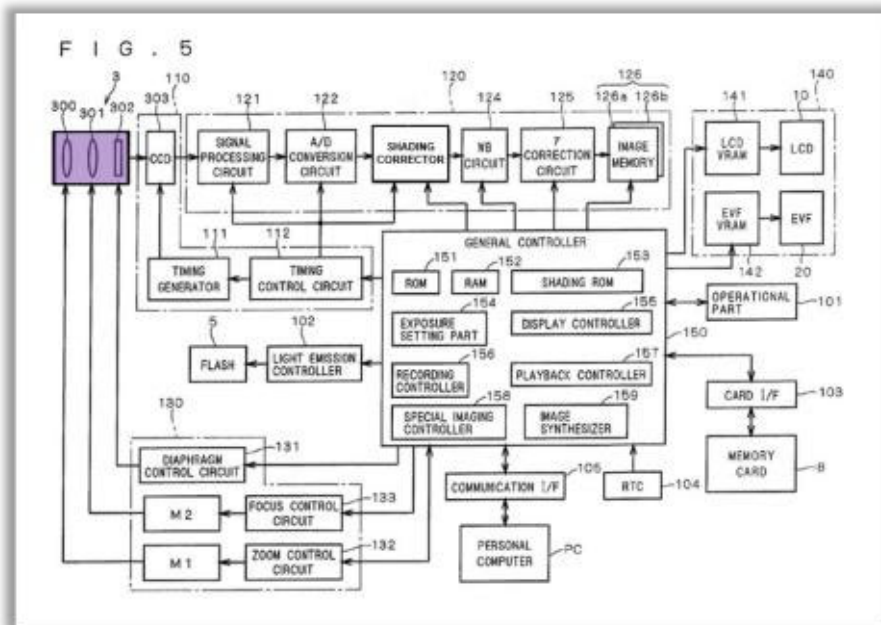
Niikawa discloses a digital camera mechanism (digital camera 1). Ex-1003, ¶99.

[9A-2] an optical lens mechanism,

Niikawa discloses that digital camera 1 has an imaging lens 3 (purple), including zoom lens 300 and focus lens 301. Ex-1005, [0066], [0067], [0076], [0089], Figs. 3, 5; Ex-1003, ¶100.



Ex-1005, Fig. 3.



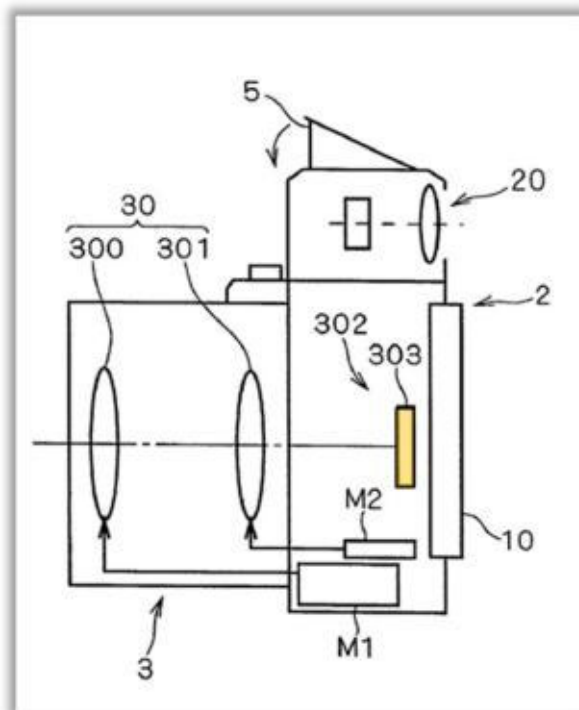
Ex-1005, Fig. 5 (with shading corrector processor).

Niikawa discloses an optical lens mechanism (imaging lens 3). Ex-1003,

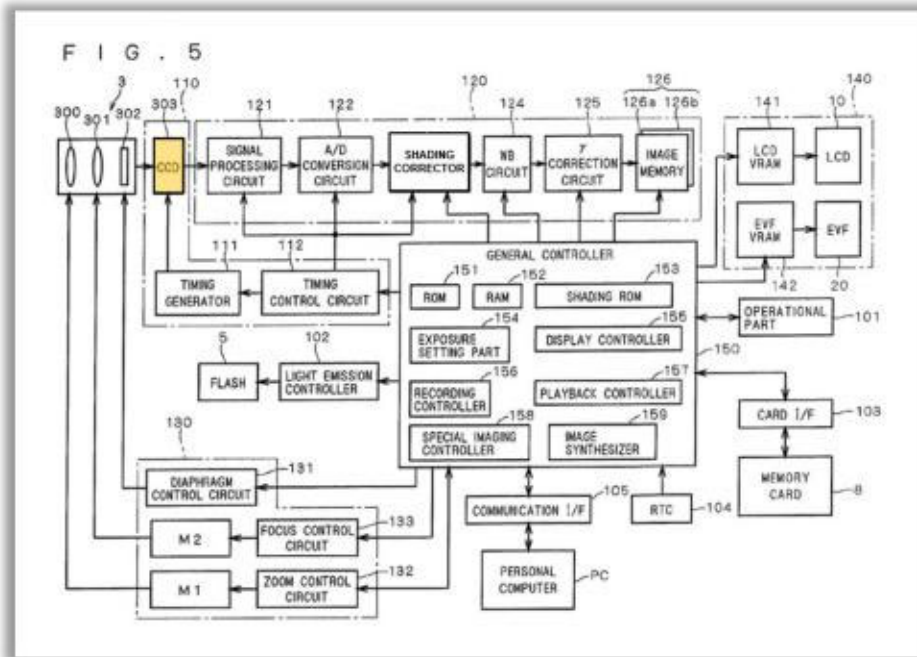
¶101.

[9A-3] a digital sensor,

Niikawa discloses that digital camera 1 has a digital sensor in the form of CCD 303 (orange). Ex-1005, [0067], [0077], Figs. 3, 5, Claim 8 (“an image sensor for acquiring a first image and a second image for the same subject in different timings”). The ’805 Patent teaches that a CCD is a digital sensor. Ex-1001, 2:47-50, 2:64-66, 5:7-23, 8:14-16, 13:64-67, 17:51-54, 18:30-35, 33:42-44; Ex-1003, ¶102.



Ex-1005, Fig. 3.

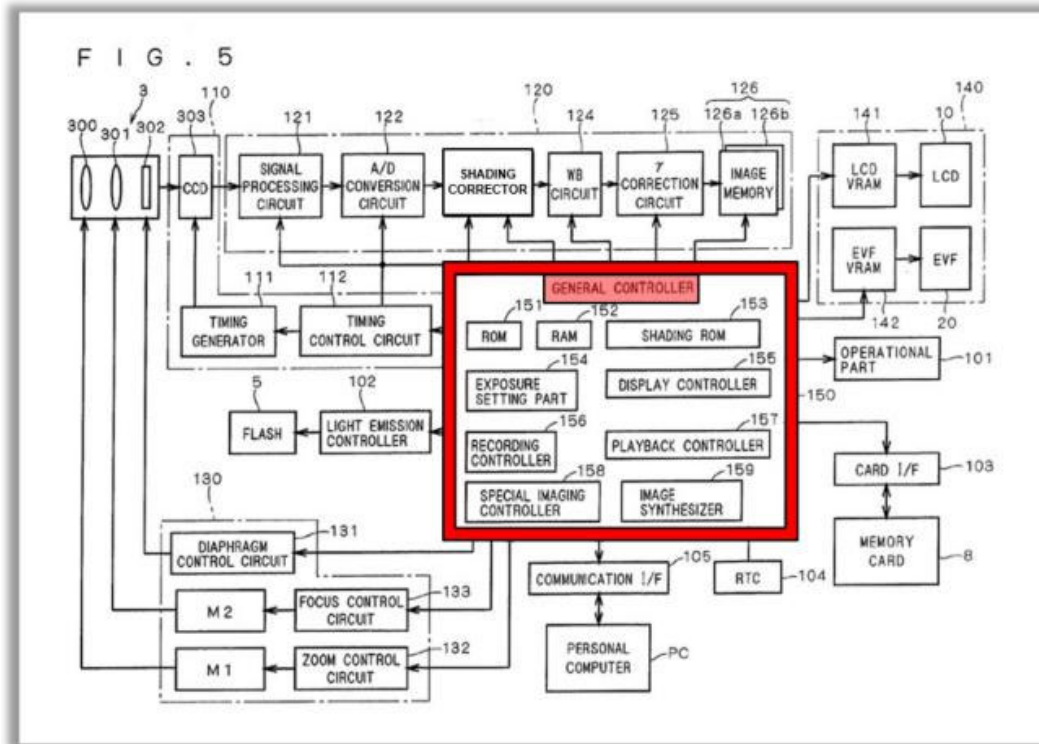


Ex-1005, Fig. 5 (with shading corrector processor).

Niikawa discloses a digital sensor (CCD 303). Ex-1003, ¶103.

[9A-4] a microprocessor,

Niikawa discloses that digital camera 1 includes general controller 150 (red), which “is implemented by a microcomputer and performs centralized control of the exposure function and playback function.” Ex-1005, [0082], [0084], [0095], Fig. 5. A POSA would have understood that a microcomputer is a microprocessor. Ex-1003, ¶104.

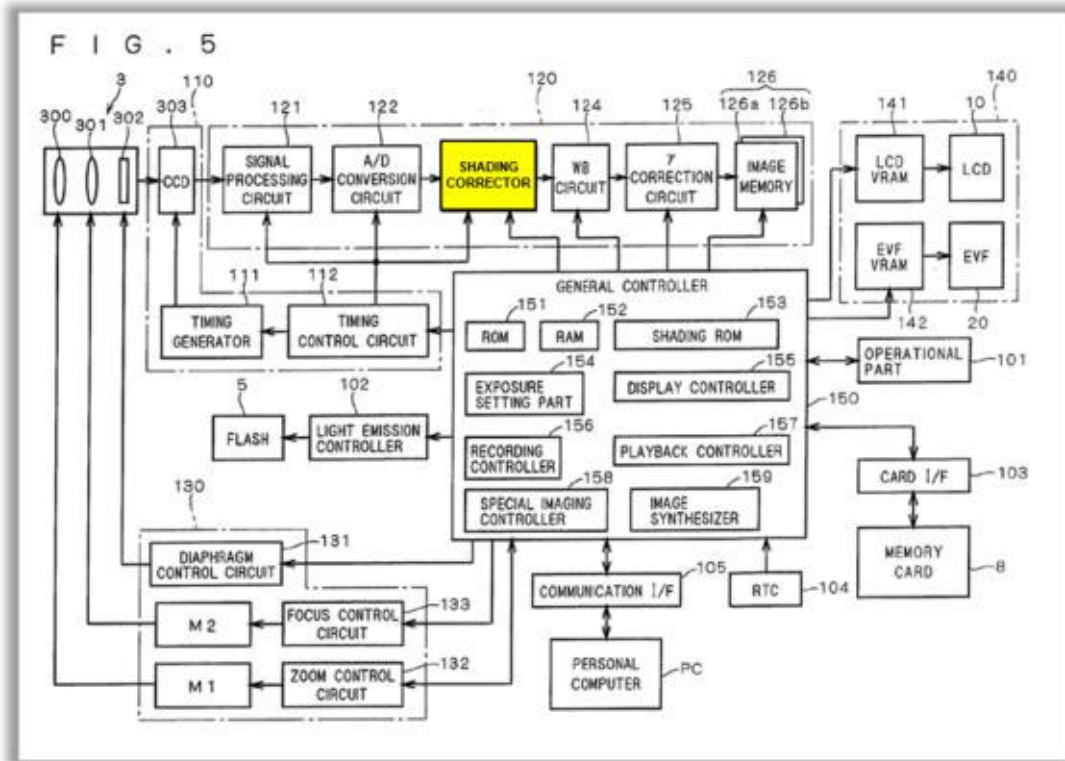


Ex-1005, Fig. 5 (with shading corrector processor).

Niikawa discloses a microprocessor (general controller 150). Ex-1003, ¶105.

[9A-5] a digital signal processor,

Niikawa discloses that digital camera 1 has a shading corrector (yellow) as part of signal processor 120 that executes “digital signal processing with respect to an image signal outputted from the CCD 303.” Ex-1005, [0079], Claims 1, 2, 4, 5; *see also id.*, [0077], [0092], Fig. 5. Niikawa discloses that the shading corrector may be implemented as a hardware circuit, as in shading correction circuit 123, or the shading corrector may be implemented using a processor. *Id.*, [0078]-[0079], [0082], [0108], [0110], [0122], Figs. 5-6, Claims 1, 2, 4, 5. Both of these implementations are disclosed as separate from the controller. *Id.*; Ex-1003, ¶106.



Ex-1005, Fig. 5 (with shading corrector processor).

To the extent the shading correction circuit implementation of Niikawa does not explicitly disclose a digital signal processor, a POSA would have been motivated to replace shading correction circuit 123 with a processor in view of Niikawa's own claims. Claims 2 and 5 of Niikawa recite that the shading corrector of Niikawa claim 1 could either be a hardware circuit or a processor. Ex-1005, Claims 1, 2, 4, 5. A POSA would have been motivated to make this modification because a processor provides known advantages where a programmable upgrade in processing function (such as image optimization) may be desirable. Ex-1003, ¶107; *see also* Ex-1010, [0023], [0026]-[0027], [0029], [0035], Fig. 1 (disclosing a CPU, an RPU/DSP, and an LSI/ASIC for correcting aberrations).

A POSA would have been further motivated to make this modification because it would have been a simple substitution of one known element (shading correction circuit 123) for another (processor) yielding predictable results (shading correction). Ex-1003, ¶108.

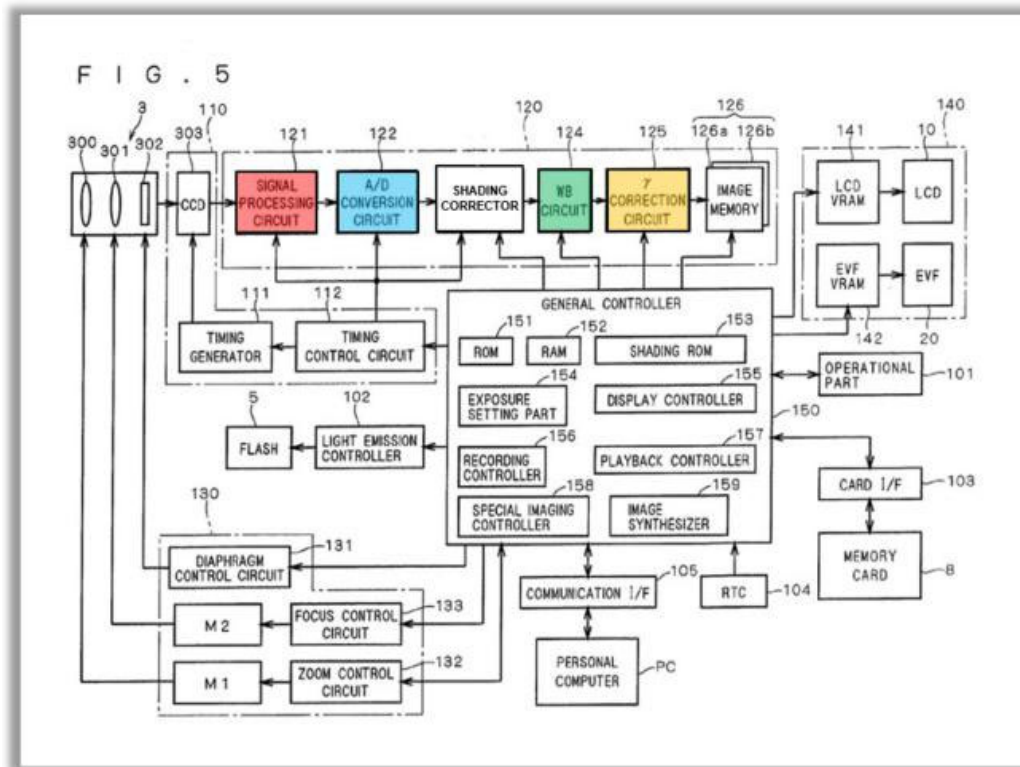
A reasonable expectation of success existed for implementing this combination because shading correction with a processor performing a multiplication operation would work the same as shading correction with a hardware multiplier. *Id.*, ¶109.

Niikawa discloses a digital signal processor (shading corrector with a processor). Ex-1003, ¶110.

[9A-6] an application specific integrated circuit,

Niikawa discloses signal processor 120 including signal processing circuit 121 (red), A/D conversion circuit 122 (blue), WB circuit 124 (green), and γ correction circuit 125 (orange). Ex-1005, [0079], Fig. 5. A POSA would have understood that these circuits are special hardware circuits, which are part of the application specific integrated circuit (“ASIC”), i.e., signal processor 120. Ex-1003, ¶¶111-12; Ex-1005, [0122] (explaining that shading correction circuit 123 can be a “special hardware circuit” for performing “shading correction with relatively high speed”); *see also id.*, [0080]-[0081], [0086]; Ex-1001, Fig. 1 (labeling both the ASIC

and DSP as 195); Ex-1031, Claims 6, 12 (continuation patent claiming that the ASIC may include the DSP).



Ex-1005, Fig. 5 (with shading corrector processor).

To the extent not expressly disclosed, a POSA would have been motivated to implement the hardware circuits of signal processor 120 on an ASIC. ASICs were commonly implemented with DSPs and microprocessors to correct aberrations in digital cameras as of the Priority Date. Ex-1003, ¶113; *see also* Ex-1010, [0023], [0026]-[0027], [0029], [0035], Fig. 1 (disclosing a CPU, an RPU/DSP, and an LSI/ASIC for correcting aberrations); Ex-1012, [Abstract], [0023], [0027], [0029]-[0032], [0045], Figs. 1, 2 (disclosing an ASIC and CPU for correcting aberrations). ASICs were known to offload labor-intensive operations of a system, whereby its

higher speed hardware switching operation may be leveraged for repetitive tasks such as aberration correction that consume less power. Ex-1003, ¶113; Ex-1014, 7:48–8:23, 9:28:47, 17:45-67, 24:48-25:3, 25:51-57 (describing using an ASIC to process and correct images). Niikawa provides further motivation to replace the circuits in signal processor 120 with an ASIC to attain “relatively high speed.” Ex-1005, [0122].

Furthermore, PO conceded during the prosecution of the related ’339 Patent that use of a combination of ASICs, microprocessors, and DSPs were known to be used in cameras for image processing and other tasks. Ex-1015, 154-155 (acknowledging that “microprocessors and ASICs are used in digital cameras” and “that a digital signal processor (DSP), typically an [ASIC], is used to process a digital image file”). Accordingly, by PO’s own admissions it would have been obvious to implement an ASIC in combination with a DSP and microprocessor for image processing in a digital camera. Ex-1003, ¶114.

A POSA would have been motivated to implement the circuits in signal processor 120 as an ASIC because it would have been a simple substitution of one known element (the circuits of signal processor 120) for another (an ASIC) to obtain predictable results (fast signal processing and filtration). Ex-1003, ¶115.

A POSA would have had a reasonable expectation of success of implementing this combination because microprocessors, DSPs, and ASICs were available in

commercial off-the-shelf components routinely used and combined for image processing in cameras as admitted by PO. *Id.*, ¶116.

Niikawa discloses or renders obvious an application specific integrated circuit (signal processing circuit 121, A/D conversion circuit 122, WB circuit 124, and γ correction circuit 125). *Id.*, ¶117.

[9A-7] system software,

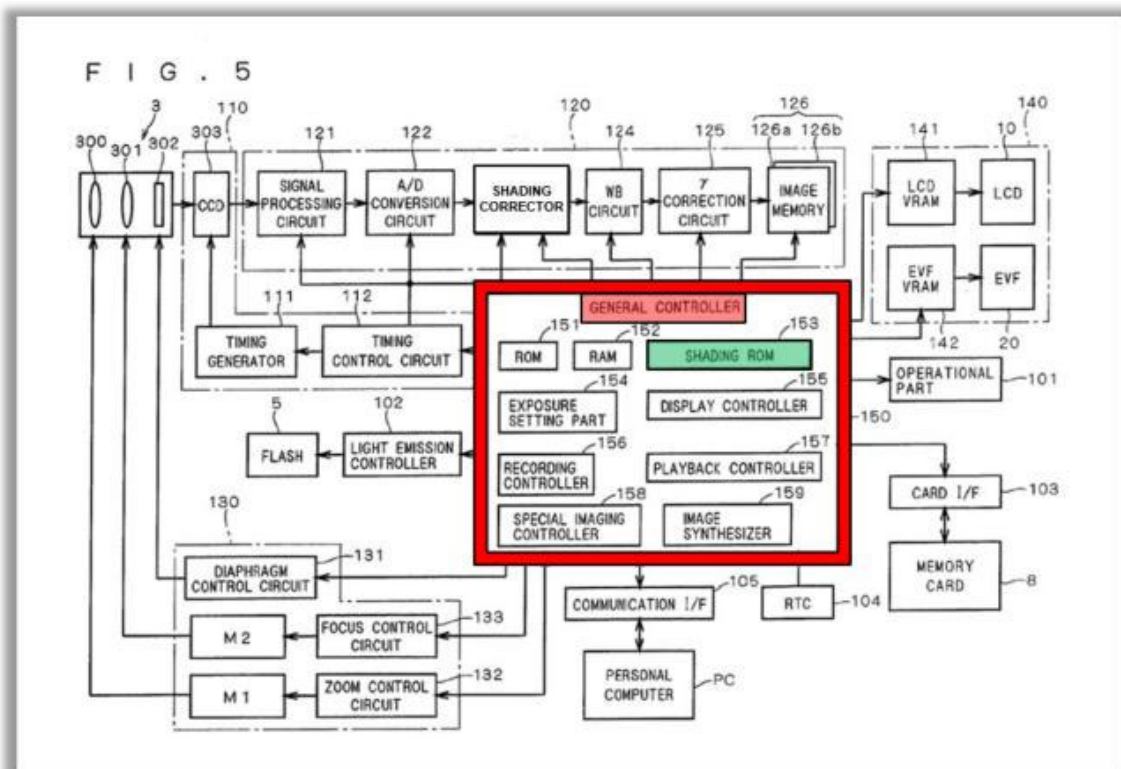
Niikawa discloses that general controller 150 has ROM 151 which stores programs for processing and controlling functions and components of digital camera 1. Ex-1005, [0096], *see also id.*, [0022] (“the present invention is directed to a program product containing a program for executing an image processing.”). The ’805 Patent describes “processing software” as “stored in either a microprocessor or an ASIC.” Ex-1001, 22:9-12. A POSA would have understood that the programs stored in ROM 151 were system software. Ex-1003, ¶119.

Niikawa discloses system software (programs stored in ROM 151). *Id.*, ¶120.

[9A-8] a database management system

Niikawa discloses that general controller 150 (red) accesses and retrieves correction tables stored in shading ROM 153, i.e., the database (green). Ex-1005, [0082]-[0086], [0096], [0108] (teaching that correction tables store correction coefficients), Fig. 5. Each correction table is a matrix of inverse correction coefficients corresponding to the respective pixels of CCD 303 and the focal length

and f-number at the time of imaging. *Id.*, [0083]-[0084]. A POSA would have understood that those correction tables are an example of a database. Ex-1016, 2:8-12 (“a database may be viewed as one or more tables of information”); Ex-1017, 1:36-39 (“Data records in a computer database are maintained in tables, which are a collection of rows all having the same columns.”); Ex-1003, ¶121.



Ex-1005, Fig. 5 (with shading corrector processor).

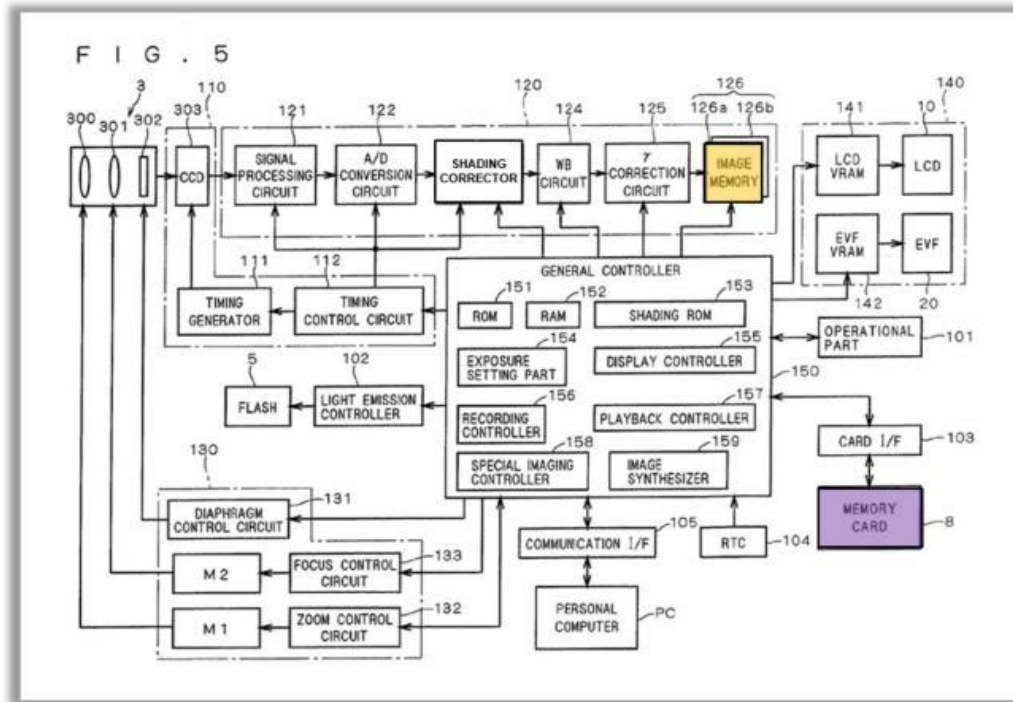
Despite other limitations in the claim reciting a “database” without antecedent basis, to the extent the claimed “database management system” (“DBMS”) is not limited to a database, Niikawa also discloses a DBMS, as disclosed in the ’805 Patent. General controller 150 includes ROM 151 which stores programs for controlling functions and components of digital camera 1. Ex-1005, [0096], Fig. 5.

Those programs comprise a DBMS at least because they are software that retrieves image correction data associated with focal length and f-number at the time of imaging from the database. *Id.*, [0082]-[0086], [0096], [0101], [0108], Figs. 5, 7-8; Ex-1003, ¶122.

Niikawa discloses a database management system (the correction tables organized in shading ROM 153/general controller 150 and the programs stored in ROM 151). *Id.*, ¶123.

[9A-9] and a memory storage sub-system;

Niikawa discloses that digital camera 1 has image memory 126 (orange) and memory card 8 (purple). Ex-1005, [0016], [0066], [0087], Figs. 2, 5. After image processing, the modified digital image files are stored in image memory 126 and memory card 8. *Id.*, [0032], [0079], [0086], [0092], [0100]-[0102], [0109]-[0110], [0121], Figs. 5, 8; Ex-1003, ¶124.



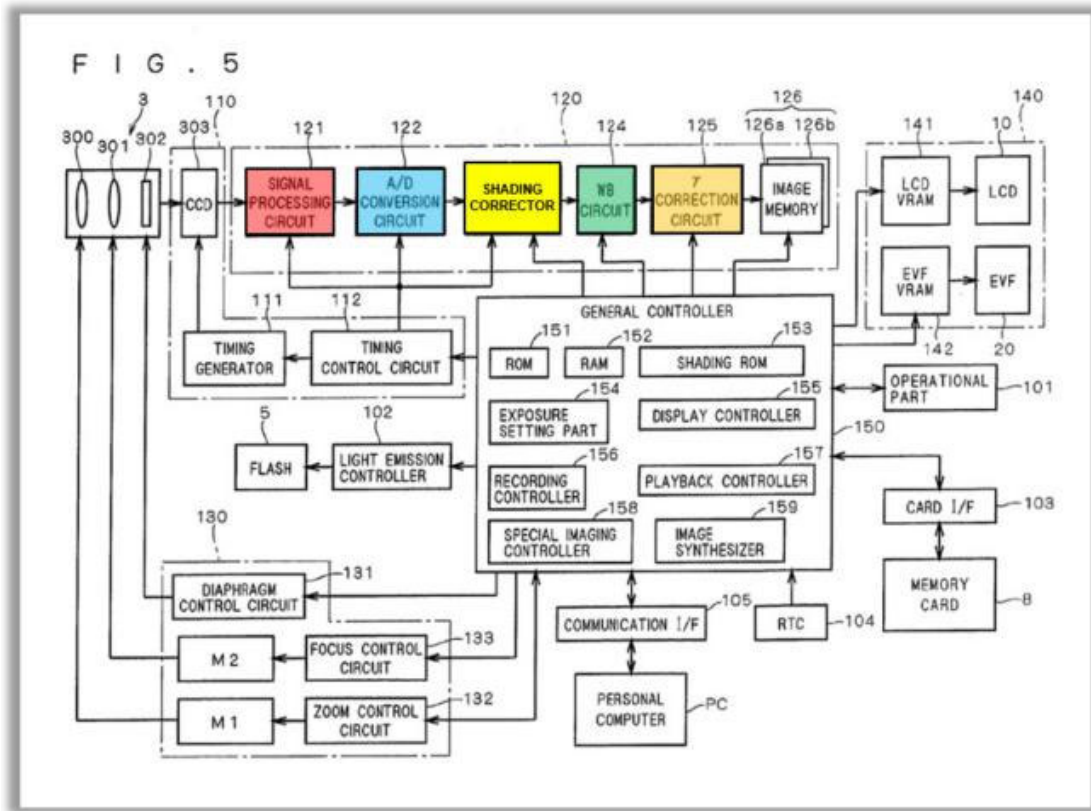
Ex-1005, Fig. 5 (with shading corrector processor).

Niikawa discloses a memory storage sub-system (image memory 126 and/or memory card 8). Ex-1003, ¶125.

[9B] wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor;

Niikawa discloses signal processor 120 including signal processing circuit 121 (red), A/D conversion circuit 122 (blue), WB circuit 124 (green), and γ correction circuit 125 (orange). Ex-1005, [0079], Fig. 5. As explained in [9A-6], a POSA would have known that these circuits were an ASIC or would have been obvious to replace with an ASIC. Signal processor 120 also includes the shading corrector (yellow). *Id.*, [0078]-[0079], [0082], [0108], [0110], [0122], Fig. 6, Claims 1, 2, 4, 5. Digital camera 1 uses these components of signal processor 120 to correct

the aberrations from lens 3 by applying digital filtration. Ex-1009, 38; Ex-1003, ¶126.



Ex-1005, Fig. 5 (with shading corrector processor).

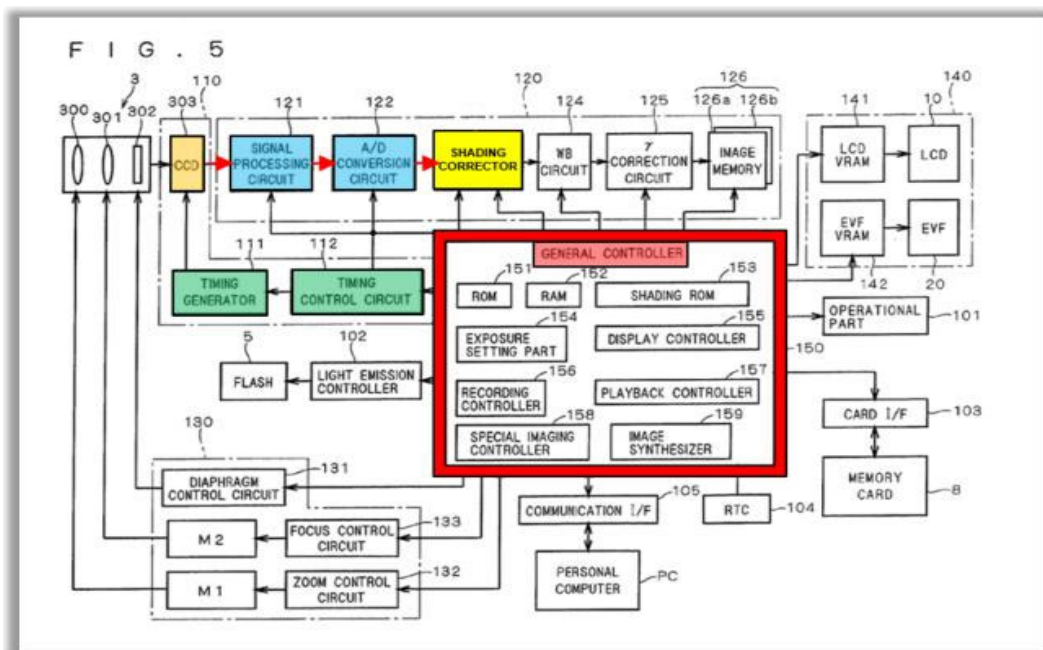
Specifically, CCD 303 outputs the image signal to signal processing circuit 121, which executes analogue signal processing, mainly configured by a CDS (correlation double sampling) circuit and an AGC (auto gain control) circuit, and serves to reduce the sampling noise and adjust the signal level for the image signal outputted from the CCD 303. Ex-1005, [0080], [0107], [0110]. Signal processing circuit 121 then outputs the image signal to the A/D conversion circuit 122, which converts the analogue image signal outputted from the signal processing circuit 121 to a digital image signal and sends it to the shading corrector. *Id.*, [0081], [0107],

[0110]. Thus, the ASIC processes and converts the data for the shading corrector to filter and correct the shading aberration. Ex-1003, ¶127.

Shading corrector uses the inverse correction coefficients sent from general controller 150 and shading ROM 153 to correct shading based on the optical condition. Ex-1005, [0082]-[0085], [0108]. The processor of the shading corrector applies the multiplication function to multiply the received image data by the inverse correction coefficients to correct the shading aberration. *Id.*, Abstract, [0082]-[0083], [0107]-[0110], Fig. 6, Claim 5. A POSA would have understood that multiplying the image data by the inverse correction coefficients to correct vignetting is digital filtration. Ex-1003, ¶128. The remaining components of the ASIC (WB circuit 124 and γ correction circuit 125) further digitally filter the image data using a level conversion table inputted from the general controller and a γ correction table. Ex-1005, [0086]; Ex-1003, ¶128. Niikawa discloses or renders obvious wherein the aberrations from the optical lens mechanism (shading aberrations) are corrected by applying digital filtration (multiplying the digital image data by correction coefficients) by using the application specific integrated circuit (signal processing circuit 121, A/D conversion circuit 122, WB circuit 124, and γ correction circuit 125) and the digital signal processor (shading corrector). *Id.*, ¶129.

[9C] wherein the microprocessor is used to provide digital and optical data to the digital signal processor;

Niikawa discloses that the data captured by CCD 303 (orange) is forwarded to signal processor 120 using a readout control signal inputted from the timing generator 111 (green) controlled by general controller 150 (red). Ex-1005, [0077]-[0079], [0096], [0107]-[0108]. The data includes optical data representing the optical conditions or shading aberrations associated with the focal length and f-number at the time of exposure. Ex-1005, [0056]-[0058], [0084], [0108]; Ex-1001, 3:45-53, 9:60-63 (describing “optical vignetting” or shading); Ex-1003, ¶130. Using signals controlled by general controller 150, signal processor circuit 121 and A/D conversion circuit 122 (blue) process and convert the analog data into digital data and forward that data to the shading corrector (yellow), as depicted by the red arrows below. Ex-1005, [0080]-[0081], [0107], [0110]; Ex-1003, ¶130.

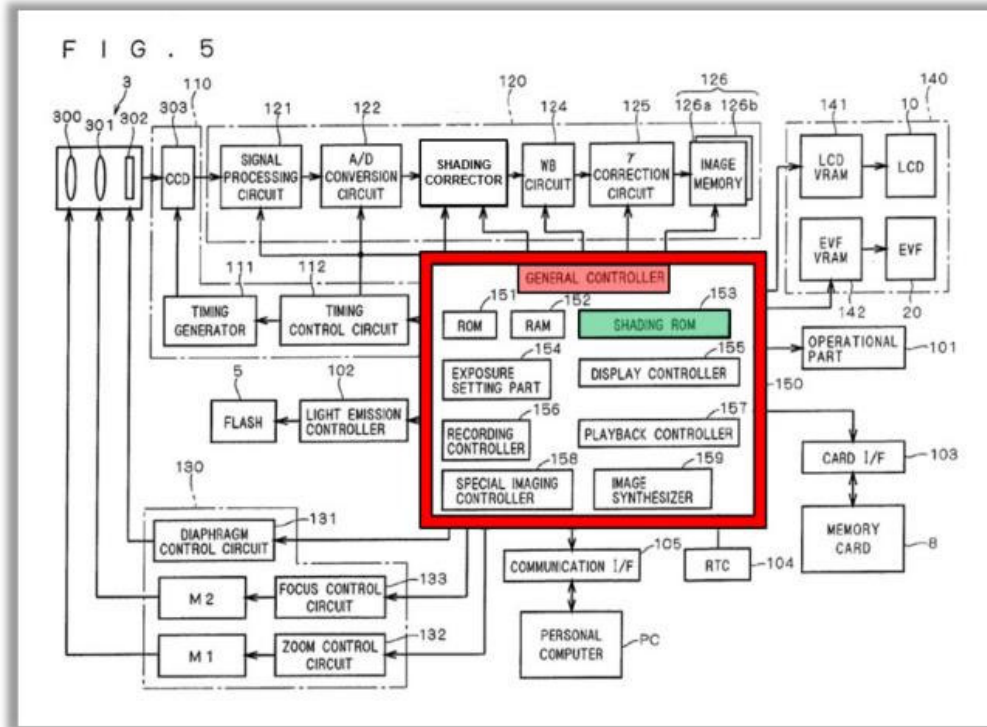


Ex-1005, Fig. 5 (with shading corrector processor).

Niikawa discloses wherein the microprocessor (general controller 150) is used to provide digital (converted image data) and optical data (data representing optical conditions and aberrations) to the digital signal processor (shading corrector). Ex-1003, ¶131.

[9D] wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;

Niikawa discloses that general controller 150 (red) uses programs stored in ROM 151 to identify one of a plurality of correction tables from shading ROM 153, the database (green), according to optical conditions, such as focal length and f-number at the time of imaging. Ex-1005, [0082]-[0085], [0096], [0101], [0108], Figs. 5, 7, 8. The correction tables in shading ROM 153 include the inverse of correction coefficients that correspond to specific optical aberrations and are used to correct those aberrations. *Id.*, [0082]-[0085]; Ex-1003, ¶132.



Ex-1005, Fig. 5 (with shading corrector processor).

The lens optical conditions signify the aberrations in the lens. Specifically, a lens having an adjustable aperture value would have different shading characteristics, e.g., different vignetting, at each aperture value. The focal length of the lens affects vignetting too. Ex-1003, ¶133. The '805 Patent teaches that aberrations change at different focal lengths. Ex-1001, 26:19-21. To the extent “optical aberrations” requires multiple aberrations, the aberrations at each aperture value (or aperture and focal length pair) are multiple aberrations. Thus, by identifying the optical conditions at the time of imaging, general controller 150 identifies the specific optical aberration to correct in the database. Ex-1003, ¶133.

To the extent not expressly disclosed, a POSA would have been motivated to modify the programs stored in general controller 150 to identify both specific shading aberrations and other types of aberrations. Enomoto discloses storing information about the lens characteristics in a storing section, and that information may be either correction functions/equations and/or coefficients for correcting aberrations such as lateral chromatic aberration and distortion. Ex-1006, 14:4-49. Processor 14 in Enomoto includes a CPU used to identify that information from the storing section and send it to an aberration correcting part 56 for correcting those aberrations by digital image processing. *Id.*, Abstract, 11:60-12:9, 12:33-40, 13:6-18, 14:4-24, Fig. 2; Ex-1003, ¶134.

A POSA would have been motivated to use the programs stored in general controller 150 (like the CPU of processor 14) to identify both shading and other types of aberrations in shading ROM 153 (like in lens characteristics data supply subsection 60) to improve image quality. Ex-1003, ¶135. Niikawa states that the purpose of its invention is to improve image quality and graphic effect. Ex-1005, [0003]. Enomoto likewise teaches consistently outputting high quality images free from color-mismatch, distortion, uneven brightness, and blurring. Ex-1006, Abstract, 3:62-4:4, 13:13-21. A POSA would have been motivated to modify the programs stored in general controller 150 to identify multiple types of aberrations

because each aberration identified and corrected would further improve the image quality. Ex-1003, ¶135.

A POSA would have been motivated to modify the programs stored in general controller 150 to identify both shading and other types of aberrations because it would have used a known technique (identifying multiple types of aberrations) to improve similar devices (general controller 150 and the CPU of processor 14) in the same way (correcting multiple aberrations). *Id.*, ¶136.

A reasonable expectation of success existed as Enomoto discloses that processor 14 identifies multiple aberrations, which the general controller 150 similarly does for shading aberrations, so the modification to identify different types of aberrations using general controller 150 would have been straightforward and within the skill of a POSA. *Id.*, ¶137.

Niikawa discloses and Niikawa in view of Enomoto render obvious wherein the system software (programs stored in ROM 151) is organized to identify specific optical aberrations (shading aberrations for specific focal lengths and f-numbers/or other types of aberrations) and to access the database (the correction tables stored in ROM 153) to identify specific corrections to the aberrations (correction coefficients). *Id.*, ¶138.

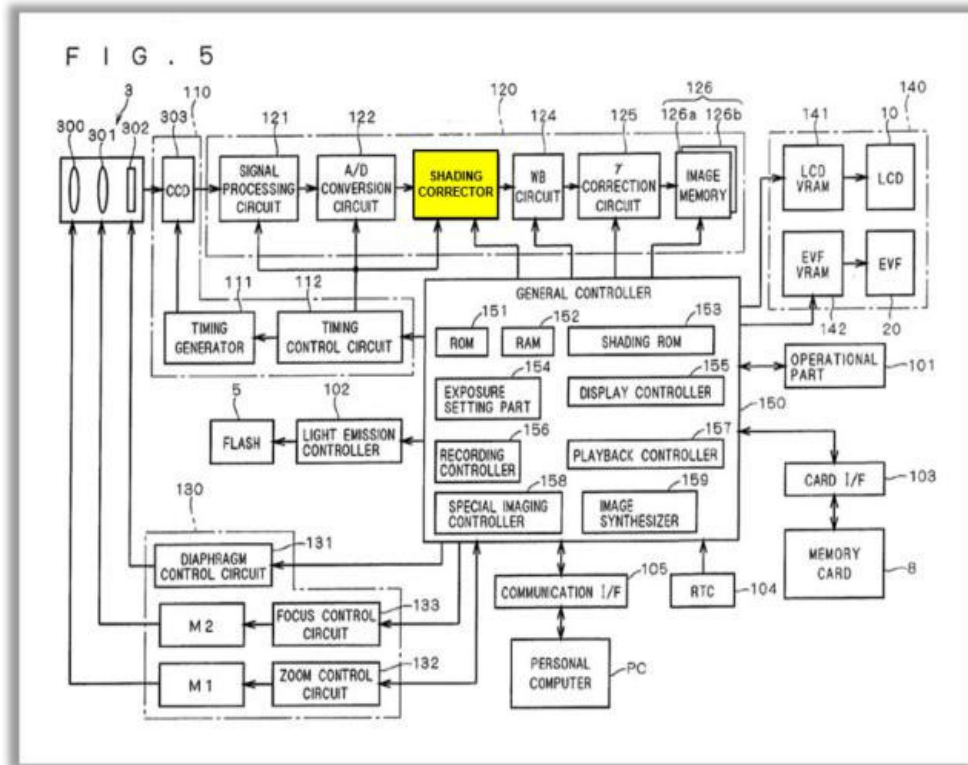
[9E] wherein the system software forwards the data from the digital sensor to the digital processor;

Niikawa discloses this limitation as explained in [9C]. Specifically, the programs stored in ROM 151 of general controller 150 control drivings of CCD 303, signal processor circuit 121, and A/D conversion circuit 122 using the timing generator 111 and timing control circuit 112 to forward the data from CCD 303 to the shading corrector. Ex-1005, [0077]-[0081], [0096], [0107]-[0108], [0110], Fig. 5; Ex-1003, ¶139.

Niikawa discloses wherein the system software (programs stored in ROM 151) forwards the data (converted image data and data representing optical conditions and aberrations) from the digital sensor (CCD 303) to the digital processor (shading corrector). Ex-1003, ¶140.

[9F] wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;

Niikawa discloses shading corrector (yellow) uses the correction coefficients sent from general controller 150 to correct shading based on the optical condition. Ex-1005, [0082]-[0085], [0108], Claims 1, 2, 4, 5. The processor of shading corrector selects the multiplication function (the specific procedure) to multiply the received image data by the correction coefficients to optimize the image and correct the shading aberration. Ex-1005, Abstract, [0082]-[0083], [0107]-[0110], Fig. 6, Claim 5; Ex-1003, ¶141.



Ex-1005, Fig. 5 (with shading corrector processor).

To the extent not expressly disclosed, a POSA would have been motivated to modify the shading corrector to select a specific procedure to correct different types of aberrations in view of Enomoto. As explained in [9D], a POSA would have been motivated to implement the programs stored in general controller 150 to identify different types of aberrations. Enomoto further teaches that the aberration correcting part 56 “select[s] from among” multiple types of aberrations, such as lateral chromatic aberration and distortion, and corrects them by image processing using the lens characteristics. Ex-1006, 13:6-18, 19:25-35. The lens characteristics include the correction functions and/or the coefficients for the correction. *Id.*, 14:25-49. Similarly, a POSA would have been motivated to modify the processor of the

shading corrector to select different correction procedures to correct different types of aberrations. Ex-1003, ¶142.

A POSA further would have been motivated to modify the shading corrector to select from multiple correction procedures depending on the aberration because it would have used a known technique (selecting from multiple aberration correction procedures) to improve similar devices (shading corrector and aberration correcting part 56) in the same way (correcting multiple aberrations). *Id.*, ¶143.

A reasonable expectation of success existed as Enomoto discloses that aberration correcting part 56 selects aberration correction procedures, which shading corrector similarly does for shading aberrations, so the modification to select between multiple aberration correction procedures using the shading corrector would have been straightforward and within the skill of a POSA. *Id.*, ¶144.

Niikawa discloses and Niikawa in view of Enomoto render obvious wherein the digital signal processor (shading corrector) selects a specific procedure (multiplication using correction coefficients/or other aberration correction procedures) to optimize the image and corrects the aberrations (shading aberrations for specific focal lengths and f-numbers/or other types of aberrations). *Id.*, ¶145.

Niikawa disclose wherein the lens type (imaging lens 3 including zoom lens 300) is a zoom lens. Ex-1003, ¶147.

[9H] wherein the lens focal length alternates from specific fixed focal length lens settings in a succession of steps;

Niikawa discloses changing the focal length of zoom lens 300. Ex-1005, [0066], [0067], [0072], [0076], [0089]-[0090], Figs. 3, 5. Camera main body 2 has a zoom motor M1 for changing the zoom ratio of the zoom lens 300, which is controlled by the lens controller 130 function in general controller 150. *Id.* As the lens has different focal lengths positions, shading ROM 153 stores correction tables for different optical conditions, including different focal length positions. *Id.*, [0084]; Ex-1003, ¶148.

Changing the focal length on the zoom lens alternates the settings for the specific focal length in a succession of steps. Ex-1018, 6:22-40 (disclosing that for zoom lenses, “each of the lens characteristics at switchable focal lengths may be held (stored)”); Ex-1001, 25:57-61. (“In the case of zooms, however, where the focal-length is not fixed, the adjustments must correlate to the changes in the focal length. In effect, this condition presents a continuous resampling process”); Ex-1019, ¶34 (OIT asserting that cameras meet this limitation because they “necessarily correct[] and modif[y] aberrations at different focal lengths based on the focal length chosen when using the zoom lens”); Ex-1003, ¶149.

Niikawa discloses wherein the lens focal length alternates from specific fixed focal length lens settings in a succession of steps. *Id.*, ¶150.

[9I] wherein optical aberrations are corrected with digital filtration to modify multiple images from different focal lengths in a succession of data files; and

Niikawa discloses this limitation as explained in [9B] and [9H]. Additionally, Niikawa describes capturing, correcting, and storing multiple images in sequential files. Ex-1005, [0067], [0079], [0084] (describing a “plurality of correction tables for different parameters which are the optical conditions such as focal length and f-number at the time of imaging”), [0089]-[0090], [0101] (disclosing storing the image files sequentially), [0102], [0106]-[0111] (correcting aberrations of captured images based on characteristics such as focal length), Fig. 8 (showing sequential data files, each recording focal length); Ex-1003, ¶151.

Niikawa discloses wherein optical aberrations (shading aberrations for specific focal lengths and f-numbers/or other types of aberrations) are corrected with digital filtration (multiplying the digital image data by correction coefficients) to modify multiple images from different focal lengths in a succession of data files. *Id.*, ¶152.

[9J] wherein the modified data file consisting of the digital data optimized from the aberrations that are corrected from the original optical image is stored in memory.

Niikawa discloses this limitation as explained in [9A-9]. Ex-1003, ¶153.

Niikawa discloses wherein the modified data file consisting of the digital data optimized from the aberrations (shading aberrations for specific focal lengths and f-numbers/or other types of aberrations) that are corrected from the original optical image (image data from CCD 303) is stored in memory (image memory 126 and/or memory card 8). *Id.*, ¶154.

Accordingly, claim 9 would have been obvious over (a) Niikawa and (b) Niikawa in view of Enomoto. *Id.*, ¶155.

2. Independent Claim 24

[24pre] A method of image filtration comprising:

Niikawa discloses [24pre] as explained in [9pre]. Specifically, Niikawa discloses a method of shading correction by digital filtration. Ex-1005, Abstract, [0012], [0056], [0079], [0082]; Ex-1003, ¶156.

[24A-1]-[24A-9] a digital camera mechanism, an optical lens mechanism, a digital sensor, a microprocessor, a digital signal processor, an application specific integrated circuit, system software, a database management system and a memory storage sub-system;

See [9A-1]-[9A-9]. Ex-1003, ¶157.

[24B] wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and digital signal processor;

See [9B]. Ex-1003, ¶158.

[24C] the method consisting of; alternating the lens focal length of a zoom lens from specific fixed focal length lens settings in a succession of steps;

See [9G] and [9H]. Ex-1003, ¶159.

[24D] creating data files corresponding to each focal length lens setting;

Niikawa discloses creating image data files from image data collected from CCD 303. Ex-1005, [0067], [0076]-[0077], [0079], [0081], [0100]. Image files are sequentially stored in the order of being captured. *Id.*, [0101]. When they are stored, the files contain information such as the focal length at capture, indicating that the files created correspond to each focal length setting. *Id.*, [0101], Fig. 8; Ex-1003, ¶160.

Niikawa discloses creating data files corresponding to each focal length lens setting. *Id.*, ¶161.

[24E] forwarding the data from a digital sensor to the digital signal processor;

See [9E]. Ex-1003, ¶162.

[24F] providing digital and optical data to a digital signal processor;

See [9C]. Ex-1003, ¶163.

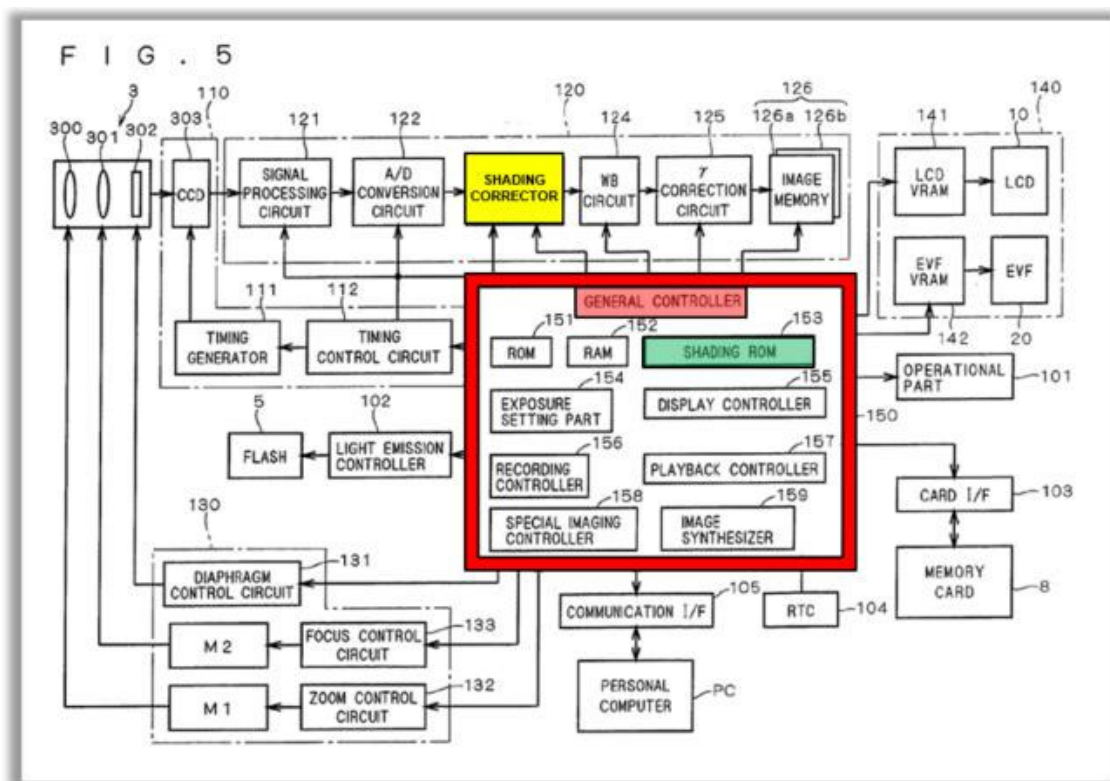
[24G] identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations;

See [9D]. Ex-1003, ¶164.

[24H] selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations;

Niikawa discloses that general controller 150 (red) identifies inverse correction coefficients in a correction table from shading ROM 153 (green) according to optical conditions, such as lens type, focal length and f-number at the time of imaging. Ex-1005, [0082]-[0085], [0096], [0101], [0108], Figs. 5, 7, 8.

General controller 150 sends those correction coefficients to the shading corrector (yellow) to correct shading based on the optical condition. *Id.*, [0082]-[0085], [0108]. The shading corrector may be implemented with a processor for performing an operational process, such as multiplication, on image data using said coefficients. *Id.*, Abstract, [0082]-[0083], [0108], Claim 5. By identifying the coefficients to send to, and be used as part of, the shading corrector, general controller 150 also identifies the operational process (e.g., the multiplication function) for the shading corrector to perform. Ex-1003, ¶165.



Ex-1005, Fig. 5 (with shading corrector processor).

A POSA would have been motivated to modify the programs stored in general controller 150 to identify the correction algorithms in the database for each type of

aberration. As explained in [9D], a POSA would have been motivated to modify the programs stored in general controller 150 to identify multiple types of aberrations in view of Enomoto. Enomoto also discloses that the CPU identifies correction functions/equations in the storing section and sends them to aberration correcting part 56 to apply. Ex-1006, Abstract, 11:60-12:9, 12:33-40, 13:6-18, 14:4-49, Fig. 2. Because the general controller 150 identifies different types of aberrations, a POSA would have been motivated to modify general controller 150 (like the CPU of processor 14) to identify corresponding correction algorithms in shading ROM 153 (like in the storing section) and send it to the processor of the shading corrector (like aberration correcting part 56) as well. Ex-1003, ¶166.

A POSA would have been motivated to store the algorithms in shading ROM 153 so that the user could update them after purchasing the camera. Ex-1005, [0096] (disclosing that additional program data can be read out and installed in ROM 151 of general controller 150); Ex-1020, 4:63-5:1, 5:31-40, 6:27-32, 7:51-57 (disclosing that control processor 20 can add software updates to a digital camera after its initial purchase and store them in an algorithm memory 28 for use by DSP 22, including modifying and updating aberration correction algorithms); Ex-1021, [005]-[008], [012]-[018], Figs. 2, 3, Claim 1 (disclosing an in-camera control unit to derive aberration correction functions using characteristics of the input device, like “distance between the calibration graphic 26 and the lens 11” and “brightness,” then

store the functions in memory to later use to correct aberrations), [038] (disclosing that the calibration program used to derive correction functions can be recalibrated by a specialty store or manufacturer after manufacturing the camera); Ex-1003, ¶167.

A POSA would have been further motivated to modify the programs stored in general controller 150 because it would have used a known technique (selecting procedures in a database) to improve a similar device (general controller 150 and the CPU of processor 14) in the same way (correcting different types of aberrations). *Id.*, ¶168.

A POSA would have had a reasonable expectation of success of implementing this combination because selecting and sending the procedure by accessing shading ROM 153 would work the same way as identifying and sending the coefficients by accessing shading ROM 153. *Id.*, ¶169.

Niikawa discloses and Niikawa in view of Enomoto render obvious selecting a specific procedure (multiplication using correction coefficients/or other aberration correction procedures) from the database (the correction tables in ROM 153) using the microprocessor (general controller 150) to optimize the image and correct the aberrations (shading aberrations for a specific focal length and f-number/or other types of aberrations). *Id.*, ¶170.

[24I] applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations;

See [9B]. Ex-1003, ¶171.

[24J] correcting optical aberrations with digital filtration to modify multiple images from different focal lengths in a succession of data files; and

See [9I]. Ex-1003, ¶172.

[24K] storing the modified data files in memory.

See [9A-9], [9J]. Ex-1003, ¶173.

Accordingly, claim 24 would have been obvious over (a) Niikawa and (b) Niikawa in view of Enomoto. *Id.*, ¶174.

B. Grounds 2(a) and 2(b)

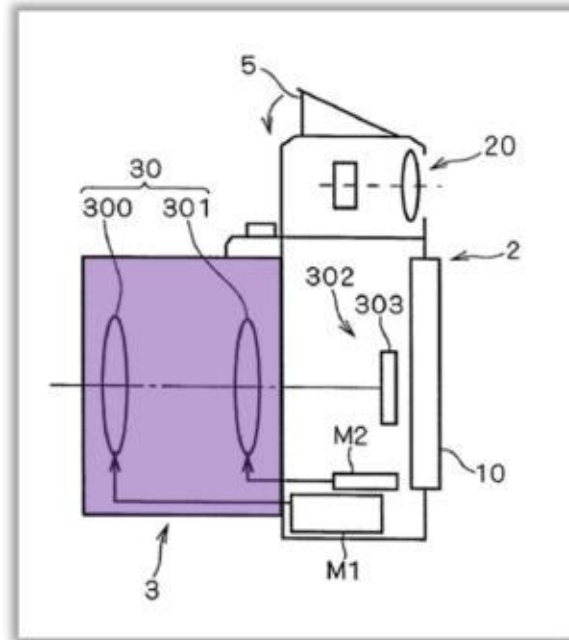
1. Independent Claim 1

[1pre]-[1A-9] A digital imaging system for image filtration comprising: a digital camera mechanism, an optical lens mechanism, a digital sensor, a microprocessor, a digital signal processor, an application specific integrated circuit, system software, a database management system and a memory storage sub-system;

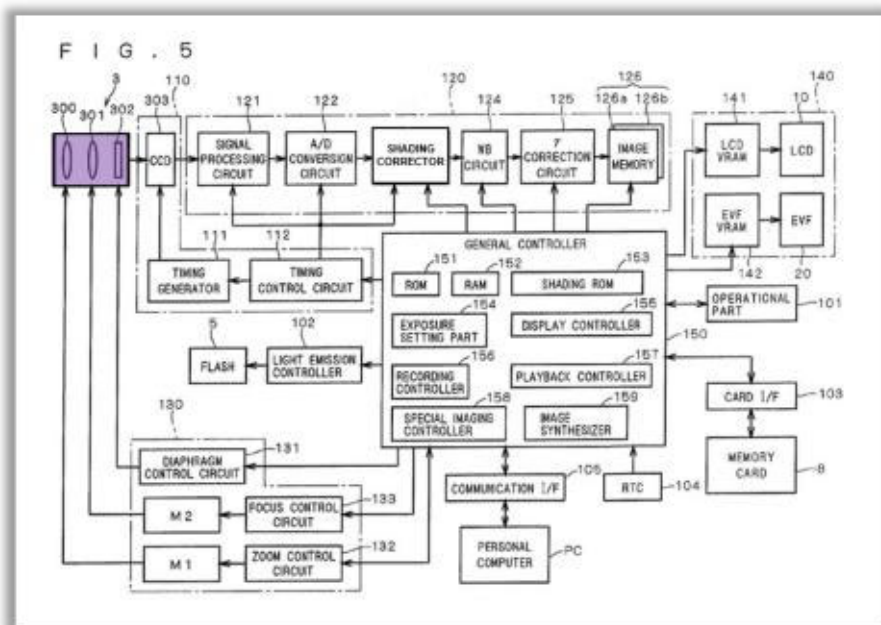
See [9pre]-[9A-9]. Ex-1003, ¶176.

[1B] wherein the optical lens mechanism is a fixed focal length;

Niikawa discloses that digital camera 1 has an imaging lens 3 (purple), including zoom lens 300 and focus lens 301. Ex-1005, [0066], [0067], [0076], [0089], Figs. 3, 5; Ex-1003, ¶177.



Ex-1005, Fig. 3.



Ex-1005, Fig. 5 (with shading corrector processor).

Niikawa discloses that the user can adjust zoom lens 300 to different fixed focal lengths. Ex-1005, [0058] (describing settings for different focal lengths), [0067], [0072], [0083]-[0084], [0089]-[0090], [0108]; *see also* Ex-1001, 26:29-30

(“This is as if each zoom lens contains a combination of multiple lenses of specific focal lengths.”), claim 9 (“wherein the [zoom] lens focal length alternates from specific fixed focal length lens settings in a succession of steps”); Ex-1003, ¶178.

To the extent not expressly disclosed, a POSA would have been motivated to replace imaging lens 3 of Niikawa with a fixed focal length lens. Niikawa discloses that imaging lens 3 is detachable. Ex-1005, [0066]. It was well known to use either a fixed focal length lens or a zoom lens with a camera, including with a camera having detachable lenses, depending on the situation. Ex-1003, ¶179. Correcting aberrations in fixed focal length lenses was also well known. Ex-1023, 3:66-5 (disclosing correcting aberrations in fixed focal length lenses); Ex-1024, 40:9-24, 40:44-47 (same); Ex-1003, ¶190. Niikawa also discloses identifying correction tables to correct shading aberrations in the captured image data using optical conditions such as focal length and f-number at the time of imaging. Ex-1005, [0084], [0101], [0108], Figs. 7, 8. The correction tables for zoom and fixed focal length lenses would be the same, except zoom lenses require additional correction tables to account for each focal length. Ex-1024, 40:44-47 (“If the camera used to take the image is a fixed focal length type which has no zooming capability, the focal length may be acquired from the information for identifying the lens type (or the camera model)”); Ex-1018, 6:22-40 (explaining that correcting aberrations for zoom

lenses requires storing corrections “based on the lens characteristics corresponding to each focal length”); Ex-1003, ¶¶179-80.

During prosecution of the related ’339 Patent, PO stated, “[o]ne must conceive of the problem of optical aberrations of a zoom lens as a set of different types of fixed focal length lenses.” Ex-1015, 121. Moreover, during prosecution, PO stated that “[s]ince the invention that includes the main allowed claims focuses on the filtration of images and image components, the distinction between fixed focal length lenses and zoom lenses are less relevant than the primary issue of filtration. Ex-1002, 161. PO explained that “[f]ixed and zoom lenses are merely different animals of the species and share numerous components as disclosed in the original disclosure[.]” *Id.* The ’805 Patent likewise admits that the different aberrations between zoom and fixed focal length lenses were known. Ex-1001, 4:25-38; Ex-1003, ¶181.

A POSA would have been further motivated to replace detachable lens 3 with a fixed focal length lens because it would have been a simple substitution of one known element (lens 3) for another (a fixed focal length lens) to obtain predictable results (correcting aberrations based on focal length). Ex-1003, ¶182.

A POSA would have had a reasonable expectation of success of implementing this combination because digital cameras with fixed focal length lenses were commercially available, Niikawa’s aberration correction solution would apply

similarly to both zoom and fixed lenses, and Niikawa teaches detachable lenses allowing for different lenses. *Id.*, ¶183.

Niikawa discloses and renders obvious wherein the optical lens mechanism (imaging lens 3) is a fixed focal length lens. *Id.*, ¶184.

[1C] wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor;

See [9B]. Ex-1003, ¶185.

[1D] wherein the microprocessor is used to provide digital and optical data to the digital signal processor;

See [9C]. Ex-1003, ¶186.

[1E] wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;

See [9D]. Ex-1003, ¶187.

[1F] wherein the system software forwards the data from the digital sensor to the digital processor;

See [9E]. Ex-1003, ¶188.

[1G] wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;

See [9F]. Ex-1003, ¶189.

[1H] wherein the data are forwarded from the digital sensor to the digital signal processor by an application specific integrated circuit;

Niikawa discloses this limitation as explained in [9C]. Specifically, signal processor circuit 121 and A/D conversion circuit 122 forward the data from CCD

303 to the shading corrector. Ex-1005, [0077]-[0081], [0096], [0107]-[0108], [0110], Fig. 5. As explained in [1A-6], a POSA would have known that these circuits either were an ASIC or would have been obvious to replace with an ASIC. Ex-1003, ¶190.

Niikawa discloses and renders obvious wherein the data are forwarded from the digital sensor (CCD 303) to the digital signal processor (shading corrector) by an application specific integrated circuit (signal processing circuit 121, A/D conversion circuit 122, WB circuit 124, and γ correction circuit 125). *Id.*, ¶191.

[1I] wherein the digital signal processor applies a fast Fourier transform to a data file in order to satisfy a user specified special effects function;

The '805 Patent discloses using a soft effect as a special effect for portraiture, which blurs the background around an in-focus subject. Ex-1001, 13:7-10, 13:37-48, 14:39-43, 15:8-24, 32:17-67 (describing using soft effect or blurring and depth of field for portraiture). The '805 Patent further discloses that a fast Fourier transform (FFT) is an example of a digital filtration process that can be used to sharpen or soften an image. *Id.*, 31:11-19; Ex-1003, ¶192.

During prosecution of the related '339 Patent, the Examiner took official notice that “it is old and well known in the art to have a system wherein the digital signal processor applies at least one FFT algorithm to correct the at least one optical aberration.” Ex-1015, 136, 143. PO acknowledged that it did not invent the FFT; rather, “the present invention uses the FFT as one class of algorithm to apply to

specific optical or digital aberrations in image files in order to provide solutions. There is no reason not to include a powerful class of algorithm to the toolbox in order to solve the aberrations.” *Id.*, 123; *see also* Ex-1025, ¶¶17-18 (disclosing correcting the chromatic aberration by digital signal processing using an FFT); Ex-1027, 1:7-11, 1:31-49, 3:1-12, 6:3-20, 9:36-67 (disclosing correcting channel dependent color aberrations, such as chromatic aberrations that result in a color blurring effect, using an FFT and filter that convolves the image data with weighted coefficients); Ex-1003, ¶193.

Niikawa discloses a user-specified special effects function: desirably blurring an image. Niikawa discloses a process for “gradation control.” Ex-1005, [0061]. Niikawa teaches that a phenomenon sometimes occurs that light portions in the subject image are too white, while dark portions in the subject image are too black due to the narrow dynamic range of CCD 303. *Id.* To substantially widen that range, the gradation control process involves capturing two images of different exposures for the same subject in different timings and synthesizing them. *Id.*, [0061], [0103]-[0122] (describing the full gradation control process), Fig. 9. The user can choose whether to select this mode from the digital camera. *Id.*, [0074]. As an alternative to the gradation process, Niikawa further teaches that a first image focused at the main subject and a second image focused at the background of the main subject can be

synthesized to obtain a desirably blurred synthesized image. *Id.*, [0237]; Ex-1003, ¶194.

Likewise, Levien discloses a sharpening transfer function 20 that uses an FFT to determine filtration coefficients and information to control the amount of blur and sharpening in an image. Ex-1007, Abstract, 1:7-9, 1:54-55, 2:7-29, 3:5-10, 3:36-4:60, Figs. 2-3, 7-8; Ex-1003, ¶195.

A POSA would have been motivated to modify the processor of the shading corrector to apply transfer function 20, including the FFT, to accurately blur the image focused at the background of the main subject to obtain the desirably blurred synthesized image. Ex-1005, [0237]; Ex-1003, ¶196. Ichiyama teaches that the FFT “requires a control unit with high computing power since it is likely to require a lot of calculation processing and thus to take time, but has an advantage in enabling correction of reduced resolution by high-frequency band correction, etc.” Ex-1020, [007]. PO confirmed that “[t]here is no reason not to include [such] a powerful class of algorithm to the toolbox in order to solve the aberrations.” Ex-1023, 152; Ex-1003, ¶196.

A POSA would have been further motivated to include the FFT algorithm in the shading corrector to perform the user-specified special effects function because it would have used a known technique (FFT algorithm) to improve similar devices

(shading corrector and sharpening transfer function 20) in the same way (to control blurring). Ex-1003, ¶197.

A reasonable expectation of success existed as Levien discloses using the FFT to obtain a desirably blurred image, which Niikawa similarly achieves, so the modification to use FFT in Niikawa would have been straightforward and within the skill of a POSA. *Id.*, ¶198. A reasonable expectation of success of implementing the FFT in shading corrector also existed because processors with the speed capable of implementing the FFT were known. See Ex-1020, [007], [036]; Ex-1003, ¶198.

Niikawa in view of Levien render obvious wherein the digital signal processor (shading corrector) applies a fast Fourier transform to a data file in order to satisfy a user specified special effects function (a desirable blurring function). Ex-1003, ¶199.

[1J] wherein the digital signal processor modifies the data file by applying the special effects function; and

Niikawa in view of Levien render obvious this limitation as explained in [1I]. Ex-1003, ¶200.

Niikawa in view of Levien render obvious wherein the digital signal processor (shading corrector) modifies the data file by applying the special effects function (a desirable blurring function). *Id.*, ¶201.

[1K] wherein the modified data file consisting of the digital data optimized from the aberrations that are corrected from the original optical image is stored in memory.

See [9A-9], [9J]. Ex-1003, ¶202.

Accordingly, claim 1 would have been obvious over (a) Niikawa in view of Levien and (b) Niikawa in view of Enomoto and Levien. *Id.*, ¶203.

2. Claim 2

[2] The system of claim 1: wherein the special effects function is a color enhancing function.

Niikawa in view of Levien render obvious applying a FFT to satisfy a user specified special effects function, specifically a desirable blurring function, as explained in [11]. Specifically, shading corrector would blur the background and sharpen the main subject. Ex-1003, ¶204. Using a similar technique, a POSA would have been motivated to incorporate an FFT in the shading corrector to enhance color by sharpening the color in an image in view of Levien. During prosecution of the '339 Patent, the Examiner took official notice that "it is old and well known in the art to have a system wherein the digital signal processor applies color filtration to the image file." Ex-1015, 143. Likewise, the applicant acknowledged that "[a] DSP may be used to process these digital filter components in order to eliminate digital or color artifacts related to specific image sensor pixels." *Id.*, 121. Levien teaches that "[f]or color photographs, individual color planes may be individually adaptively sharpened, or alternatively, a single composite luminance plane for the color image may be adaptively sharpened." Ex-1007, 4:61-64. Shading corrector would apply the sharpening transfer function 20 of Levien to sharpen individual color planes of the image focused at the main subject to obtain the desirably blurred synthesized

image. Ex-1005, [0237]. Sharpening those color planes would enhance the color. Ex-1003, ¶204.

A POSA would have been further motivated to include a color enhancing function because it would have used a known technique (color image sharpening) to improve similar devices (shading corrector and sharpening transfer function 20) in the same way (to enhance color). *Id.*, ¶205.

A reasonable expectation of success existed as Levien discloses using the FFT to obtain a desirably blurred image, which Niikawa similarly achieves, so the modification to use FFT in Niikawa would have been straightforward and within the skill of a POSA. *Id.*, ¶206. A reasonable expectation of success also existed as both the Examiner and PO acknowledged that using DSPs to enhance color is well known. Ex-1015, 121, 143; Ex-1003, ¶206.

Niikawa in view of Levien disclose wherein the special effects function is a color enhancing function. Ex-1003, ¶207.

Accordingly, claim 2 would have been obvious over (a) Niikawa in view of Levien and (b) Niikawa in view of Enomoto and Levien. *Id.*, ¶208.

3. Claim 3

[3] The system of claim 1: wherein the special effects function is a diffusion function of soft effect.

Niikawa in view of Levien render obvious this limitation as explained in [11]. Specifically, a diffusion function of soft effect creates a blurring effect in an image.

Ex-1003, ¶209. The '805 Patent refers to the “soft effect” as “defocus control,” which focuses on the “main subject” while producing a “pleasing bokeh” effect in “the background that is out of focus” “in which the gradations of tone are evenly smooth.” Ex-1001, 15:8-24. Niikawa discloses focusing on a main subject and blurring the background to create the desired blurring effect. Ex-1005, [0237]. And Levien discloses individually controlling blur in sub-areas of an image. Ex-1007, 1:55-67, 2:16-29, 3:18-28, 3:58-61, 4:12-15; Ex-1003, ¶209.

Niikawa in view of Levien render obvious wherein the special effects function is a diffusion function of soft effect. Ex-1003, ¶210.

Accordingly, claim 3 would have been obvious over (a) Niikawa in view of Levien and (b) Niikawa in view of Enomoto and Levien. *Id.*, ¶211.

4. Independent Claim 18

[18pre] A method of image filtration which comprises:

See [9pre] and [24pre]. Ex-1003, ¶212.

[18A-1] - [18A-9] a digital camera mechanism, an optical lens mechanism, a digital sensor, a microprocessor, a digital signal processor, an application specific integrated circuit, system software, a database management system and a memory storage sub-system;

See [9A-1]-[9A-9]. Ex-1003, ¶212.

[18B] wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor,

See [9B]. Ex-1003, ¶213.

[18C] the method consisting of; forwarding the data from a digital sensor to a digital signal processor by an application specific integrated circuit;

See [1H], [9C], [9E]. Ex-1003, ¶214.

[18D] providing digital and optical data to the digital signal processor;

See [9C]. Ex-1003, ¶215.

[18E] identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations:

See [9D]. Ex-1003, ¶216.

[18F] selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations:

See [24H]. Ex-1003, ¶217.

[18G] applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations:

See [9B]. Ex-1003, ¶218.

[18H] applying a fast Fourier transform to a data file in order to satisfy a user specified special effects function;

See [1I]. Ex-1003, ¶219.

[18I] modifying the data file by applying the special effects function using the digital signal processor; and

See [1I]. Ex-1003, ¶220.

[18J] storing the data file in memory.

See [9A-9], [9J]. Ex-1003, ¶221.

Accordingly, claim 18 would have been obvious over (a) Niikawa in view of Levien and (b) Niikawa in view of Enomoto and Levien. *Id.*, ¶222.

5. Claim 19

[19] The method of claim 18 further comprising the step of: applying the special effects function as a color enhancing function.

See [1I], [2]. Ex-1003, ¶223.

Accordingly, claim 19 would have been obvious over (a) Niikawa in view of Levien and (b) Niikawa in view of Enomoto and Levien. *Id.*, ¶224.

6. Claim 20

[20] The method of claim 18 further comprising the step of: applying the special effects function as a diffusion function of soft effect.

See [1I], [3]. Ex-1003, ¶225.

Accordingly, claim 20 would have been obvious over (a) Niikawa in view of Levien and (b) Niikawa in view of Enomoto and Levien. *Id.*, ¶226.

C. Ground 3

1. Independent Claim 4

[4pre]-[4A-9] A digital imaging system for image filtration comprising: a digital camera mechanism, an optical lens mechanism, a digital sensor, a microprocessor, a digital signal processor, an application specific integrated circuit, system software, a database management system and a memory storage sub-system;

See [9pre]-[9A-9]. Ex-1003, ¶228.

[4B] wherein the optical lens mechanism is a fixed focal length;

See [1B]. Ex-1003, ¶229.

[4C] wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor;

See [9B]. Ex-1003, ¶230.

[4D] wherein the microprocessor is used to provide digital and optical data to the digital signal processor;

See [9C]. Ex-1003, ¶231.

[4E] wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;

See [9D]. Ex-1003, ¶232.

[4F] wherein the system software forwards the data from the digital sensor to the digital processor;

See [9E]. Ex-1003, ¶233.

[4G] wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;

See [9F]. Ex-1003, ¶234.

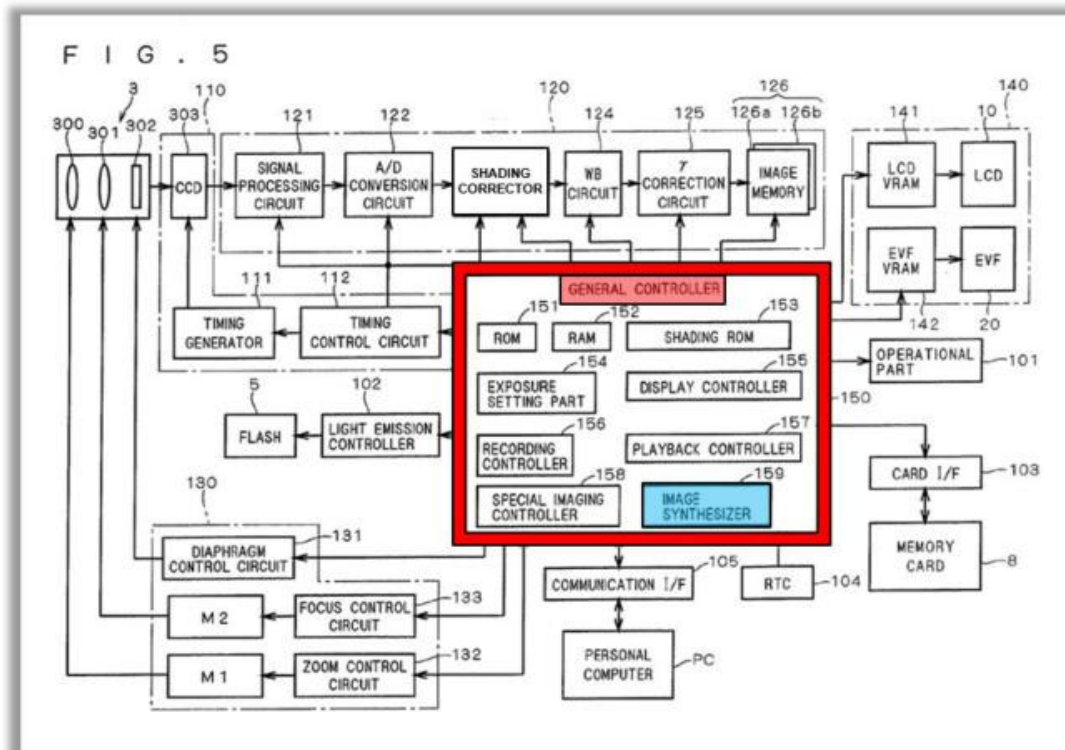
[4H] wherein the data are forwarded from the digital sensor to the digital signal processor;

See [9C], [9E]. Ex-1003, ¶235.

[4I] wherein a data file is analyzed by the microprocessor to separate specific objects in the image using the differentiation of the depth-of-field;

Niikawa discloses a process for “gradation control.” Ex-1005, [0061], [0074], [0103]-[0122], Fig. 9. This process is performed in the image synthesizer 159 (blue) in general controller 150 (red). *Id.*, [0097], [0100], [0104], [0111], [0118], Fig. 5. As an alternative to the gradation process, Niikawa further teaches that image synthesizer 159 of general controller 150 synthesizes a first image focused at the main subject and a second image focused at the background of the main subject to

obtain a desirably blurred synthesized image. *Id.*, [0237]. Thus, Niikawa discloses differentiating the main subject from the objects in the background at a different depth-of-field. Ex-1003, ¶236.



Ex-1005, Fig. 5 (with shading corrector processor).

To the extent not expressly disclosed, Yamasaki discloses an image processing apparatus, such as a digital camera, and method to generate an image with a blur effect. Ex-1008, [0001], [0106]. The digital camera changes the depth of field by variously selecting the combinations of apertures and shutter speeds and, as a result, the blur effect of objects other than a principal object can be freely controlled. *Id.*, Abstract, [0003], [0088], [0095], [0103], [0109], [0115], Figs. 14A, B. Like the '805 Patent, Yamasaki refers to this as “digital portrait mode.” Compare

Ex-1001, 13:7-10, 13:37-48, 14:39-43, 15:8-24, 32:17-67 (describing using soft effect or blurring and depth of field for portraiture), with Ex-1008, [0109]. The blur effect is added by convolving 9x9 blur filter matrices with image data. *Id.*, [0095]-[0097], [0114]-[0115]. A POSA would have understood that this process is digital filtration. Ex-1003, ¶237. Yamasaki discloses storing this program in ROM 407 of the central controller 404, which is connected to digital signal processor 403. Ex-1008, [0107], [0111]; Ex-1003, ¶237.

A POSA would have been motivated to modify general controller 150 to analyze the data files to separate specific objects in the image using the differentiation of the depth-of-field. Yamasaki teaches that “the depth of field can be changed by variously selecting the combinations of apertures and shutter speeds and, as a result, the blur effect of objects other than a principal object can be freely controlled,” thus resulting in “appealing photos.” Ex-1008, [0003]. Yamasaki further explains that separating specific objects in an image based on depth-of-field allows for “an image with a blur effect like that taken by a lens with a large aperture size [to] be generated from images taken via the lenses with a small aperture size,” resulting in “a higher-resolution image.” *Id.*, [0006], [0127]-[0128]. A POSA would have understood that this technique would be used to create the “desirably blurred synthesized image,” thereby improving image quality and graphic effect. Ex-1005, [0003], [0237]; Ex-1003, ¶238.

A POSA further would have been motivated to differentiate objects based on depth-of-field by analyzing the image data using general controller 150 because it would have used a known technique (analyzing image data to differentiate objects based on depth-of-field) to improve similar devices (general controller 150 and central controller 404) in the same way (differentiating objects based on depth-of-field). Ex-1003, ¶239.

A POSA would have had a reasonable expectation of success of implementing this combination because general controller 150 would differentiate objects based on depth-of-field the same way central controller 404 would. *Id.*, ¶240.

Niikawa discloses and Niikawa in view of Yamasaki render obvious wherein a data file is analyzed by the microprocessor (general controller 150) to separate specific objects in the image using the differentiation of the depth-of-field. *Id.*, ¶241.

[4J] wherein the digital signal processor applies filtration only to specific objects in the image;

Niikawa teaches that general controller 150 synthesizes a first image focused at the main subject and a second image focused at the background of the main subject to obtain a desirably blurred synthesized image. Ex-1005, [0237]. Niikawa in view of Enomoto render obvious using the shading corrector to apply filtration to correct for other types of aberrations, as explained in [9D] and [9E], including sharpening and correcting “defocusing” using the DSP, i.e., the aberration correction part 56 and image processing blocks 54A and 54B. Ex-1006, Abstract, 4:46-56, 5:54-62,

12:28-40, 12:56-13:18, 19:25-35, 22:31-35, Fig. 2, Claims 1, 11. And Niikawa discloses and Niikawa in view of Yamasaki render obvious using the general controller 150 to differentiate objects in an image based on depth-of-field, as explained in [4I]. Ex-1003, ¶242.

A POSA would have been motivated to modify the shading corrector to apply digital filtration after general controller 150 differentiates the specific objects in the image to accurately position the images during synthesis. Yamasaki discloses that after central controller 404 differentiates objects based on depth-of-field and applies a blurring effect, “the digital signal processor 403 executes known image processes such as a color process, gamma correction, and the like, and generates an image to be finally saved via an image compression process.” Ex-1008, [0115]-[0116]. Yamasaki discloses that the differentiation process occurs before the digital signal processing “because image deviation amounts can be detected with higher precision when the raw digital image signal is used.” *Id.*, [0118]. Niikawa similarly discloses that digital camera captures two images focused on different objects then synthesizes them, *id.*, [0237], and that shading correction is performed “at the time of capturing the images,” i.e., before synthesizing the images, so that “positioning of images can be achieved without being influenced by a shading,” *id.*, [0117]. Thus, a POSA would have been motivated to first differentiate the objects using the general controller 150 then filter the objects using the shading corrector before positioning

and synthesizing the images in image synthesizer 159 “because image deviation amounts can be detected with higher precision when the raw digital image signal is used.” Ex-1008, [0118]; Ex-1003, ¶243.

A POSA would have also been motivated to modify the shading corrector to only apply the blurring and sharpening filters to the background objects and main subject respectively to achieve the desired blurring function. Yamasaki discloses that the blur effect of objects other than a principal object can be freely controlled. Ex-1008, Abstract, [0003], [0088], [0095], [0103], [0109], [0115], Figs. 14A, B. The objects would be represented by a subset of the image data. Ex-1003, ¶244. The blur effect is added by convolving 9x9 blur filter matrices with the image data corresponding to the objects. *Id.*, [0095]-[0097], [0114]-[0115]. The shading corrector would thus apply the blur filter disclosed in Yamasaki to the background objects, or “objects other than a principal object,” and the sharpening filter disclosed in Enomoto to the main subject to achieve the desirable blurring effect. Ex-1005, [0237]; Ex-1006, Abstract, 4:46-56, 5:54-62, 12:28-40, 12:56-13:18, 19:25-35, 22:31-35, Fig. 2, Claims 1, 11; Ex-1008, [0003]; Ex-1003, ¶244.

A POSA would have been further motivated to modify the shading corrector as discussed because it would have used a known technique (filtering only specific objects with a DSP) to improve similar devices (shading corrector and digital signal processor 403) in the same way (desirable blurring). Ex-1003, ¶245.

A POSA would have had a reasonable expectation of success of implementing this combination because the shading corrector would filter specific parts of the image data the same way it would filtering the entire image, just based on a subset of the pixel data. *Id.*, ¶246.

Niikawa in view of Enomoto and Yamasaki render obvious wherein the digital signal processor (shading corrector) applies filtration (blurring and sharpening) only to specific objects in the image (the primary subject and/or the background objects). *Id.*, ¶247.

[4K] wherein the aberrations of the specific objects are corrected; and

See [4J]. Ex-1003, ¶248.

[4L] wherein the digital signal processor forwards the modified date file to storage in memory.

See [9A-9], [9J]. Ex-1003, ¶249.

Accordingly, claim 4 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶250.

2. Claim 5

[5] The system of claim 4: wherein the subject is isolated by focusing on the subject and narrowing the depth of field range by manipulating the aperture.

Niikawa discloses and Niikawa in view of Yamasaki render obvious this limitation as explained in [4I]. Additionally, a POSA would have understood that the aperture of a camera controls exposure and focus. Ex-1001, 13:11-59, 33:4-19, Fig. 9 (describing setting the aperture to different f-numbers to focus on different

objects and narrow the depth of field range); Ex-1003, ¶251. The gradation control processing mode obtains a synthesized image with substantially widened dynamic range by capturing two images having different exposures for the same subject in different timings. Ex-1005, [0074]. When the camera focuses on the main subject, the camera calculates an exposure control value, which provides the correct exposure and f-number. *Id.*, [0106]. The aperture is set at the f-number. *Id.*, [0090]. By manipulating the aperture, the camera focuses on a “main subject,” thereby narrowing the depth-of-field. Ex-1003, ¶251.

Niikawa discloses and Niikawa in view of Yamasaki render obvious wherein the subject is isolated by focusing on the subject and narrowing the depth of field range by manipulating the aperture. *Id.*, ¶252.

Accordingly, claim 5 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶253.

3. Claim 6

[6] The system of claim 4: wherein filtration is applied only to the background of an image exclusive of specific selected objects.

See [4J]. Ex-1003, ¶254.

Niikawa in view of Enomoto and Yamasaki render obvious wherein filtration (blurring) is applied only to the background of an image exclusive of specific selected objects (the main subject). *Id.*, ¶255.

Accordingly, claim 6 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶256.

4. Claim 7

[7] The system of claim 4: wherein specific color filtration is applied to objects.

Niikawa discloses a gradation process to correct when the light portions in the subject image are too white and the dark portions in the subject image are too black. Ex-1005, [0061]. Niikawa also discloses a white balance correction to adjust a white balance of captured image by converting the level of image data of each color component R, G, B from CCD 303 with the use of a level conversion table inputted from general controller 150. *Id.*, [0067], [0086]. A POSA would have understood that these are color filtration processes applied to objects in the image, such as the main subject. *Id.*, [0237]; Ex-1003, ¶257.

Niikawa discloses wherein specific color filtration (gradation process correction/white balance correction) is applied to objects (objects in the image, e.g., the main subject). Ex-1003, ¶258.

Accordingly, claim 7 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶259.

5. Claim 8

[8] The system of claim 4: wherein specific filtration applied to specific objects is soft effects.

Niikawa in view of Enomoto and Yamasaki render obvious this limitation, as explained in [4J]. Specifically, a diffusion function creates a blurring effect in an image. Ex-1003, ¶260. The '805 Patent refers to the “soft effect” as “defocus control,” which focuses on the “main subject” while producing a “pleasing bokeh” effect in “the background that is out of focus” “in which the gradations of tone are evenly smooth.” Ex-1001, 15:8-24. Niikawa discloses focusing on a main subject and blurring the background to create the desired blurring effect. Ex-1005, [0237]. And Yamasaki discloses that the blur effect of objects other than a principal object can be freely controlled. Ex-1008, Abstract, [0003], [0088], [0095], [0103], [0109], [0115], Figs. 14A, B; Ex-1003, ¶260.

Niikawa in view of Enomoto and Yamasaki render obvious wherein specific filtration applied to specific objects is soft effects (blurring specific objects in the background). *Id.*, ¶261.

Accordingly, claim 8 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶262.

6. Independent Claim 21

[21pre] A method of image filtration which comprises:

See [9pre], [18pre]. Ex-1003, ¶263.

[21A-1]-[21A-9] A method of image filtration which comprises: a digital camera mechanism, an optical lens mechanism, a digital sensor, a microprocessor, a digital signal processor, an application specific integrated circuit, system software, a database management system and a memory storage sub-system;

See [9A-1]-[9A-9]. Ex-1003, ¶263.

[21B] wherein the aberrations from the optical lens mechanism are corrected by applying digital filtration by using the application specific integrated circuit and the digital signal processor;

See [9B]. Ex-1003, ¶264.

[21C] the method consisting of; forwarding the data from a digital sensor to a digital signal processor;

See [9C], [9E], [1H]. Ex-1003, ¶265.

[21D] analyzing a data file by the microprocessor to separate specific objects it the image using the differentiation of the depth-of-field;

See [4I]. Ex-1003, ¶266.

[21E] providing digital and optical data to the digital signal processor;

See [9C]. Ex-1003, ¶267.

[21F] identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations;

See [9D]. Ex-1003, ¶268.

[21G] selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations;

See [24H]. Ex-1003, ¶269.

[21H] applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations;

See [9B]. Ex-1003, ¶270.

[21I] correcting the aberrations of the specific objects in the image by applying the digital signal processor filtration; and

See [4J]. Ex-1003, ¶271.

[21J] forwarding the modified data file from the digital signal process to storage in memory.

See [9A-9], [9J]. Ex-1003, ¶272.

Accordingly, claim 21 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶273.

7. Claim 22

[22] The method of claim 21 further comprising the step of: applying specific color filtration to objects.

See [4J], [7]. Ex-1003, ¶274.

Accordingly, claim 22 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶275.

8. Claim 23

[23] The method of claim 21 further comprising the step of: applying soft effects filtration to specific objects.

See [4J], [8]. Ex-1003, ¶276.

Accordingly, claim 23 would have been obvious over Niikawa in view of Enomoto and Yamasaki. *Id.*, ¶277.

D. Secondary Considerations of Non-Obviousness

Petitioner is unaware of any applicable secondary considerations of non-obviousness. None were identified or asserted during prosecution. *See generally* Ex-

1002. Regardless, even if such considerations existed, none would overcome the strong *prima facie* showing of obviousness. Ex-1003, ¶278.

VII. Discretionary Denial is Unwarranted

A. *General Plastic* Is Generally Inapplicable And Favors Petitioner

In *General Plastic*, the Board sets forth a series of factors that may be analyzed for follow-on petitions to help conserve the finite resources of the Board. However, Petitioner respectfully submits that the *General Plastic* analysis is inapplicable here. If trial is instituted in IPR2024-01373, Petitioner will move to join that proceeding as an understudy. Such circumstances “effectively neutralize[]” *General Plastic*. See *Apple Inc. v. Uniloc 2017 LLC*, IPR2018-00580, Paper 13 at 10 (PTAB Aug. 21, 2018) (instituting a joinder copycat petition where petitioner agreed to assume a passive understudy role, and noting such circumstances “effectively neutraliz[es] the *General Plastic* factors”); see also *Celltrion, Inc. v. Genetech, Inc.*, IPR2019-01019, Paper 11 at 10 (PTAB Oct. 30, 2018) (noting the joinder motion “effectively obviates any concerns of serial harassment and unnecessary expenditures of resources”); *Code200, UAB et al. v. Bright Data Ltd.*, IPR2022-00861, Paper 18 (PTAB Aug. 23, 2022) (“*Code200*”) (case remanded by Director after finding road-mapping and other *General Plastic* concerns generally inapplicable or of limited relevance when a motion for joinder presents a copycat petition).

In any event, the *General Plastic* factors counsel heavily against discretionary denial, *i.e.*, in favor of instituting the present IPR and joining it with the Nikon IPR, if instituted. *General Plastic Indus. Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, slip op. at 16 (PTAB Sept. 6, 2017) (Paper 19) (precedential as to § II.B.4.i).

The first three *General Plastic* factors all strongly favor Petitioner. Petitioner has not previously filed an IPR challenge to the '805 patent, Petitioner has included a *Sotera* stipulation in its Petition, and there are no road-mapping concerns as Petitioner has simply filed a copycat version of the Nikon Petition. These factors all counsel against discretionary denial. *Code200*, Vidal Remand (Paper 18) at 4-6.

The fourth, fifth and seventh *General Plastic* factors have limited relevance when a motion for joinder with a copycat petition is presented. *Code200*, Vidal Remand (Paper 18) at 6. In any event, those factors favor Petitioner as the forthcoming joinder Motion will be filed promptly after a favorable institution decision of the Nikon IPR and there should be no delay in the Nikon IPR if Petitioner's forthcoming joinder Motion is granted.

The sixth factor also favors Petitioner as it is "the Board's 'mission to improve patent quality and restore confidence in the presumption of validity that comes with issued patents'" which "outweighs the impact on Board resources needed to evaluate the merits of a petition." *Code200*, Vidal Remand (Paper 18) at 6, *citing Cuozzo Speed Techs., LLC v. Lee*, 579 U.S. 261, 272 (2016).

Accordingly, all *General Plastic* factors counsel against discretionary denial and favor of instituting trial and granting Petitioner’s forthcoming joinder Motion. Indeed, any “concerns of fairness are outweighed by the benefits to the patent system of improving patent quality by reviewing the merits of the challenges raised in the petition[], which have not been addressed to date.” *Code200*, Vidal Remand (Paper 18) at 6, *citing General Plastic* at 16 (citing H.R. Rep. No. 112-98, pt. 1, at 40 (2011)); *see also Samsung Elecs. Am., Inc. v. Uniloc Lux. S.A.*, IPR2017-01797, Paper 8 at 33 (P.T.A.B. Feb. 6, 2018) (“Patent Owner’s complaint about the multiple [IPR] petitions filed against [its] patent is not persuasive when the volume appears to be a direct result of its own litigation activity.”).

B. The Board Should Not Deny Institution Under *Fintiv*

Institution is appropriate under the six-factor test set forth in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 6 (P.T.A.B. Mar. 20, 2020) (precedential) (“*Fintiv*”), as further clarified by Director Vidal’s June 21, 2022 interim procedure for discretionary denials (the “June 21st Memo”) available at: https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

In determining whether to exercise discretion to deny institution in view of a parallel proceeding, the Board considers the *Fintiv* factors and “takes a holistic view of whether efficiency and integrity of the system are best served by denying or

instituting review.” *Fintiv*, IPR2020-00019, Paper 11 at 6. Importantly, the June 21st Memo explained that “the PTAB will not rely on the *Fintiv* factors to discretionarily deny institution in view of parallel district court litigation where”—as here—“a petition presents compelling evidence of unpatentability.” June 21st Memo at 2.

Turning initially to the fourth and dispositive factor here (overlap between issues), Petitioner stipulates that, if this IPR is instituted, Petitioner will not pursue the grounds raised, or that reasonably could have been raised, in this IPR in district court proceedings. *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 18-19 (P.T.A.B. Dec. 1, 2020) (precedential). There is therefore no overlap with arguments made in the district court proceedings. This stipulation “mitigates concerns of potentially conflicting decisions and duplicative efforts between the district court and the PTAB,” and the Director has clarified that the PTAB will not discretionarily deny institution where, as here, Petitioner has made a *Sotera* stipulation. June 21st Memo, 7-8. Discretionary denial under the *Fintiv* factors is therefore not appropriate.

C. The Board Should Not Deny Institution Under 35 U.S.C. § 325(d)

The Board also should not exercise its discretion under §325(d) to deny institution. This Petition presents the same arguments and evidence that is presented in IPR2024-01373 and Petitioner intends to seek joinder with that proceeding. No additional prior art or grounds are raised herein, and an *Advanced Bionics* analysis

is inapplicable should IPR2024-01373 be instituted and joinder to that proceeding be granted.

VIII. Mandatory Notices

A. Real Party-in-Interest

Petitioner certifies that Samsung Electronics Corp., Ltd. and Samsung Electronics America, Inc. are the only real parties-in-interest.

B. Related Matters

As mentioned above, the Canon IPR, Nikon IPR, and Sony IPR involved the '805 Patent. *See* IPR2020-01321, IPR2024-01373, and IPR2024-00924.

The following district court actions involve the '805 Patent.

1. U.S. District Court for the Eastern District of Texas.

(i) *Optimum Imaging Technologies LLC v. FUJIFILM Corporation*, Case No. 4-23-cv-00922; (ii) *Optimum Imaging Technologies LLC v. Nikon Corporation*, Case No. 4-23-cv-00923; (iii) *Optimum Imaging Technologies LLC v. Olympus Corporation, et al.*, Case No. 4-23-cv-00924; (iv) *Optimum Imaging Technologies LLC v. Panasonic Corporation*, Case No. 4-23-cv-00926; (v) *Optimum Imaging Technologies LLC v. Sony Corporation*, Case No. 4-23-cv-00928; (vi) *Optimum Imaging Technologies LLC v. Samsung Electronics Co., Ltd.*, Case No. 4:23-cv-00927.

2. U.S. District Court for the Western District of Texas

Canon Inc. v. Optimum Imaging Technologies LLC, Case No. 1:20-cv-01238
(Terminated April 28, 2021).

3. U.S. District Court for the Northern District of California

FUJIFILM North America Corporation v. Optimum Imaging Technologies LLC, Case No. 4:24-cv-03297.

Petitioner also notes that the '805 Patent is in the same family as two other patents: U.S. Patent No. 8,451,339 and U.S. Patent No. 10,877,266. Nikon is currently challenging the '339 and '266 Patents, respectively, in IPR2024-01372 and IPR2024-01374. Sony has challenged these patents, respectively, in IPR2024-00925 and IPR2024-01046.

C. Lead and Back-up Counsel Under 37 C.F.R. §42.8(b)(3) and Service Information under 37 C.F.R. §42.8(b)(4)

Petitioner designates the following lead and back-up counsel:

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Service on Petitioner may be made by mail or hand delivery to: Greenberg Traurig, LLP, 1750 Tysons Boulevard, Suite 1000, McLean, VA 22102. Petitioner also consent to and prefer electronic service by emailing Samsung-OIT-IPRs@gtlaw.com and counsel of record.

D. Fees

The required fee is being paid electronically through P-TACTS.

Dated: January 23, 2025

Respectfully Submitted,

/Andrew R. Sommer/

Andrew R. Sommer

Reg. No. 53,932

CERTIFICATE OF WORD COUNT

The undersigned certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW complies with the type volume limitation in 37 C.F.R. § 42.24(a)(1)(i). According to the utilized word-processing system's word count, the petition—excluding the caption, table of contents, table of exhibits, mandatory notices, certificate of word count, and certificate of service—contains 13,583 words.

Dated: January 23, 2025

/Andrew R. Sommer/

Andrew R. Sommer

Attorney for Petitioner

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing **Petition for *Inter Partes* Review**, the associated **Powers of Attorney**, and **Exhibits 1001 to 1027 and 1029 to 1033** were served by UPS Priority Overnight on the correspondence address of record indicated in the Patent Office's Patent Center system for U.S. Patent No. 7,612,805:

The Law Office of Michael J. Scheer
5531 Murietta Avenue
Sherman Oaks, CA 91401
UNITED STATES

Dated: January 23, 2025

/Andrew R. Sommer/

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