

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Nikon Corporation, Panasonic Entertainment & Communication Co., Ltd.,
Olympus Corporation, OM Digital Solutions Corporation, FUJIFILM North
America Corporation, FUJIFILM Corporation,

Petitioners,

v.

Optimum Imaging Technologies LLC,
Patent Owner.

Case IPR2024-01373

Patent No. 7,612,805

DECLARATION OF ROBERT L. STEVENSON

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I. Introduction

1. My name is Robert L. Stevenson. I have been retained by counsel for Olympus Corporation, OM Digital Solutions Corporation, FUJIFILM Corporation, FUJIFILM North America Corporation, Nikon Corporation, and Panasonic Entertainment & Communication Co., Ltd. (“Petitioners”) as an expert witness in this *inter partes* review to examine whether claims 1-9 and 18-24 of U.S. Patent No. 7,612,805 (“the ’805 Patent” or “Ex-1001”) are patentable over certain prior art. I understand the ’805 Patent is currently assigned to Optimum Imaging Technologies LLC (“Patent Owner”).

2. I have personal knowledge of all the facts set forth herein, and if called to testify at any hearing in this *inter partes* review, I would competently testify and verify that testimony contained herein.

3. I am being compensated at my hourly rate of \$750 per hour. I am also being reimbursed for out-of-pocket expenses. My compensation does not depend in any way on the outcome of this proceeding or the particular opinions I express, or the testimony I give.

4. I expect to be available for deposition and to testify at the evidentiary hearing in this *inter partes* review to the extent required.

5. This declaration contains my conclusions and a summary of my analysis including a summary of my conclusions; an overview of my qualifications

as an expert; an overview of the scope and terms of my engagement for this declaration; an overview of the materials I have considered in arriving at my conclusions; an overview of the terminology and legal principles that I applied in my analysis; an overview of the technical background of the subject matter; an overview of the '805 Patent; an analysis of the level of ordinary skill in the art related to the '805 Patent; and an analysis of the asserted references; and a patentability analysis of the challenged claims.

6. This declaration is based on information currently available to me. I intend to continue my investigation and study, which may include a review of documents and information that may yet be produced, as well as deposition testimony from depositions for which transcripts are not yet available or that may yet be taken in this review. Therefore, I expressly reserve the right to expand or modify my opinions as my investigation and study continue, and to supplement my opinions in response to any additional information that becomes available to me, any matters raised by Patent Owner and/or other opinions provided by Patent Owner's expert(s), or in light of any relevant orders from the Patent Trial and Appeal Board or other authoritative body.

II. Background and Qualifications

7. My qualifications and professional experience are described in my Curriculum Vitae, a copy of which can be found in Ex-1004. The following is a brief summary of my relevant qualifications and professional experience.

8. I have a bachelor's degree in Electrical Engineering from the University of Delaware and a Ph.D. degree in Electrical Engineering from Purdue University. My Ph.D. research was on communications and signal processing.

9. I am presently a Professor in the Department of Electrical Engineering and in the Department of Computer Science and Engineering at the University of Notre Dame. I first joined the faculty at the University of Notre Dame as an Assistant Professor in the Department of Electrical Engineering in 1990. I was granted tenure and promoted to the rank of Associate Professor in August 1996. I attained the rank of Professor in the Department of Electrical Engineering in August 2002, and I continue to serve in that capacity. I have served concurrently as a Professor in the Department of Computer Science and Engineering at the University of Notre Dame from January 2003 through June 2018.

10. Since 2013 I have served as an Associate Chair of the Department of Electrical Engineering. I also serve as the Director of Undergraduate Studies in Electrical Engineering. In this role I oversee the department's undergraduate program in Electrical Engineering.

11. I spent the summer of 1992 at the Air Force Research Lab in Rome, New York and I spent the summer of 1993 at the Intel® Corporation in Hillsboro, Oregon. Several leading computing companies, including Intel®, Sun Microsystems®, Apple® Computer, and Microsoft®, have supported my research at Notre Dame. During the past 20 years, I have published over 150 technical papers related to the field of image processing and digital systems.

12. I am a member of the Institute of Electronics and Electrical Engineers, The International Society for Optical Engineering, and the Society for Imaging Science and Technology. I am a member of the academic honor societies Eta Kappa Nu, Tau Beta Pi, and Phi Kappa Phi.

13. For the past 20 years my work has focused on the design of techniques, hardware, and software for the processing of digital signals using digital computing devices. As an academic researcher I attempt to develop novel ideas for systems, then publish and present those ideas to the technical community. My success as an academic is directly related to the insights and techniques that provide the basis for new generations of products. My early work on digital techniques for printing and image capture devices led to significant interaction with companies developing desktop computers products in the early 1990's as they tried to incorporate those ideas into their products.

14. My interaction with Apple's Imaging Group focused on various imaging devices such as digital cameras, scanners, and printers and how to best support those devices on desktop computers. At Intel, I worked in Intel's Architecture Lab at the time the MMX multimedia instructions were being incorporated into the Pentium processor. My work there dealt with developing video compression techniques for CD-ROM's and network communications that were well matched to the Pentium architecture. I also gave a series of talks on how advanced communication and video processing techniques could be better supported on the Pentium platform. Similarly, my interaction with Sun Microsystem's group examined how advanced signal processing techniques could be best implemented using Sun's new Visual Instruction Set on the Sparc architecture.

15. I have also received significant support for my research from several U.S. Department of Defense Agencies. The Air Force Research Laboratory has funded my work to develop advanced parallel processing algorithms that exploited an ad-hoc network of mixed computers to achieve significant computational advantages over their previously implemented techniques. Other Department of Defense agencies have supported my work in image and video enhancement.

16. Through my work I have contributed significantly to the understanding and modeling of the limitations of and aberrations found in optical image capture systems. For example, I directed a Ph.D. dissertation entitled "Modeling,

Approximation, and Estimation of Spatially-varying Blur in Photographic Systems” with my student John Simpkins and co-authored several papers in the 2011-2016 directly on the modeling of optical systems.

17. Additionally, I have developed numerous novel computational algorithms to overcome such issues with optical capture systems over the past 30 years. Some examples include “Improved Definition Image Expansion” (1994), “Color Palette Restoration” (1995), “Extraction of High-Resolution Frames from Video Sequences” (1996), “Reduced-Complexity Iterative Post-Filtering of Video” (2001), “Improving the Performance of Single Chip Image Capture Devices” (2003), “Estimation Theoretic Approach to Dynamic Range Improvement Through Multiple Exposures” (2003), “A Parameterized Spatially-Varying PSF Model” (2014), “Multi-Image Motion Deblurring Aided By Inertial Sensors” (2016), “Inertial Sensor Aided Multi-Image Nonuniform Motion Blur Removal Based on Motion Decomposition” (2018), “Deep Motion Blur Removal Using Noisy/Blurry Image Pairs” (2021), and “DeblurExpandNet: Image Motion Deblurring Network Aided by Inertial Sensor Data” (2022). These references were all published in peer referred international journals and have collectively been cited thousands of times in the field. I have also presented such work at international conferences around the world. Complete citations to this work can be found in my curriculum vitae which is included as Ex-1004.

18. I have published over 150 papers in international journals and international conferences.

19. I am an inventor of U.S. Pat. No. 6,081,552, “Video Coding Using a Maximum A Posteriori Loop Filter,” June 27, 2000.

20. Additional information concerning my background, qualifications, publications, conferences, honors, and awards are described in my Curriculum Vitae (Ex-1004).

III. Materials Reviewed

21. In reaching the conclusions described in this declaration, I have relied on the documents and materials recited herein as well as those identified in this declaration, including the '805 Patent, the prosecution history of the '805 Patent, the prior art references, and information discussed and any other references specifically identified in this declaration, including the materials identified in the chart below.

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	[Reserved]
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”)

Exhibit	Description
Ex-1010	Certified Translation of Japanese Pat. App. Pub. No. 2004-266768 (“Matsutani”)
Ex-1011	Japanese Pat. App. Pub. No. 2004-266768 (“Matsutani-JP”)
Ex-1012	Certified Translation of Japanese Patent App. Pub. No. 2003-158672 (“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”)
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	<i>Sotera</i> Stipulation for Petitioners
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”)

IV. Summary of Opinions

22. Ground 1(a): It is my opinion that claims 9 and 24 are obvious over Niikawa.

23. Ground 1(b): It is my opinion that claims 9 and 24 are obvious over Niikawa in view of Enomoto.

24. Ground 2(a): It is my opinion that claims 1-3 and 18-20 are obvious over Niikawa in view of Levien.

25. Ground 2(b): It is my opinion that claims 1-3 and 18-20 are obvious over Niikawa in view of Enomoto and Levien.

26. Ground 3: It is my opinion that claims 4-8 and 21-23 are obvious over Niikawa in view of Enomoto and Yamasaki.

V. Understanding of the Law

27. I am not a legal expert. In forming my opinions, I have been informed of and applied the legal standards as follows. I understand that the legal standards relating to anticipation and obviousness apply to the '805 Patent and have been instructed to assume an effective filing date of July 11, 2006.

28. I understand that a patent claim is invalid if the claimed invention is not new. For a claim to be invalid on the basis of anticipation because it is not new, all of its elements must be present, either expressly or inherently, in a single previous

device or method, or described, either expressly or inherently, in a single previous publication or patent.

29. I understand that the description in a reference does not have to be in the same words as the claim, but all the requirements of the claim must be there, either stated expressly or necessarily implied or inherent to one of ordinary skill in the field of technology of the patent at the time of the invention, so that someone of ordinary skill in the field of technology of the patent looking at that one reference would be able to make and use the claimed invention. I further understand that to be necessarily implied or inherent, the claim element must be a necessary part of the reference that is not expressly disclosed. Merely being one option is not sufficient for a claim element to be necessarily implied or inherent to a person of ordinary skill in the art (“POSA”).

30. I have been informed that in relying upon the theory of inherency, there must be a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.

31. I understand that a patent claim is “obvious” and therefore invalid when the differences between the claimed subject matter and the prior art are such that the

subject matter as a whole would have been obvious at the time the invention was made to a POSA to which the subject matter pertains.

32. In making an obviousness determination, I understand that there are several factors to consider: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art at the time of the effective filing date of the claimed invention; (3) the differences between the claimed invention and the prior art, if any, and (4) objective considerations, if any exist, such as any commercial success, copying, prior failure by others, licenses, longstanding need, and unexpected results.

33. I understand that prior art used to show that a claimed invention is obvious must be “analogous art.” Prior art is analogous art to the claimed invention if (1) it is from the same field of endeavor as the claimed invention (even if it addresses a different problem) or (2) the reference is reasonably pertinent to the problem faced by the inventor (even if it is not from the same field of endeavor as the claimed invention).

34. I have been informed and understand that the U.S. Supreme Court has recognized several rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to

obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led a POSA to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

35. Also, I have been informed and understand that obviousness does not require physical combination/bodily incorporation, but rather consideration of what the combined teachings would have suggested to a POSA at the time the claimed invention was made.

36. I understand that it is improper to engage in hindsight when trying to determine the obviousness of a patent claim. I understand that the obviousness inquiry must be conducted from the standpoint of a POSA at the time the claimed invention was made. What is known today, and what is learned from the teachings and disclosures of the patent itself containing the claim under analysis, should not be considered.

37. I have been informed that various “secondary considerations” (sometimes referred to as objective indicia of non-obviousness) may support a

determination of non-obviousness and that such secondary considerations must be considered as part of an obviousness analysis. I have been informed that secondary considerations of non-obviousness may include:

- a. commercial success of a product due to the merits of the claimed invention;
- b. a long felt need for the solution provided by the claimed invention;
- c. unsuccessful attempts by others to find the solution provided by the claimed invention;
- d. copying of the claimed invention by others;
- e. unexpected and superior results from the claimed invention; and
- f. acceptance by others of the claimed invention as shown by praise from others in the field or from the licensing of the claimed invention.

38. I understand that in order for such “secondary considerations” evidence to be relevant to the obviousness inquiry, there must be a relationship or “nexus” between the advantages and features of the claimed invention and the evidence of secondary considerations.

39. I understand that if a claim is not obvious, then the claims that depend from it are not obvious.

40. I have been advised that in an *inter partes* review the claim terms generally should be given their ordinary and customary meaning as a POSA would have understood them at the time of the effective filing date of the claimed invention and in light of the patent and its prosecution history. Furthermore, I have been instructed that a claim's plain language can help guide the interpretation of the claim terms in question, and the manner in which a claim term is used in a claim may be informative of its meaning.

41. Further, I have been informed that in an *inter partes* review proceeding, only claim terms that are actually in dispute need be construed. Thus, terms that are not in dispute, or ones for which alternative constructions would not render a different finding, do not need to be construed.

42. I have also been advised that the claim terms being construed must be construed in light of, and consistent with, the intrinsic evidence of the patent. I understand that a patent's intrinsic evidence includes the patent's prosecution history (which includes the prior art considered by the Examiner(s)), the patent's claims, and the patent's written description as given in the specification of the patent.

43. I have also been advised that when the meaning of a patent's claim term is disputed, the specification of the patent itself is the best guide to the meaning of that claim term. I understand that while embodiments given by the specification can help understand the meaning of claim terms, preferred embodiments and other examples given in the specification should not further limit the claims by being read into the claim terms being construed.

44. I also understand that an inventor may be his or her own lexicographer by specifically defining his or her own terms within the specification such that they then possess a specific meaning that can be different than the meaning they would otherwise have. I also understand that such an inventor can overcome the plain and ordinary meaning of a given claim term if he or she clearly and explicitly defines or redefines a claim term.

45. I have also been advised that after the patent's claims and specification, the next critical source of evidence regarding the meaning of a patent's claim terms comes from the patent's prosecution history. I understand that the prosecution history contains remarks made by the applicant during prosecution of the application that issues as the patent and those remarks may act to define, redefine, disclaim, or limit the meaning of a claim term, and that if a patentee made statements during prosecution that so limits the scope of a claim term, it is improper for a patent owner

to regain the scope given up during prosecution that leads to the issuance of the patent.

46. I have also been advised that in addition to the intrinsic evidence discussed above, extrinsic evidence may also be considered when construing claims, although it is generally not as significant as the intrinsic record itself when understanding the meaning of a claim term. It is my understanding that extrinsic evidence is any relevant evidence that would inform the understanding of the claim terms such as textbooks, dictionaries, expert testimony, treatises, or other like material.

47. I understand that a patent claim must particularly point out and define the boundaries of the subject matter to be protected by that claim. I understand that this requires that a patent claim be sufficiently definite. I understand that a patent claim is indefinite, and thus invalid, if its claims, when read in light of the intrinsic record, fail to inform a POSA with reasonable certainty about the scope of the invention.

VI. Level of Ordinary Skill in the Art

48. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a POSA at the time the claimed invention was made, which I understand is potentially as early as July

11, 2006 (the earliest priority date identified on the face of the '805 Patent). I understand that the factors considered in determining the ordinary level of skill in a field of art include the level of education and experience of persons working in the field; the types of problems encountered in the field; the teachings of the prior art, and the sophistication of the technology at the time the claimed invention was made. I understand that a POSA is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a POSA would also have knowledge from the teachings of the prior art, including the art cited below.

49. Based on the technologies disclosed in the '805 Patent, I believe that a POSA would have been a person with a Bachelor of Science degree in electrical engineering, physics, or a related field, with at least two years of industry experience or research, both concerning digital camera system design and image processing at the time the claimed invention was made.

50. Well before July 11, 2006 (the earliest priority date identified on the face of the '805 Patent), my level of skill in the art was at least that of a POSA. I am qualified to provide opinions concerning what a POSA would have known and understood at the time the claimed invention was made, and my analysis and conclusions herein are from the perspective of a POSA as of that date.

VII. Claim Construction

51. For the purpose of this declaration, all claim terms should be given their ordinary meaning to a POSA.

52. I understand that 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.

VIII. Background on the State of the Art

A. Digital Image Correction In Camera

53. The '805 Patent states that “software systems [e.g., Photoshop] have been developed that deal with problems post-production” “[i]n order to transcend the optical and digital limits of present camera systems...” (Ex-1001, 6:32-38) and that “[i]n the past, [] optical filtration processes were added after the production process via editing software such as Photoshop. However, in the present system, these combinations of processes are performed in-camera by user-adjusted settings” (*id.*, 12:66-13:3). Thus, the '805 Patent seeks to disclose and claim camera systems that deal with aberrations in-camera. However, such techniques were well known in the art by the time the '805 Patent was filed.

54. For example, as in other prior art discussed herein, Ricoh Technical Paper 31 (Ex-1029), published December 1, 2005, shows using “image processing software embedded in the digital camera” as a “method to correct the aberrations and intensity of a small compact digital camera with a wide-angle zoom lens.” *Id.*, Abstract. Ricoh shows formulas that use adjustable coefficients to correct distortion, peripheral shading and chromatic shift that change with zoom position, aperture value and shooting distance. *Id.*, Summary. Ichiyama discloses two additional methods of correction. The first is by comparing a captured calibration image to an ideal (reference) image in memory, ascertaining the differences between the two images, and generating a correction equation that is stored in memory and used to correct subsequently captured images. Ex-1021, [005]-[008], [015]-[016]. The second involves using a fast Fourier transform (FFT) to transform captured image data to the frequency domain and applying previously derived and stored frequency-domain correction equation to correct the image, and finally, performing an inverse Fourier transform (IFFT) to complete the image processing. *Id.*, [026], [029]-[030], Fig. 6.

55. Further, a detailed description of the hardware that could be used to implement image correction in camera is shown in Matsutani. Matsutani describes a controller 22 that includes a microprocessor (CPU), that interacts with a RPU 21 (a DSP) that corrects the images in the digital domain, and a LSI chip (ASIC) 13 that

includes the controller 22, RPU 21, and various interfaces to memory. Ex-1010, [0023], [0026]-[0027], [0029]-[0030], Fig. 1. Matsutani teaches the correction of aberrations using a correction algorithm, such as a convolution algorithm (*Id.*, [0043]), for correcting geometric characteristics of image data using a database of coefficient data (correction data). *Id.*, [0007], [0043]-[0046]. Matsutani also teaches that captured image data includes various types of aberrations (chromatic aberration, spherical aberration, coma aberration, astigmatism, field curvature and distortion, etc.) and that known techniques for correcting the effects of these aberrations are disclosed in Ex-1025 (“Ito”) and Ex-1032 (“Shiomi”). Ex-1010, [0003].

56. Ito discloses using a fast Fourier transform as the chromatic aberration correction that is applied by digital signal processing. Ex-1025, [0017]. Shiomi describes a video camera device that corrects chromatic aberration resulting from the use of a zoom lens. Ex-1032, Abstract. Shiomi discloses storing tables of “aberration correction coefficients” indexed to “focal length information f_M and a focusing lens movement amount ΔN ” of the zoom lens. *Id.*, [0021], Figs. 6(b)-(c).

57. In general, it was well-known in the art that image correction may be performed in a digital camera using in-camera hardware and software. *See, e.g.*, Ex-1020, 2:33-35 (teaching that “[a]n electronic camera can use a programmable digital processor controlled by software.”), 1:65-2:2 (teaching that “the camera contains EPROM memory with code for in-camera white balance and gamma correction and

also stores the compiled code which is used (by the computer) to operate the camera and to process the images from sensor color filter array to obtain a full resolution, color corrected image.”).

B. Storage of Correction Data

58. It was known that this type of correction information can be stored in the camera lens itself, the camera body, or in devices connected to the camera. *See* Ex-1006, 12:28-40, 13:6-12, 13:28-34, 14:4-38, Fig. 2 (teaching an “image processing apparatus 14” with a “lens characteristic data supply subsection 60” that “has a memory that stores information about the lens characteristics associated with various camera models, specifically information about the characteristics of lateral chromatic aberrations and distortions of various lenses,” including correction coefficients); Ex-1020, 4:58-5:10 (teaching that “image processing software, look-up tables, matrices, compression tables, dynamic range optimization tables, and other files capable of affecting the captured image data can be included in the digital storage device.”).

C. Optical Aberration Corrections

59. All real lenses produce images with various combinations of distortions and artifacts. These generally are called “aberrations.” Designers of lenses do what they can to minimize aberrations, but must balance that desire to minimize aberrations against issues of size, complexity, and cost of the designed lens. The

corrections may relate to known lens issues. These include, in part, the five Seidel aberrations, known to lens designers since their mathematical description was published in 1857 by Ludwig von Seidel. The Seidel aberrations are (1) spherical, (2) comatic, (3) astigmatism, (4) curvature of field, and (5) distortion.

60. These and other image defects arising due to the construction of the lens was well known in the art. *See, e.g.*, Ex-1018, 2:10-14 (“It is preferable that the image quality deterioration corrected by the lens characteristic correction unit is at least one of a chromatic aberration of magnification, a distortion aberration, defocusing and a decrease in marginal lumination.”).

D. Focal Length

61. The distance from the center of the lens to the image focal point (i.e., image sensor surface) is known as the focal length. As focal length changes, the amount of the subject captured by the lens also changes.

62. It was well-known in the art to use image correction data corresponding to user-adjustable the focal length of a lens to process image corrections. *See* Ex-1005, [0058], [0060], [0084], [0177] (teaching that the focal length of a lens is user adjustable and a shading correction circuit 123 that can perform a shading correction with reference to a plurality of correction tables stored in the shading ROM 1532 for different optical conditions such as focal length at the time of imaging.); Ex-1018, 2:59-60, 3:5-10, 4:16-20, 4:29-33, 6:23-30, 6:47-52, 8:27-41 (teaching a camera that

can correct aberrations based on lens characteristics corresponding to lens data (e.g., switchable focal length) stored for every interchangeable lens, and in case of a zoom lens for a plurality of focal lengths.); The use of correction tables to correct aberrations in fixed focal length lenses was also well known as of the Priority Date. *See* Ex-1024 at 40:9-24, 40:44-47 (disclosing correcting aberrations in fixed focal length lens). Enomoto III teaches that 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. *Id.*, 40:44-47..

E. Aperture Settings

63. Most camera lenses incorporate an aperture (often realized as an iris diaphragm) which can be opened or closed to varying degrees to control the overall amount of light taken in by the lens. Some cameras permit the user to adjust the aperture, but most current cameras, especially simpler ones, adjust the aperture automatically.

64. The aperture setting of a lens is typically described by an “f-number” or “f-stop” which is the ratio of the lens’ focal length to the diameter of the aperture. Larger f-numbers describe smaller aperture settings, which allow less light through the lens to form the image.

65. It was well known in the art that aperture settings are user-adjustable image capturing parameters. *See, e.g.,* Ex-1020 , 5:11-15, 7:16-23, 7:38-50 (teaching a camera with user-adjustable aperture value).

F. Fast Fourier Transform (“FFT”)

66. Fast Fourier Transform is known as a filter used in digital cameras to improve image quality by converting the image signal into the frequency domain for filtering.

67. And it was well-known in the industry to use FFT to blur or sharpen an image. *See, e.g.,* Ex-1007, 2:7-26, 3:36-67, 4:12-15, 4:27-35, Fig. 7 (teaching a sharpening transfer function 20 that uses a 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).

G. Depth of Field (“DOF”) Adjustment

68. The DOF is the distance between the nearest and the furthest objects that are in acceptably sharp focus in an image captured with a camera. DOF, as the ’805 Patent explains, is “dependent on the aperture setting of the lens[.]” ’805 Patent, 13:17-18.

69. It was well-known in the art that shutter speed and aperture, which determine depth of field when image is being captured, are adjustable. *See, e.g.,* Ex-1005, [0090], [0103] (teaching that a special imaging controller 158 changes the

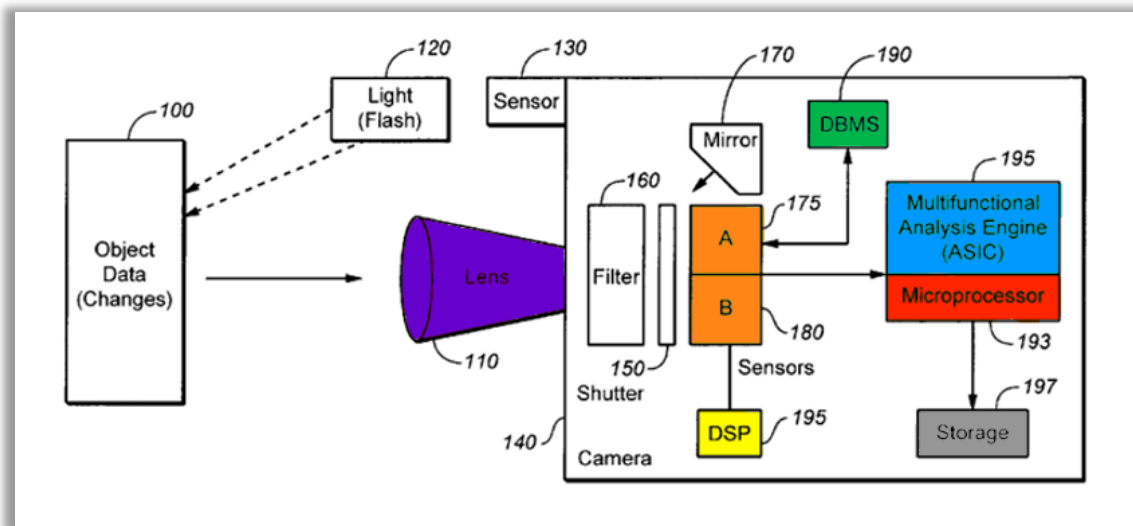
exposure time of the CCD 303 which corresponds to the shutter speed, and that a diaphragm control circuit 131 drives the diaphragm 302 and sets the amount of aperture).

IX. Overview Of The '805 Patent

A. Summary

70. 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.

71. 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.1001, Fig. 1.

B. Relevant Prosecution History

72. 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.

73. The Examiner also issued a restriction requirement. Ex-1002, 166. In its response, 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. *Id.*, 161. PO further 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.*

74. The '805 Patent issued on November 3, 2009.

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

X. Overview of the Prior Art References

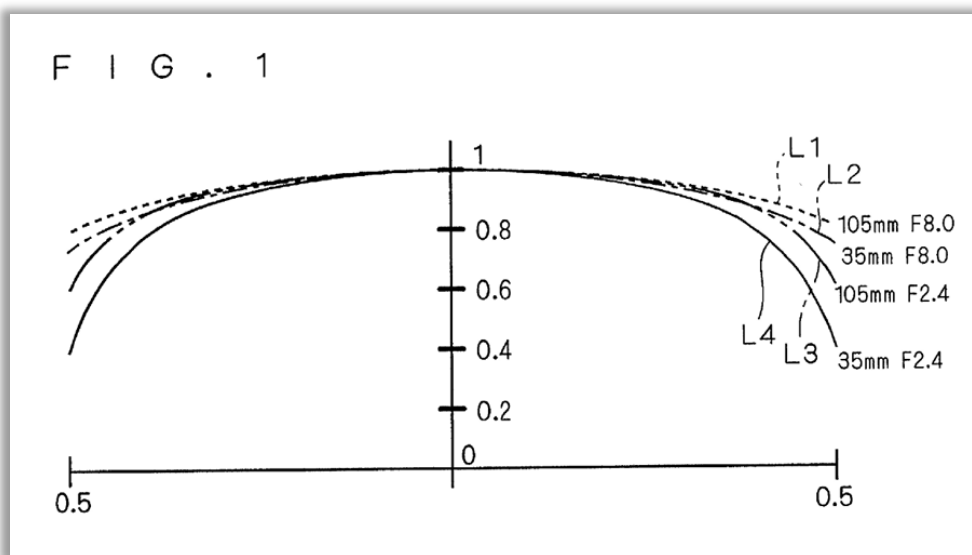
76. I have reviewed and am familiar with the following prior art references:

(1) Niikawa, (2) Enomoto, (3) Levien, and (4) Yamasaki.

A. Niikawa

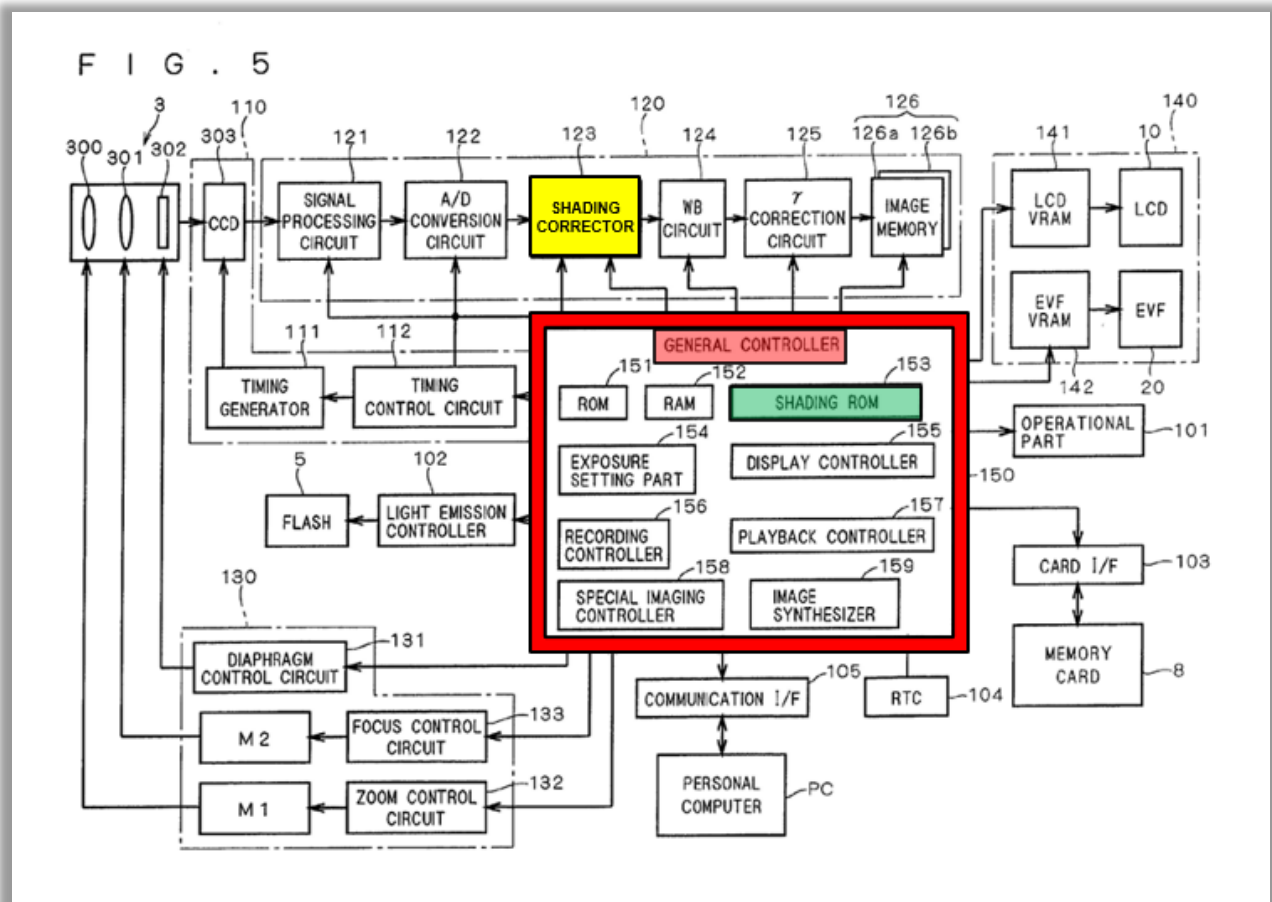
77. Niikawa discloses an image processing apparatus, e.g., a digital camera, that performs shading correction on images, which is a form of image aberration correction. *See, e.g.*, Ex-1005, Abstract. “When an image is captured via a lens [such as lens 3 and digital sensor CCD 303] in a digital camera 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].

78. Figure 1 of Niikawa depicts an example of how shading can influence an image captured using a digital camera with lenses at different focal lengths and “f-numbers.” *See* Ex-1005, [0057]-[0060]. As shown in Figure 1, focal length (represented in mm) and f-number influence shading. *Id.*, [0060].



Ex-1005, Fig. 1.

79. As seen in Figure 5 (processor implementation shown below), Niikawa teaches a signal processor 120 with a shading corrector (yellow) that corrects shading due to optical conditions. Ex-1005, [0082]. 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 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).

80. 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. Claim 4, from which, claim 5 depends separately recites a controller. *Id.*, Claim 4. A POSA reading Claim 5 of

Niikawa would understand that the processor of the shading corrector is separate from the controller, just as the shading corrector of Figure 5 is separate from the general controller. Thus Niikawa discloses that the shading corrector can be implemented as either a hardware circuit or a processor.

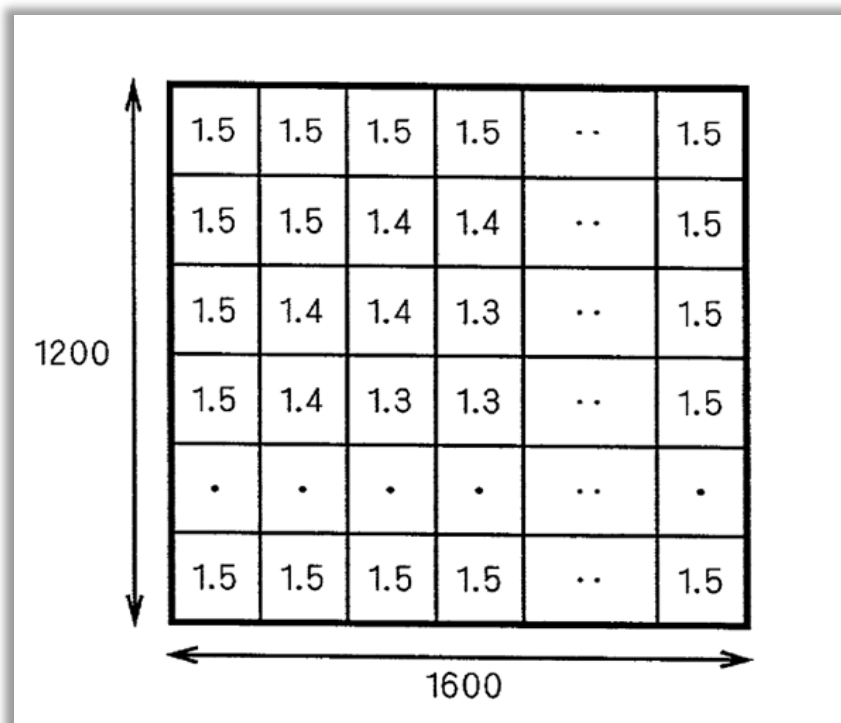
81. Although the implementation depicted in Figure 5 of Niikawa discloses the hardware circuit implementation, a POSA reading Niikawa would have understood that the embodiment of Figure 5 could equally be implemented using the disclosed processor implementation. At a minimum, it would have been obvious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

82. 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].

83. Figure 7 of Niikawa 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

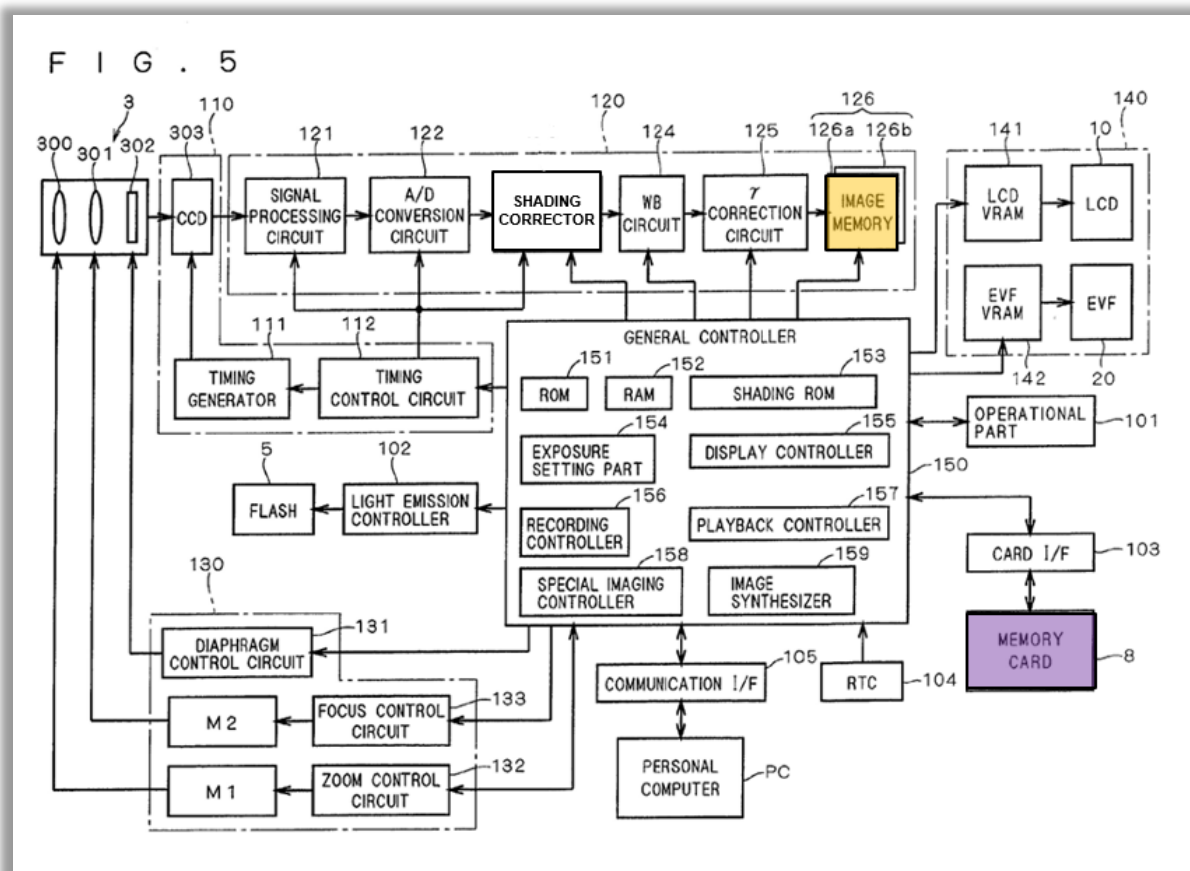
pixels×1,200 pixels of the [image pickup device] CCD 303.” *Id.*, [0056], [0083].

“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.

84. After signal processor 120 finishes processing the image, the signal processor forwards the image data to image memory 126 (orange) for temporary storage. Niikawa, [0087], [0092]. The image data and/or file are stored in image memory 126 (orange) and/or memory card 8 (purple). Niikawa, [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).

85. 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.

B. Enomoto

86. 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.

87. 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.

C. Levien

88. 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.

89. 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. *Id.*

D. Yamasaki

90. 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].

91. 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.

XI. The Challenged Claims Are Unpatentable

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

92. It is my opinion that claims 9 and 24 are obvious over (a) Niikawa, and (b) Niikawa in view of Enomoto.

1. Independent Claim 9

a. Element [9pre]

“A digital imaging system for image filtration comprising:”

93. Niikawa discloses a digital imaging system, e.g., an image processing apparatus or camera, that performs shading correction on images. *See, e.g.*, Niikawa, Abstract, [0012], [0056], [0079], [0082]. A decrease in light farther away from a

center of a lens is known as vignetting. The '805 Patent discloses that vignetting or shading correction is a form of filtration. Ex-1001, 30:28-37, 30:44-50. A POSA would have also understood that multiplying digital image data with correction coefficients for shading correction is a form of digital filtration.

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

b. Element [9A]

“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;”

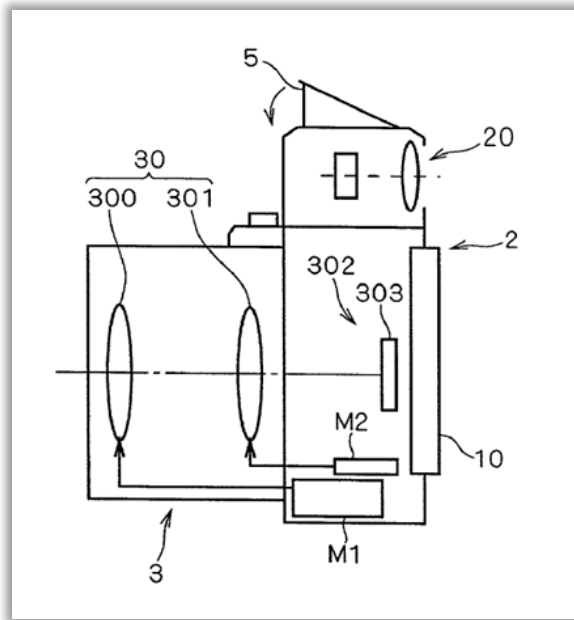
95. It is my opinion that Niikawa teaches or suggests [9A].

96. Element [9A] recites “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.” I address each of the sub-elements in turn.

(1) [9A-1] Digital Camera Mechanism

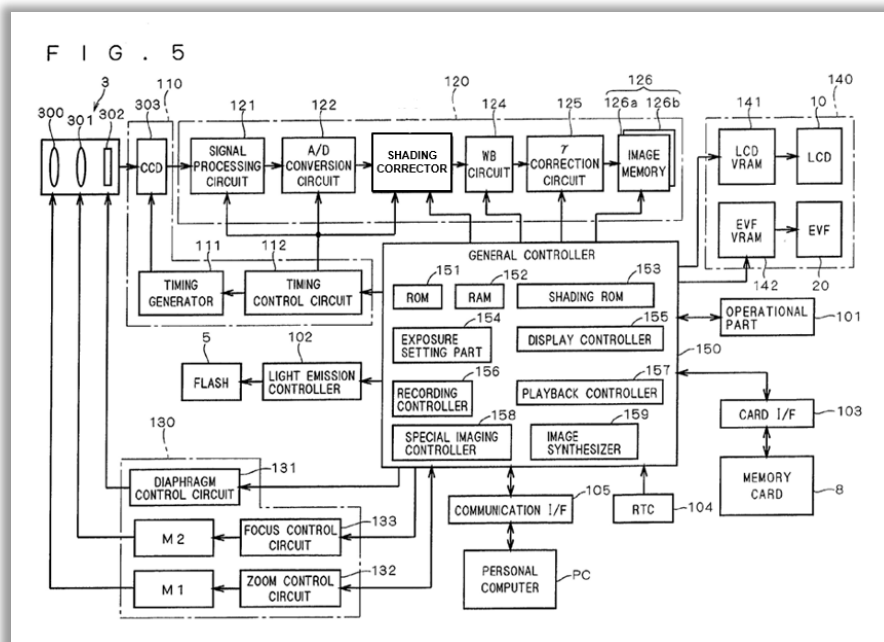
97. Niikawa discloses digital camera 1. Ex-1005, Abstract, [0065], [0075], Figs. 2-5. Figure 3 depicts a cross-section view of digital camera 1 with imaging lens 3, including zoom lens 300 and focus lens 301, and camera main body 2. *Id.*,

[0027], [0065], [0067], [0069], [0088].



Ex-1005, Fig. 3.

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

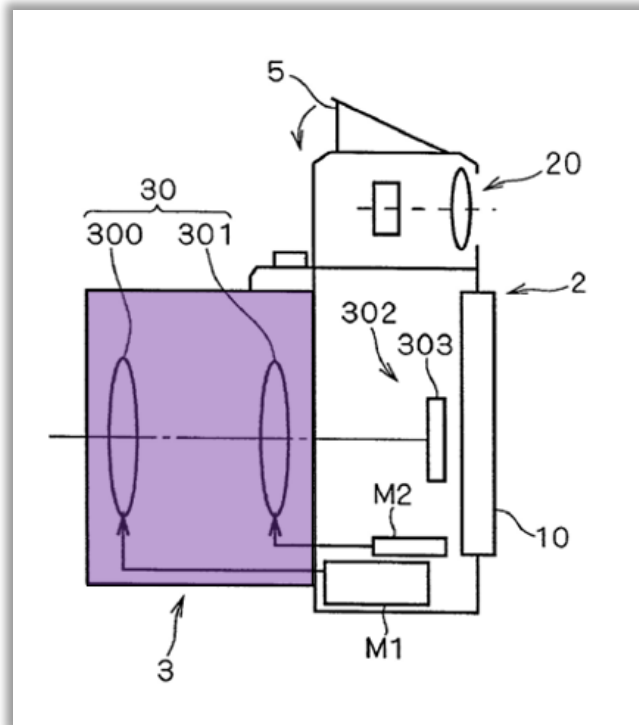


Ex-1005, Fig. 5 (with shading corrector processor).

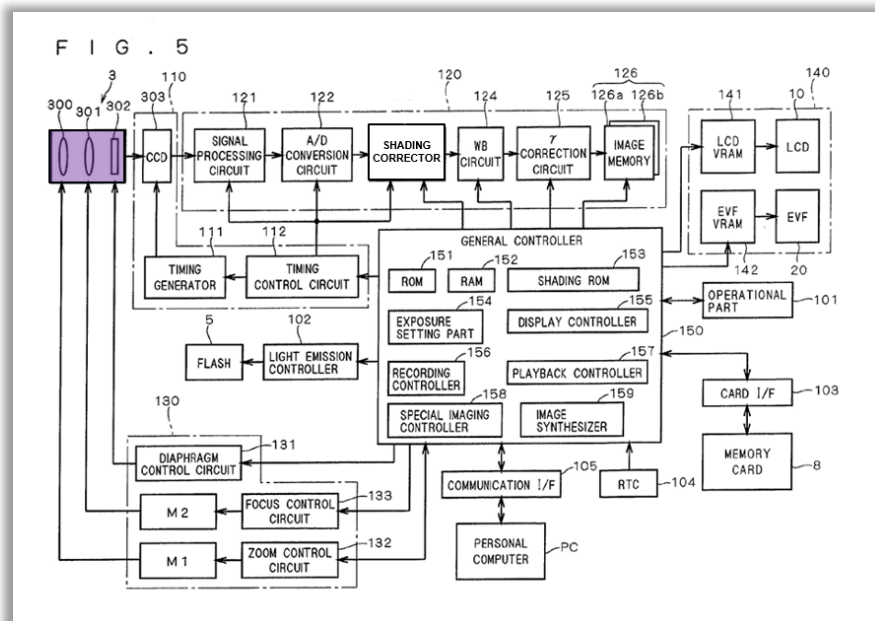
99. Niikawa discloses a digital camera mechanism (digital camera 1).

(2) [9A-2] Optical Lens Mechanism

100. 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-1005, Fig. 3.

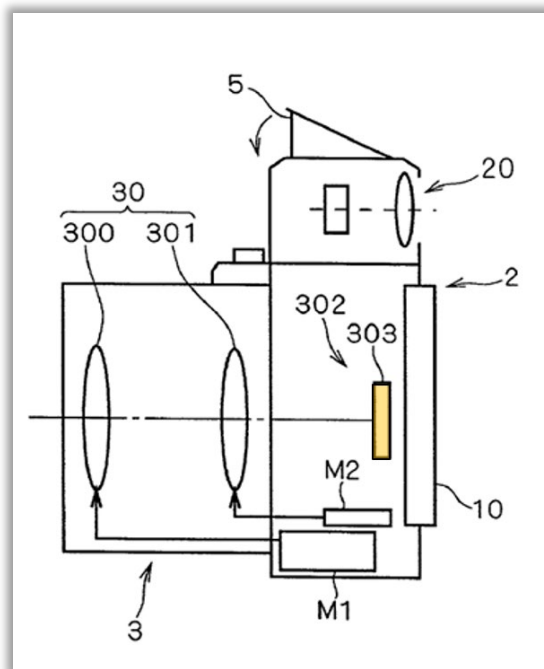


Ex-1005, Fig. 5 (with shading corrector processor).

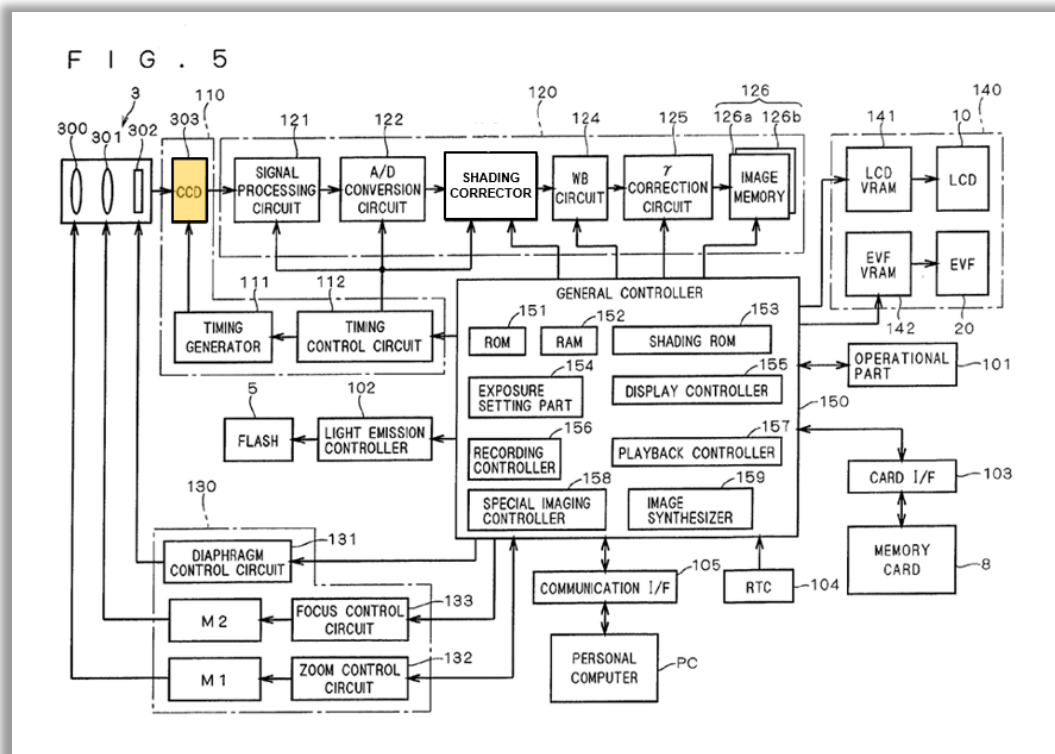
101. Niikawa discloses an optical lens mechanism (imaging lens 3).

(3) [9A-3] Digital Sensor

102. 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”). Notwithstanding that a CCD provides an analog signal that requires digitization, the '805 specification identifies a CCD as a “digital sensor[]” in which “photons are recorded by electrically charged pixels.” 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-1005, Fig. 3.

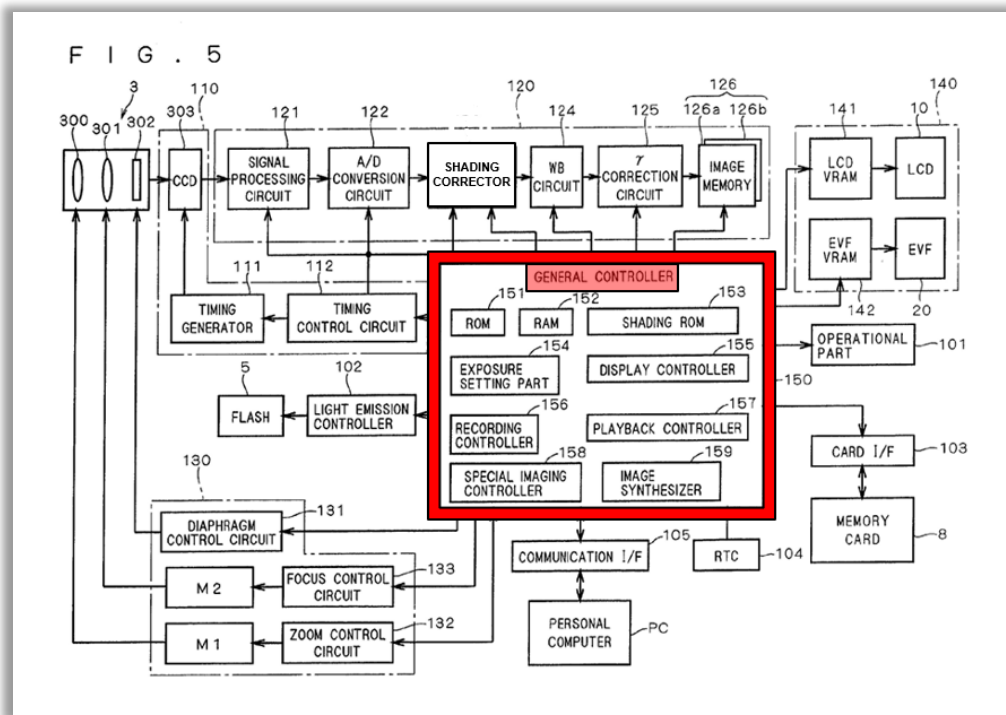


Ex-1005, Fig. 5 (with shading corrector processor).

103. Niikawa discloses a digital sensor (CCD 303).

(4) [9A-4] Microprocessor

104. 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. A microcomputer includes central processing unit, which is a microprocessor, and other components such as memory and input/output interfaces. The microprocessor is responsible for executing software instructions, processing data, and controlling components (such as memory, etc.). A POSA would have understood that the exposure and playback functions are managed by a microprocessor within a microcomputer.

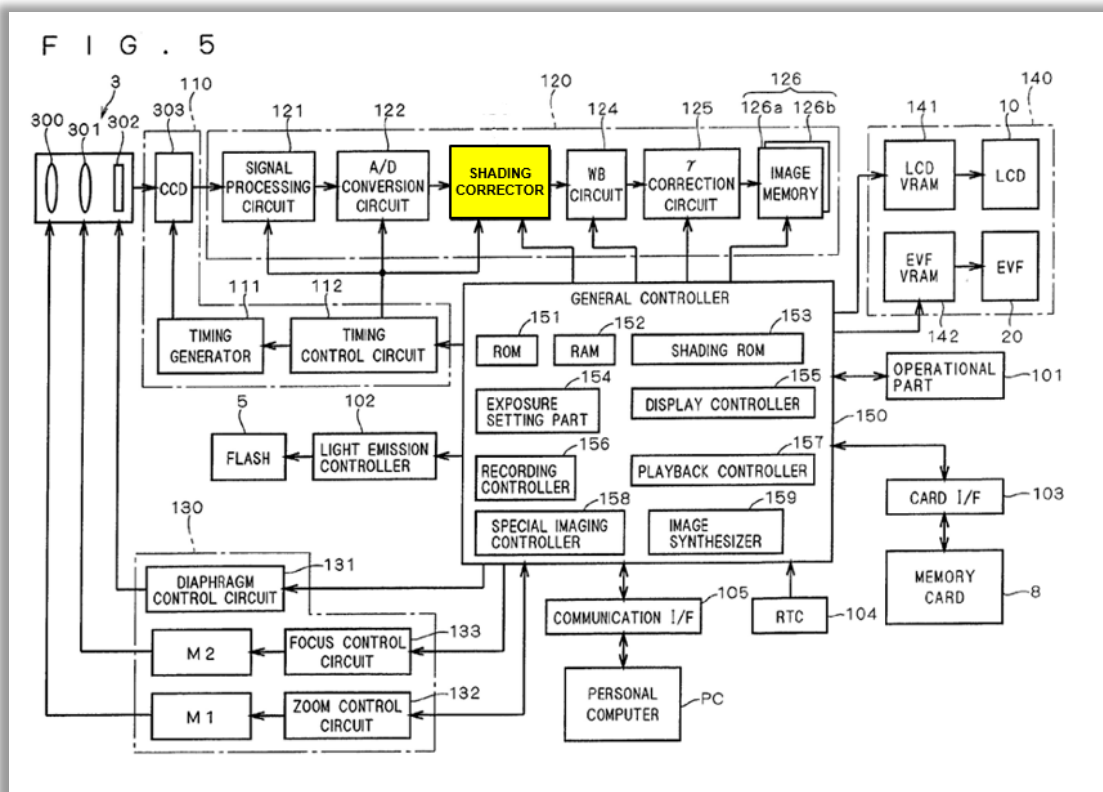


Ex-1005, Fig. 5 (with shading corrector processor).

105. Niikawa discloses a microprocessor (general controller 150).

(5) [9A-5] Digital Signal Processor

106. 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]; *see also id.*, [0077], [0092], Fig. 5, Claims 1, 2, 4, 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-1005, Fig. 5 (with shading corrector processor).

107. 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. *See* Ex-1010, [0023], [0026]-[0027], [0029], [0035], Fig. 1 (disclosing a CPU (microprocessor),

real-time processing circuit (DSP), and large-scale integrated circuit (ASIC) for correcting aberrations). Unlike processors, the operation of a hardware multiplier like shading corrector 123 cannot be changed or upgraded because they are implemented in fixed hardware. As such, a POSA who wanted to implement to reprogram or upgrade a processing function would have used a processor instead of the functionally fixed shading correction circuit.

108. 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).

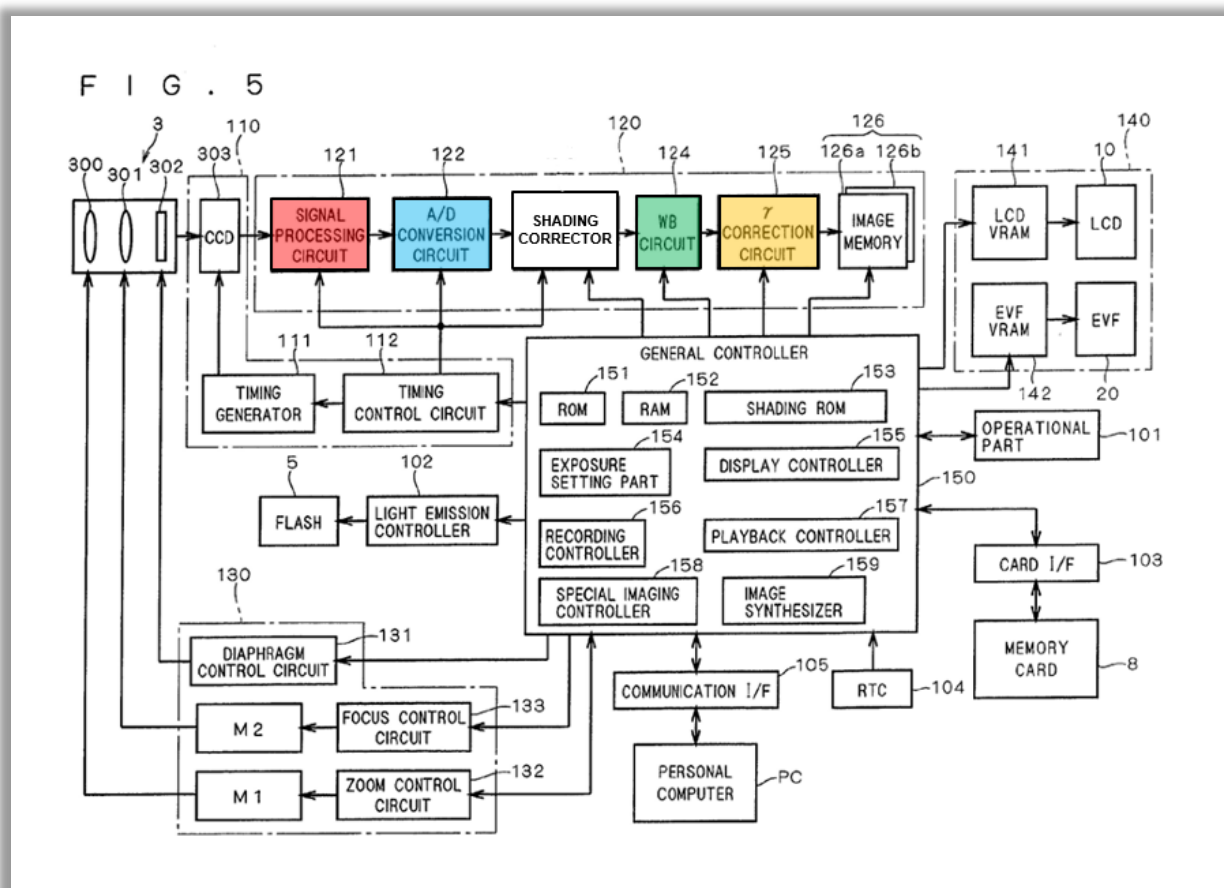
109. A reasonable expectation of success existed for implementing this combination because shading correction with a processor performing a multiplication operation would work the same as shading correction with a hardware multiplier.

110. Thus, Niikawa discloses a digital signal processor (shading corrector with a processor).

(6) [9A-6] Application Specific Integrated Circuit

111. 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-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).

112. Niikawa describes these circuits as performing dedicated tasks within the signal processing workflow, such as A/D conversion, white balance adjustment, and gamma correction. These are precisely the kinds of functions that would be integrated into an ASIC to optimize performance, reduce power consumption, and minimize space. Niikawa emphasizes the need for real-time processing and mentions the use of special hardware circuits. The circuits being part of a signal processor 120 that handles specific image processing tasks indicated that they are custom-designed for this particular application reinforces the idea that these are not general-purpose components but instead are specifically designed for the tasks they perform. This is a hallmark of ASICs, which are tailored to meet the needs of a specific application rather than being general-purpose processors.

113. 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-1010, [0023], [0026]-[0027], [0029], [0035], Fig. 1 (disclosing a CPU (microprocessor), real-time processing circuit (DSP), and large-scale integrated circuit (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-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].

114. 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, 120-121 (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.

115. 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).

116. 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.

117. 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).

118. [Reserved].

(7) [9A-7] System Software

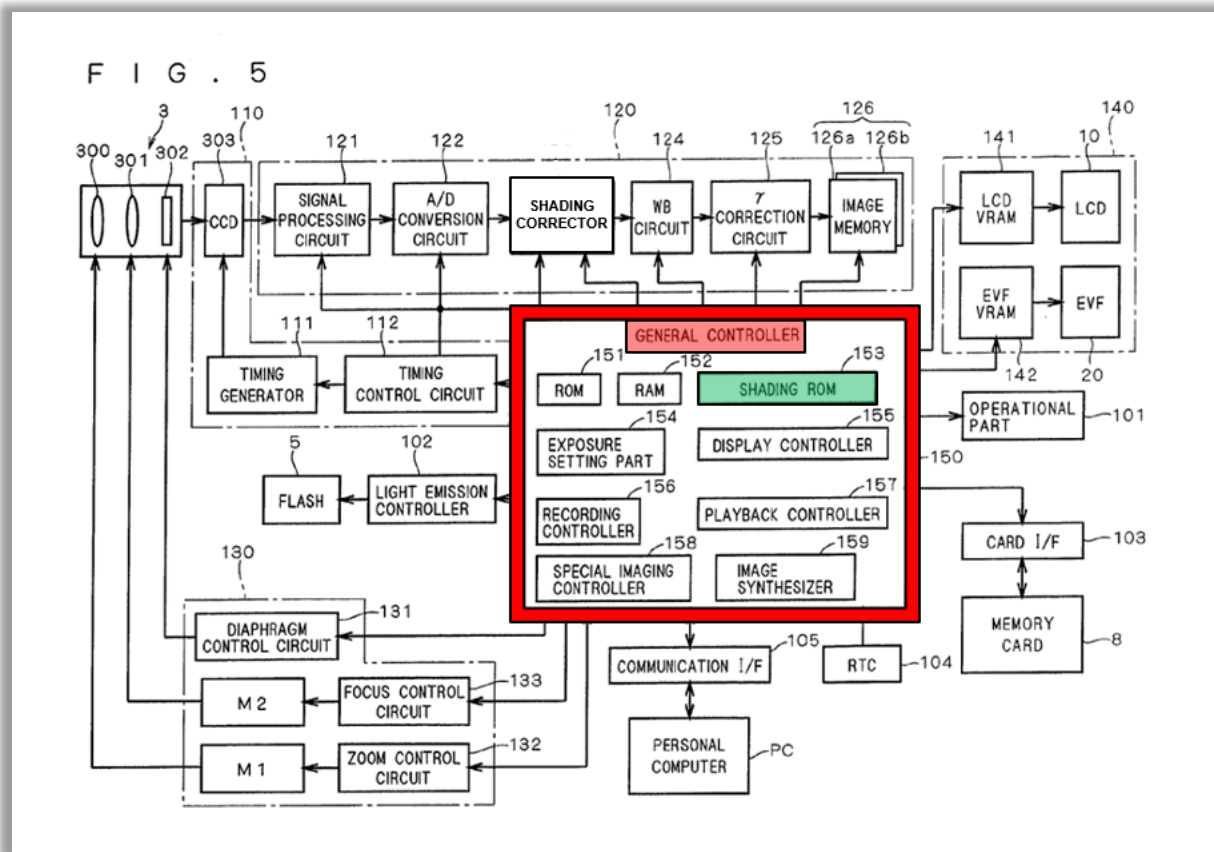
119. Niikawa discloses that general controller 150 has ROM 151 which stores programs for processing and controlling functions and components of digital camera 1. Ex-1005, [0096], *see also id.*, [0022] (“the present invention is directed to a program product containing a program for executing an image 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.

120. Thus, Niikawa discloses system software (programs stored in ROM 151).

(8) [9A-8] Database Management System

121. Niikawa discloses that digital camera 1 has a general controller 150 (red) that 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 1,920,000 pixels of 1,600 pixels×1,200 pixels of the 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.”). Niikawa’s correction table is a structured set of data storing correction coefficients that are accessed and used by the general controller to correct image data. A POSA would have thus understood that the correction tables, which store data in a structured way that serves a particular function(s), is a database.



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

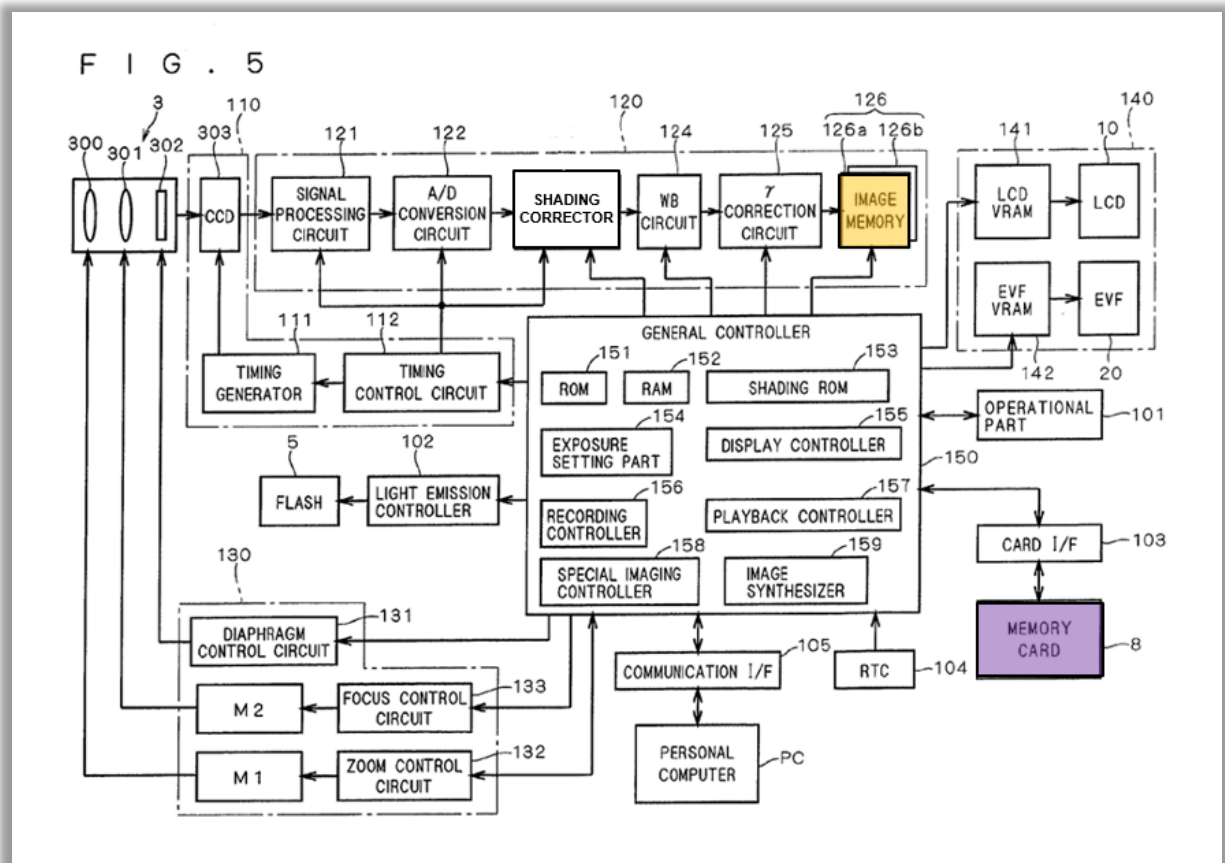
122. Despite other limitations in the claim reciting a “database” without antecedent basis, to the extent the claimed “database management system” (“DBMS”) is not limited to a database, Niikawa also discloses a DBMS, as disclosed in the ’805 Patent. General controller 150 includes ROM 151 which stores 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.

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

(9) [9A-9] Memory Storage Sub-System

124. 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-1005, Fig. 5 (with shading corrector processor).

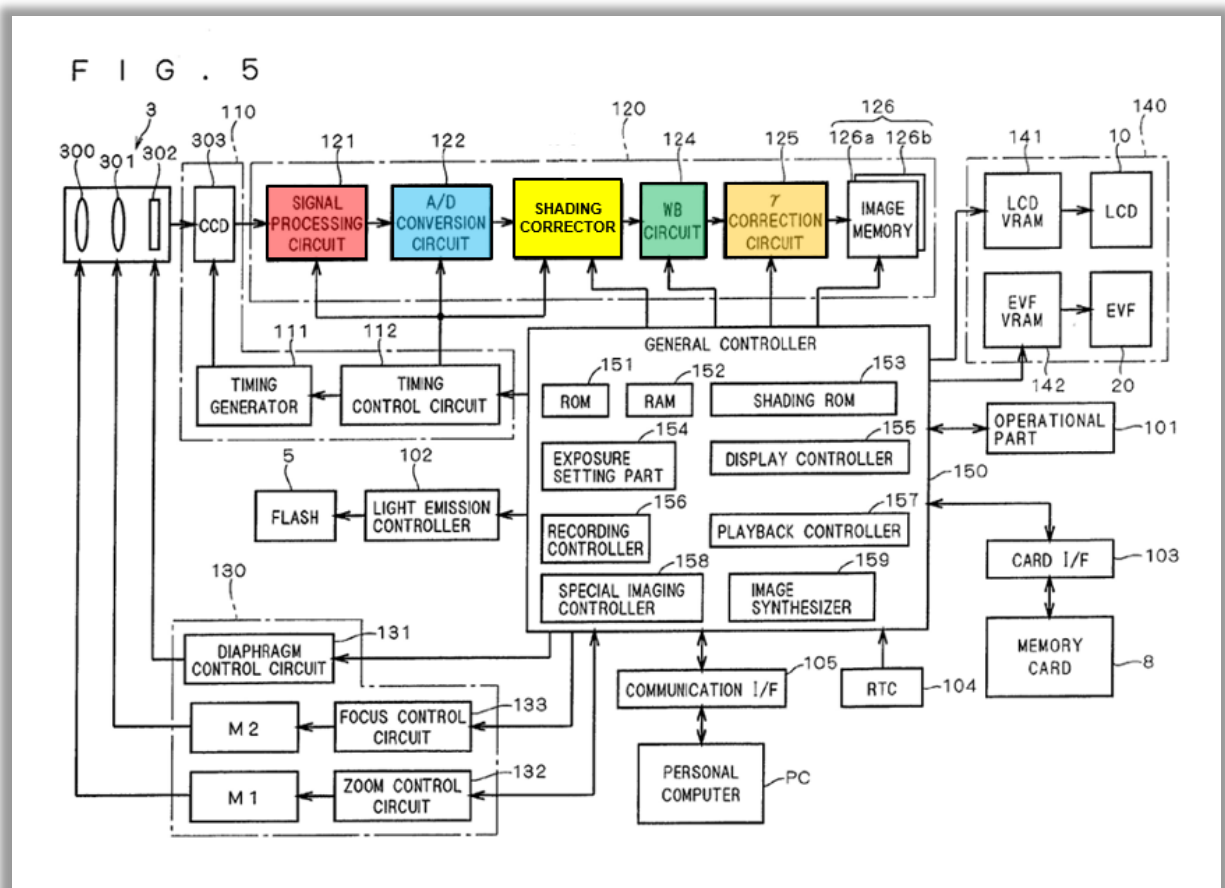
125. Thus, Niikawa discloses a memory storage sub-system (image memory 126 and/or memory card 8).

c. Element [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;”

126. 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-1005, Fig. 5 (with shading corrector processor).

127. 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.

128. 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. 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].

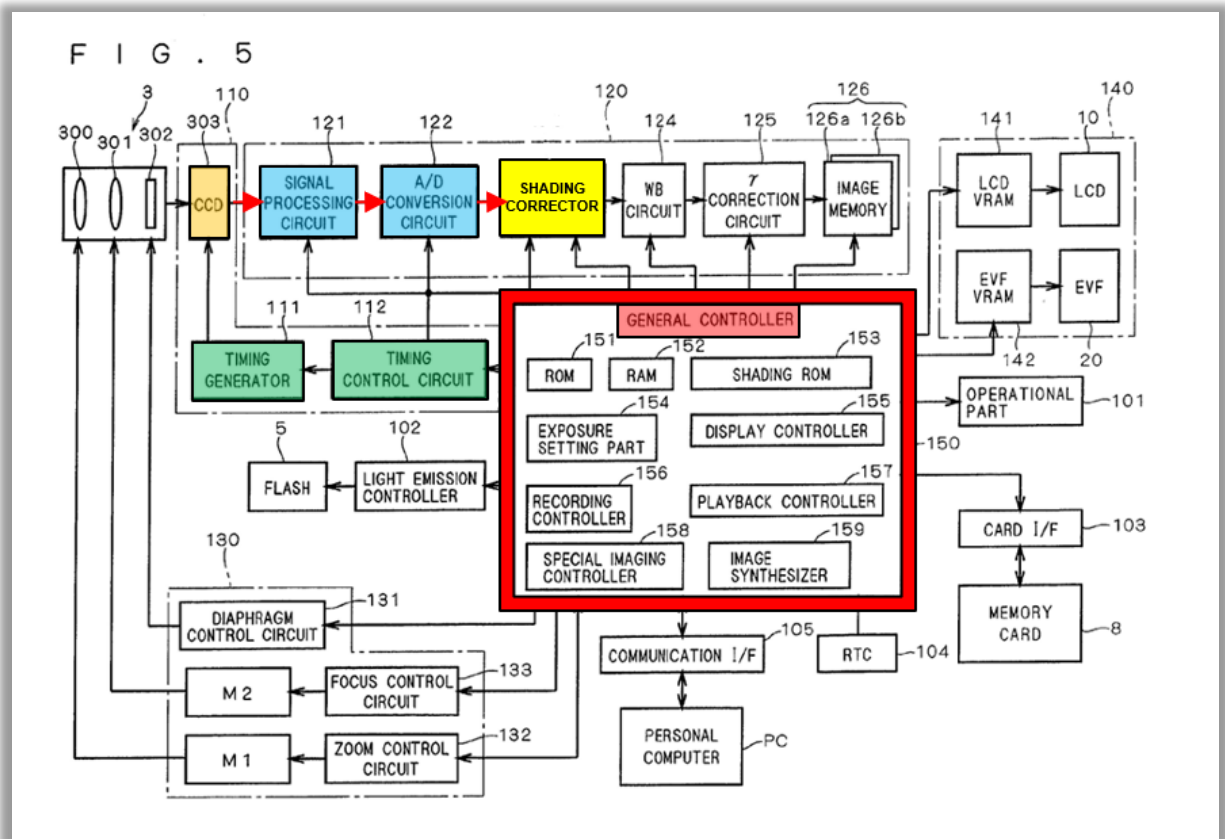
129. Niikawa discloses or renders obvious wherein the aberrations from the

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).

d. Element [9C]

“wherein the microprocessor is used to provide digital and optical data to the digital signal processor;”

130. 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). 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-1005, Fig. 5 (with shading corrector processor).

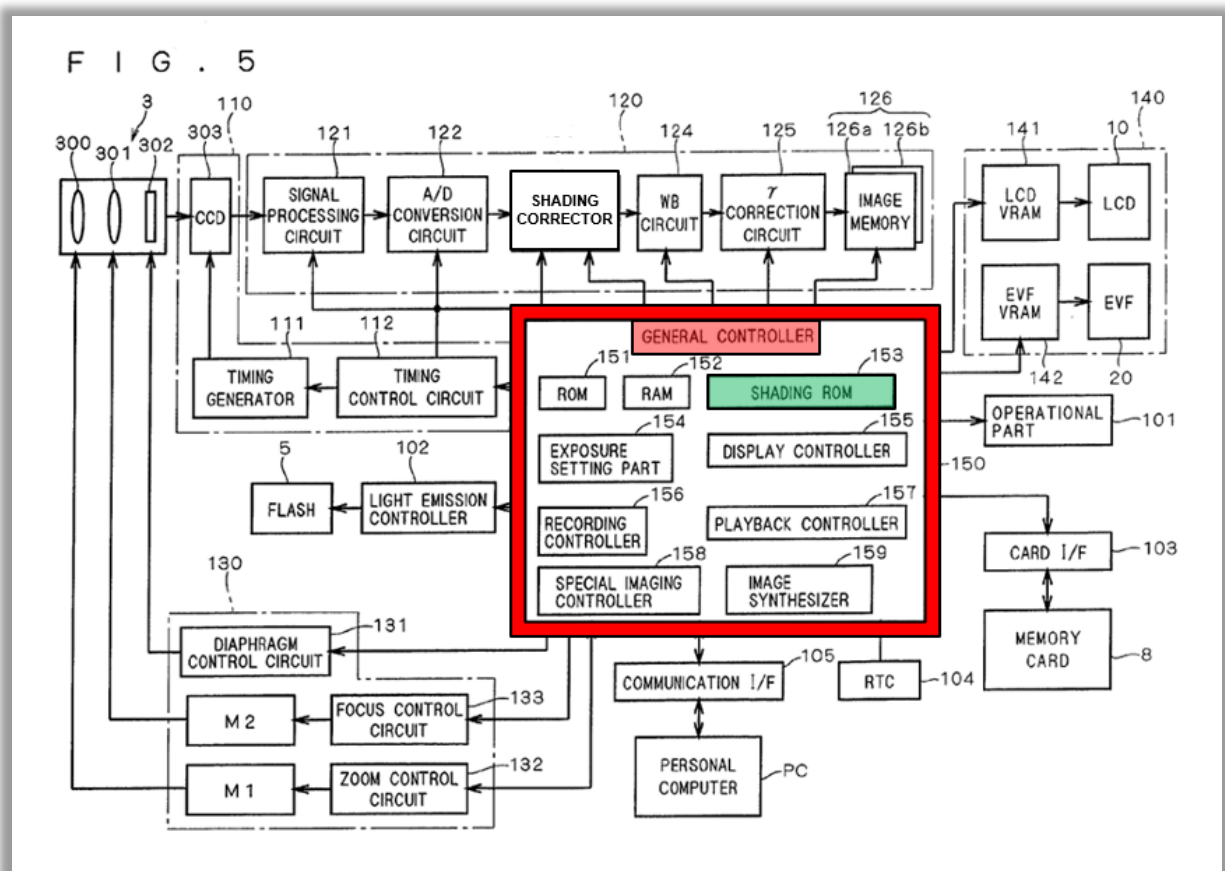
131. Niikawa discloses wherein the microprocessor (general controller 150) is used to provide digital (converted image data) and optical data (data representing optical conditions and aberrations) to the digital signal processor (shading corrector).

e. Element [9D]

“wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;”

132. 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-1005, Fig. 5 (with shading corrector processor).

133. 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. Lens characteristics, such as focal length, aperture, and design, significantly influence optical aberrations. Short focal lengths can exacerbate spherical aberration and chromatic aberration, while longer focal lengths generally reduce these effects. Larger apertures increase spherical aberration and coma by utilizing more of the lens surface, including the periphery where these issues are more pronounced. Lens design, including the use of aspherical and low-dispersion elements, helps correct issues like astigmatism, coma, and chromatic aberration. Advanced coatings and materials further reduce color fringing and distortion. Overall, the interplay of these characteristics determines the quality and clarity of the resulting image. 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.

134. 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.

135. 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. 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.

136. 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).

137. 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.

138. 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).

f. Element [9E]

“wherein the system software forwards the data from the digital sensor to the digital processor;”

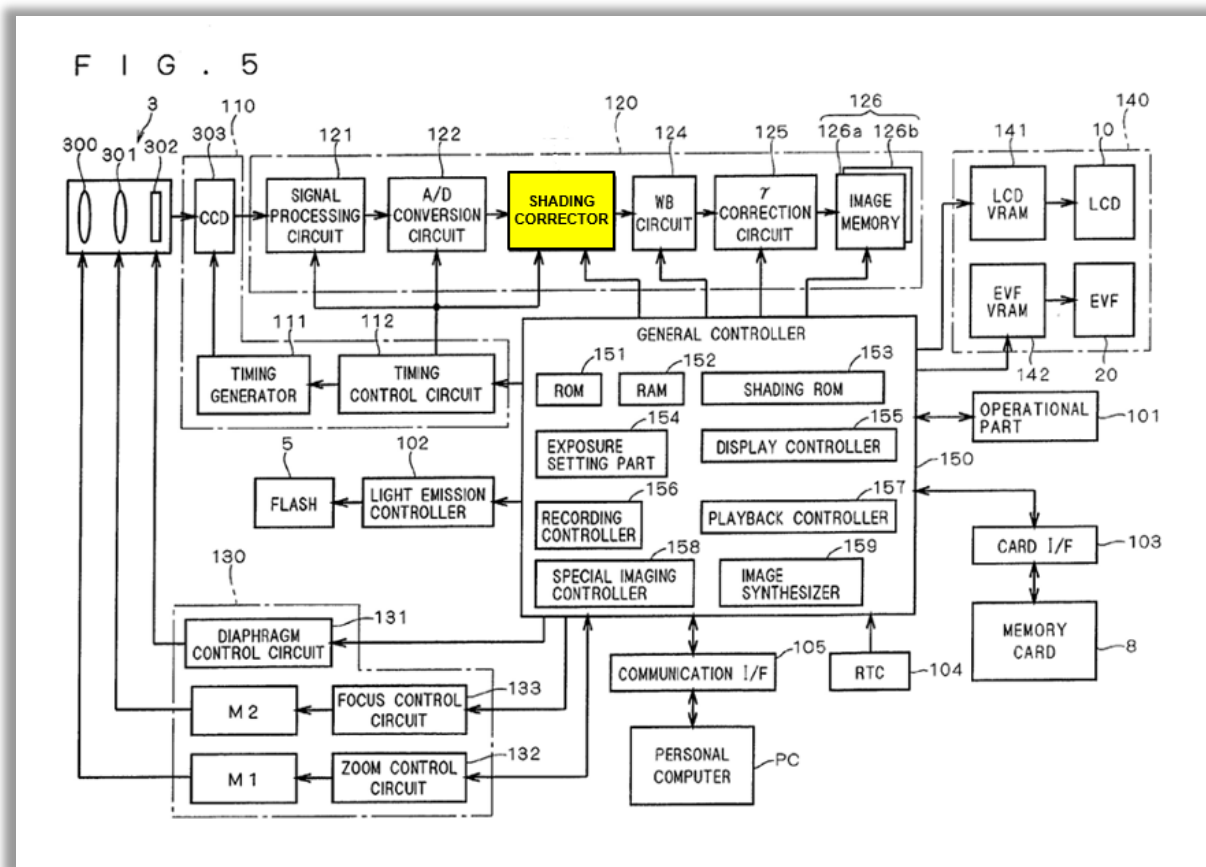
139. Niikawa discloses this limitation as explained in [9C]. Specifically, the programs stored in ROM 151 of general controller 150 control drivings of CCD 303, signal processor circuit 121, and A/D conversion circuit 122 using the timing generator 111 and timing control circuit 112 to forward the data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

140. 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).

g. Element [9F]

“wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;”

141. 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-1005, Fig. 5 (with shading corrector processor).

142. 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.

143. 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).

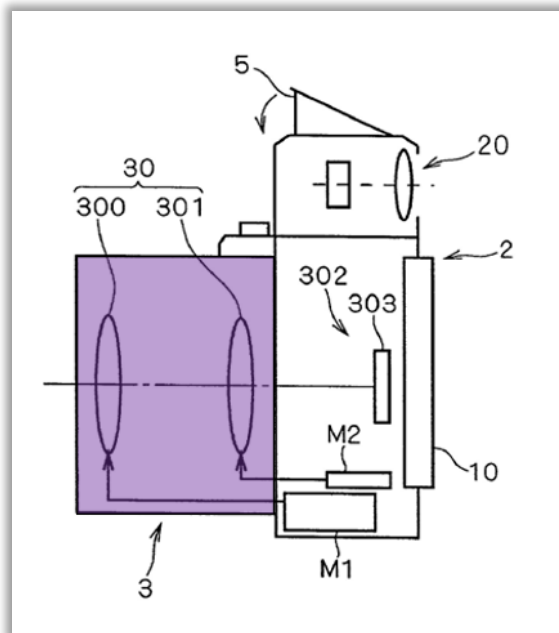
144. A reasonable expectation of success existed as Enomoto discloses that aberration correcting part 56 selects aberration correction procedures, which shading corrector similarly does for shading aberrations, so the modification to select between multiple aberration correction procedures using the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

145. 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).

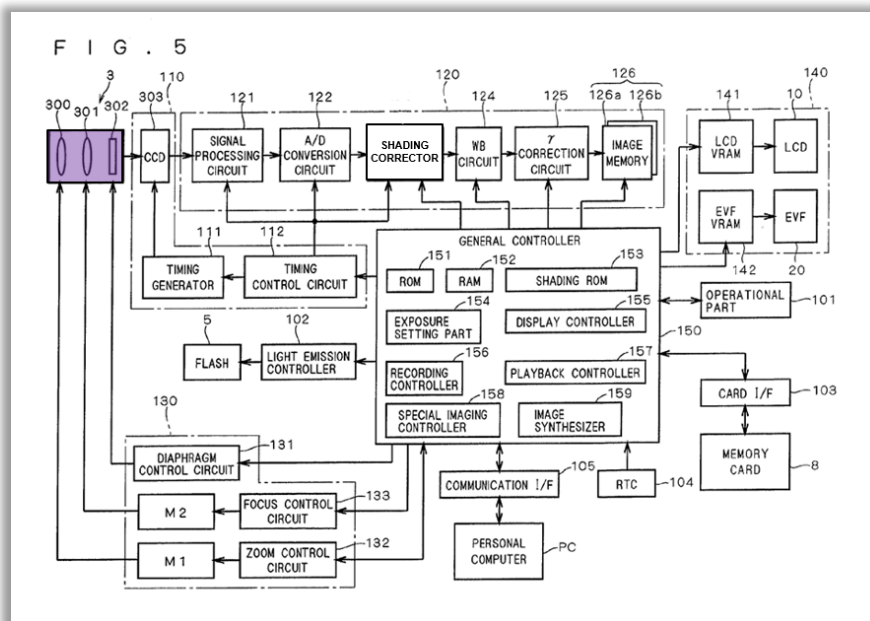
h. Element [9G]

“wherein the lens type is a zoom lens;”

146. 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-1005, Fig. 3.



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

147. Niikawa discloses wherein the lens type (imaging lens 3 including zoom lens 300) is a zoom lens.

i. Element [9H]

“wherein the lens focal length alternates from specific fixed focal length lens settings in a succession of steps;”

148. 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].

149. 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”).

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

j. Element [9I]

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

151. 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).

152. 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.

k. Element [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.”

153. Niikawa discloses this limitation as explained in [9A-9].

154. 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).

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

2. Independent Claim 24

a. Element [24pre]

“A method of image filtration comprising:”

156. 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].

b. Elements [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;”

157. Niikawa discloses and renders obvious [24A-1]-[24A-9] as explained in [9A-1]-[9A-9].

c. Element [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;”

158. Niikawa discloses or renders obvious [24B] as explained in [9B].

d. Element [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;”

159. Niikawa discloses [24C] as explained in [9G] and [9H].

e. Element [24D]

“creating data files corresponding to each focal length lens setting;”

160. 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.

161. Niikawa discloses creating data files corresponding to each focal length lens setting.

f. Element [24E]

“forwarding the data from a digital sensor to the digital signal processor;”

162. Niikawa discloses [24E] as explained in [9E].

g. Element [24F]

“providing digital and optical data to a digital signal processor;”

163. Niikawa discloses [24F] as explained in [9C].

h. Element [24G]

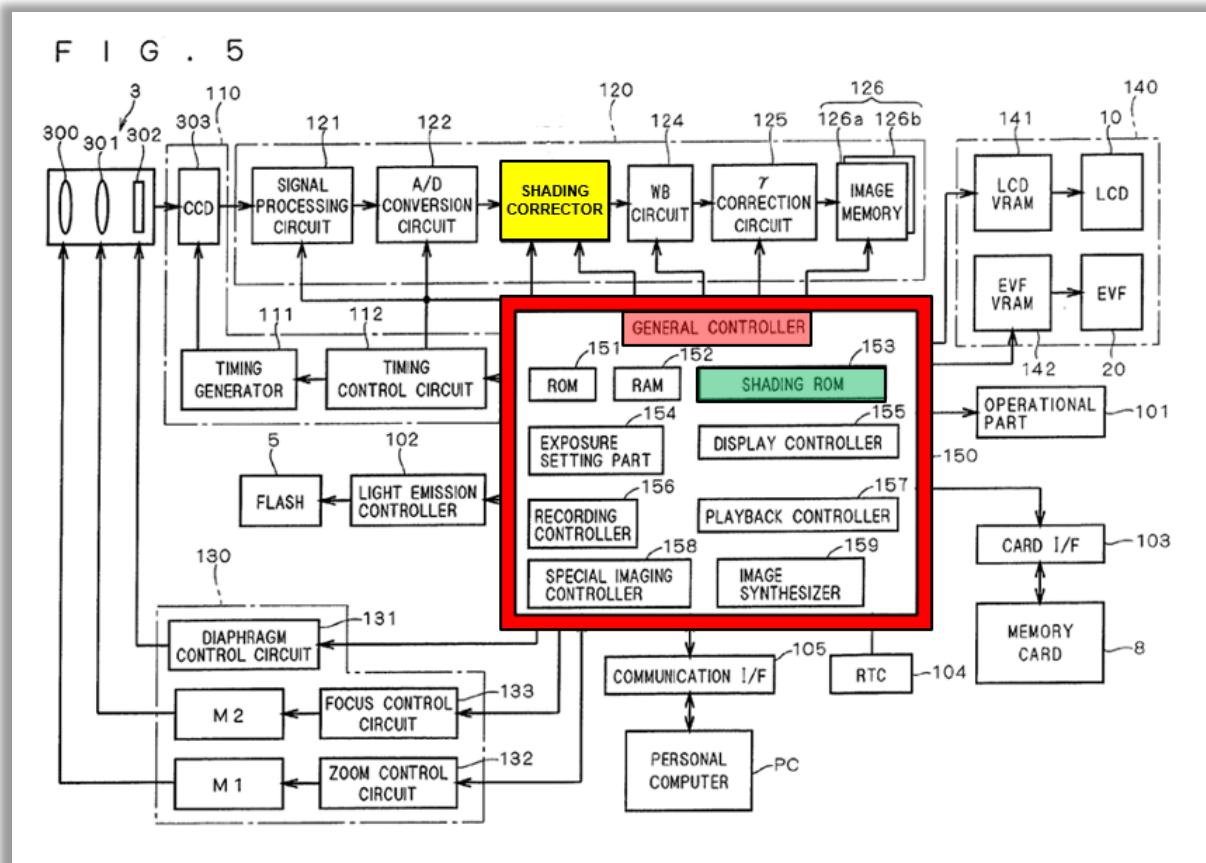
“identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations;”

164. Niikawa discloses or Niikawa in view of Enomoto render obvious [24G] as explained in [9D].

i. Element [24H]

“selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations;”

165. 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-1005, Fig. 5 (with shading corrector processor).

166. 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.

167. 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).

168. 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).

169. 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.

170. 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).

j. Element [24I]

“applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations;”

171. Niikawa discloses [24I] as explained in [9B].

k. Element [24J]

“correcting optical aberrations with digital filtration to modify multiple images from different focal lengths in a succession of data files; and”

172. Niikawa discloses [24J] as explained in [9I].

I. Element [24K]

“storing the modified data files in memory.”

173. Niikawa discloses [24K] as explained in [9A-9] and [9J].

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

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

175. It is my opinion that claims 1-3 and 18-20 are obvious over (a) Niikawa in view of Levien, and (b) Niikawa in view of Enomoto and Levien.

1. Independent Claim 1

a. Elements [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;”

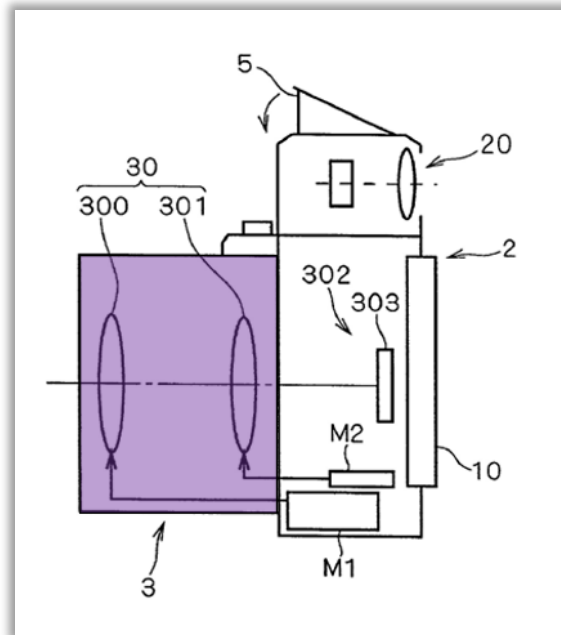
176. Niikawa discloses and renders obvious [1pre]-[1A-9] as explained in [9pre]-[9A-9].

b. Element [1B]

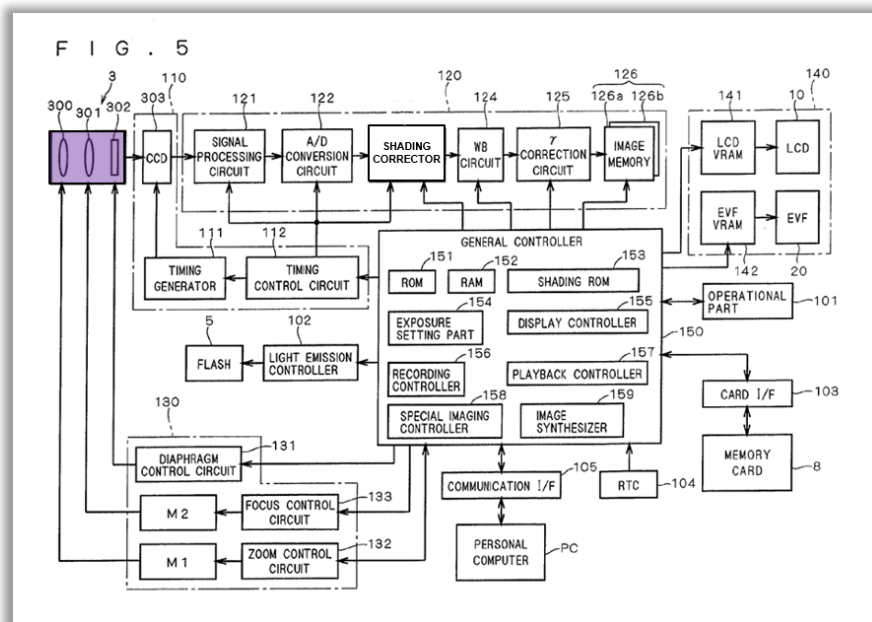
“wherein the optical lens mechanism is a fixed focal length;”

177. 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-1005, Fig. 3.



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

178. 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”).

179. 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. Cameras support interchangeable lenses because each lens has benefits and drawbacks. Zoom lenses allow quick adjustment of composition that allows a user deal with the demands of a changing environment where there is a need to quickly adapt to different shooting conditions. On the other hand, while fixed focal length (typically referred to as a prime lens) do not have this advantage, they will generally have a higher optical quality and fewer aberrations due to their less complex design. A typically user of a camera with interchangeable lenses will have several types of lenses, including both zoom and prime lenses so that can choose the lens that is most appropriate for the situation.

180. Correcting aberrations in fixed focal length lenses also was well known.

Ex-1023, 3:66-5 (disclosing correcting aberrations in fixed focal length lenses); Ex-1024, 40:9-24, 40:44-47 (same); 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”).

181. 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.

182. 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).

183. 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.

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

c. Element [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;”

185. Niikawa discloses [1C] as explained in [9B].

d. Element [1D]

“wherein the microprocessor is used to provide digital and optical data to the digital signal processor;”

186. Niikawa discloses [1D] as explained in [9C],

e. Element [1E]

“wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;”

187. Niikawa discloses [1E] as explained in [9D].

f. Element [1F]

“wherein the system software forwards the data from the digital sensor to the digital processor;”

188. Niikawa discloses [1F] as explained in [9E].

g. Element [1G]

“wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;”

189. Niikawa discloses [1G] as explained in [9F].

h. Element [1H]

“wherein the data are forwarded from the digital sensor to the digital signal processor by an application specific integrated circuit;”

190. 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 [9A-6], a POSA would have known that these circuits either were an ASIC or would have been obvious to replace with an ASIC.

191. 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).

i. Element [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;”

192. 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.

193. 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).

194. 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].

195. 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.

196. 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]. 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.

197. 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).

198. 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. 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].

199. 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).

j. Element [1J]

“wherein the digital signal processor modifies the data file by applying the special effects function; and”

200. Niikawa discloses [1J] as explained in [1I].

201. 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).

k. Element [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.”

202. Niikawa discloses [1K] as explained in [9A-9], [9J].

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

2. Claim 2

“The system of claim 1: wherein the special effects function is a color enhancing function.”

204. 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. 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.

205. 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).

206. 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. 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.

207. Niikawa in view of Levien disclose wherein the special effects function is a color enhancing function.

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

3. Claim 3

“The system of claim 1: wherein the special effects function is a diffusion function of soft effect.”

209. 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. 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.

210. Niikawa in view of Levien render obvious wherein the special effects function is a diffusion function of soft effect.

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

4. Independent Claim 18

a. Elements [18pre]- [18A-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;”

212. Niikawa discloses and renders obvious [18pre]-[18A-9] as explained in [9pre]-[9A-9] and [24pre].

b. Element [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,”

213. Niikawa discloses and renders obvious [18B] as explained in [9B].

c. Element [18C]

“the method consisting of; forwarding the data from a digital sensor to a digital signal processor by an application specific integrated circuit;”

214. Niikawa discloses and renders obvious [18C] as explained in [1H],

[9C], and [9E].

d. Element [18D]

“providing digital and optical data to the digital signal processor;”

215. Niikawa discloses [18D] as explained in [9C].

e. Element [18E]

“identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations:”

216. Niikawa discloses and Niikawa in view of Enomoto render obvious [18E] as explained in [9D].

f. Element [18F]

“selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations:”

217. Niikawa discloses and Niikawa in view of Enomoto render obvious [18F] as explained in [24H].

g. Element [18G]

“applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations:”

218. Niikawa discloses and renders obvious [18G] as explained in [9B].

h. Element [18H]

“applying a fast Fourier transform to a data file in order to satisfy a user specified special effects function;”

219. Niikawa in view of Levien render obvious [18H] as explained in [1I].

i. Element [18I]

“modifying the data file by applying the special effects function using the digital signal processor; and”

220. Niikawa in view of Levien render obvious [18I] as explained in [1I].

j. Element [18J]

“storing the data file in memory.”

221. Niikawa discloses and renders obvious [18J] as explained in [9A-9], [9J].

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

5. Claim 19

“The method of claim 18 further comprising the step of: applying the special effects function as a color enhancing function.”

223. Niikawa in view of Levien render obvious [19] as explained in [1I] and [2].

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

6. Claim 20

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

225. Niikawa in view of Levien render obvious [20] as explained in [11] and [3].

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

C. Ground 3

227. It is my opinion that claims 4-8 and 21-23 are obvious over Niikawa in view of Enomoto and Yamasaki.

1. Independent Claim 4

a. Elements [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;”

228. Niikawa discloses and renders obvious [4pre]-[4A-9] as explained in [9pre]-[9A-9].

b. Element [4B]

“wherein the optical lens mechanism is a fixed focal length;”

229. Niikawa discloses and renders obvious [4B] as explained in [1B].

c. Element [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;”

230. Niikawa discloses and renders obvious [4C] as explained in [9B].

d. Element [4D]

“wherein the microprocessor is used to provide digital and optical data to the digital signal processor;”

231. Niikawa discloses [4D] as explained in [9C].

e. Element [4E]

“wherein the system software is organized to identify specific optical aberrations and to access the database to identify specific corrections to the aberrations;”

232. Niikawa discloses and Niikawa in view of Enomoto render obvious [4E] as explained in [9D].

f. Element [4F]

“wherein the system software forwards the data from the digital sensor to the digital processor;”

233. Niikawa discloses [4F] as explained in [9E].

g. Element [4G]

“wherein the digital signal processor selects a specific procedure to optimize the image and corrects the aberrations;”

234. Niikawa discloses and Niikawa in view of Enomoto render obvious [4G] as explained in [9F].

h. Element [4H]

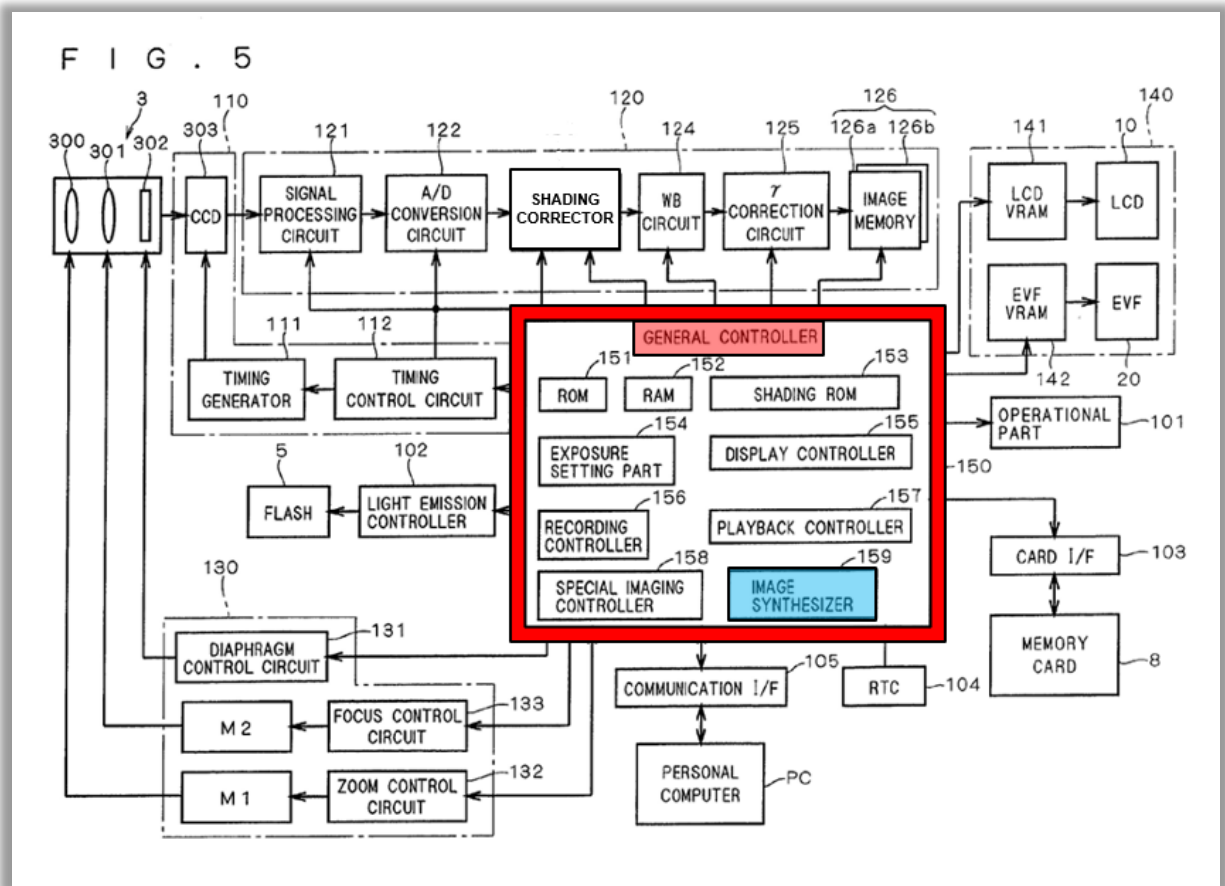
“wherein the data are forwarded from the digital sensor to the digital signal processor;”

235. Niikawa discloses and renders obvious [4H] as explained in [9C], [9E].

i. Element [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;”

236. 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-1005, Fig. 5 (with shading corrector processor).

237. 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. 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].

238. 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].

239. 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).

240. 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.

241. 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.

j. Element [4J]

“wherein the digital signal processor applies filtration only to specific objects in the image;”

242. 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 [41].

243. 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].

244. 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. 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].

245. 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).

246. 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 filter the entire image, just based on a subset of the pixel data.

247. 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).

k. Element [4K]

“wherein the aberrations of the specific objects are corrected; and”

248. Niikawa in view of Enomoto and Yamasaki render obvious [4K] as explained in [4J].

l. Element [4L]

“wherein the digital signal processor forwards the modified date file to storage in memory.”

249. Niikawa discloses [4L] as explained in [9A-9] and [9J].

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

2. Claim 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.”

251. 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). 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.

252. 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.

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

3. Claim 6

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

254. Niikawa in view of Enomoto and Yamasaki render obvious [6] as explained in [4J].

255. 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).

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

4. Claim 7

“The system of claim 4: wherein specific color filtration is applied to objects.”

257. 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].

258. 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).

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

5. Claim 8

“The system of claim 4: wherein specific filtration applied to specific objects is soft effects.”

260. 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. 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.

261. 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).

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

6. Independent Claim 21

a. Elements [21pre]-[21A-9]

“A method of image filtration which comprises: 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;”

263. Niikawa discloses and renders obvious [21pre]-[21A-9] as explained in [9pre]-[9A-9] and [24pre].

b. Element [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;”

264. Niikawa discloses and renders obvious [21B] as explained in [9B].

c. Element [21C]

“the method consisting of; forwarding the data from a digital sensor to a digital signal processor;”

265. Niikawa discloses [21C] as explained in [9C], [9E], and [1H].

d. Element [21D]

“analyzing a data file by the microprocessor to separate specific objects in the image using the differentiation of the depth-of-field;”

266. Niikawa in view of Yamasaki renders obvious [21D] as explained in [4I].

e. Element [21E]

“providing digital and optical data to the digital signal processor;”

267. Niikawa discloses and renders obvious [21E] as explained in [9C].

f. Element [21F]

“identifying specific optical aberrations and accessing a database to identify specific corrections to the aberrations;”

268. Niikawa discloses and Niikawa in view of Enomoto renders obvious [21F] as explained in [9D].

g. Element [21G]

“selecting a specific procedure from the database using the microprocessor to optimize the image and correct the aberrations;”

269. Niikawa discloses and Niikawa in view of Enomoto renders obvious [21G] as explained in [24H].

h. Element [21H]

“applying digital filtration by using the application specific integrated circuit and digital signal processor to correct digital or optical aberrations.”

270. Niikawa discloses and renders obvious [21H] as explained in [9B].

i. Element [21I]

“correcting the aberrations of the specific objects in the image by applying the digital signal processor filtration; and”

271. Niikawa in view of Enomoto and Yamasaki render obvious [21I] as explained in [4J].

j. Element [21J]

“forwarding the modified data file from the digital signal process to storage in memory.”

272. Niikawa discloses [21J] as explained in [9A-9] and [9J].

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

7. Claim 22

“The method of clam 21 further comprising the step of: applying specific color filtration to objects.”

274. Niikawa discloses [22] as explained in [4J] and [7].

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

8. Claim 23

“The method of claim 21 further comprising the step of: applying soft effects filtration to specific objects.”

276. Niikawa discloses [23] as explained in [4J] and [8].

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

D. Secondary Considerations of Non-Obviousness

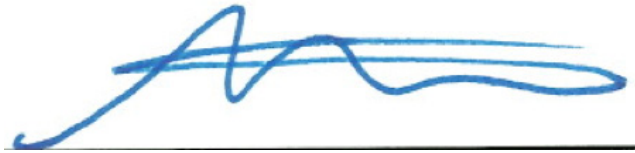
278. I am unaware of any applicable secondary considerations of non-obviousness. None were identified or asserted during prosecution. *See generally* Ex. 1002. Regardless, even if such considerations existed, none would overcome the strong *prima facie* showing of obviousness.

XII. Conclusion

279. For the reasons set forth above, in my opinion, all limitations of all claims of the '805 Patent are disclosed by the prior art (and combinations thereof) cited herein.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the results of these proceedings.

Executed on August 30, 2024 in Notre Dame, Indiana.

A handwritten signature in blue ink, appearing to be 'Robert Stevenson', is written over a solid black horizontal line.

Robert Stevenson