

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONY CORPORATION,

Petitioner

v.

OPTIMUM IMAGING TECHNOLOGIES LLC,

Patent Owner

Case IPR2024-00923

Patent No. 10,873,685

DECLARATION OF DR. OMID KIA

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I. INTRODUCTION

1. I, Dr. Omid Kia, declare as follows:
2. I have been retained as an independent expert in this matter by counsel for Patent Owner Optimum Imaging Technologies LLC (“OIT”). I have been asked to provide my opinions on certain references in the above-identified *inter partes* review (“IPR”) proceeding, IPR2024-00923, involving U.S. Patent No. 10,873,685 (“the ’685 Patent”). I have reviewed the papers and exhibits in this IPR proceeding. I have reviewed the Board’s Institution Decision in this IPR proceeding. I have reviewed other papers and exhibits, as cited and discussed herein.
3. I am being paid for my work preparing this declaration at my normal consulting rate plus reimbursement of direct expenses. My compensation is not tied to the outcome of this matter and is not based on the substance of the opinions that I provide.

II. QUALIFICATIONS

4. I have extensive image processing experience dating back to research and development efforts in a work environment while still going to school dating back to late 1980s. I have in-depth knowledge and experience in a large base of algorithms for image enhancement and correction. I have successfully applied those in medical, military and consumer products. Corrections such as aberrations

and distortions were routinely considered for calibrated uses and considered for severely degraded imaging chains. I have used, modified and created various digital cameras and have provided expert opinion regarding all matters related to digital cameras. I have reviewed software and hardware code for such systems and consulted regarding the same. A copy of my CV is concurrently submitted as EX. 2045.

5. I earned my Bachelor's of Science in electrical engineering from Catholic University America in 1987. In 1989, I completed my Master's of Science in electrical engineering from the University of Illinois at Chicago. I then attended the University of Maryland at College Park, where I earned my Ph.D. in electrical engineering in 1997.

6. A chief focus of my career has been designing and developing computed imaging, video, and content processing systems for medical and other uses, considering all aspects of the user, patient and system components, including the requisite hardware, software, networking, and user-facing system elements. My experience in this space spans industry and academia. For example, after I completed my Ph.D., I took the position of Chief Technical Officer at IMACOM in 1999. In this role, I managed a team of engineers in developing medical imaging software – including both ultrasound and X-ray imaging applications. Among other things, my role involved the development of video pipeline processing, real-time

storage and retrieval of live video, creating custom software applications and integrating custom graphical user interfaces to meet customer demands. For example, I designed algorithms where the user interface exploits the underlying information by interacting with the user interface implemented in desktop, server and mobile environments.

7. My experience includes design and development of systems for video and content processing and communication, among many other concepts, including Video over IP, video surveillance, storage and processing of real-time live video, multimedia compression and communication, and image and video indexing. For example, after I completed my Ph.D., I worked as an Electronics Engineer at the National Institute of Standard and Technology, where I worked on various projects involving multimedia compression and communication and video indexing using media processing tools to develop new and innovative techniques for archiving, processing and transmitting video and other media. I also researched techniques for serving large microscope images annotated with educational pointers for educational purposes and served as the U.S. Ambassador to the MPEG standardization Group working on the standards for MPEG-4 at the time. As another example, while working as a principal consultant for Sigma Vision, I authored several proposals directed to Video Over IP and video surveillance systems, including development of Video Over IP systems for thin clients that

were java enabled. Later on, as President of Sigma Vision, I also performed several large scale consulting projects in the area of Video Over IP.

8. I am currently a senior systems engineer, serving as subject matter expert at Coastal Communication Consultants, Inc. (hereinafter referred to as “CCCi”). In this capacity, I serve as an expert in all of CCCi’s imaging and video data initiatives along with high-technology research and development. I also serve as an expert in all of CCCi’s activities pertaining to video processing, video surveillance, image/signal processing, and other software development problems.

9. Prior to joining CCCi, I served as the Chief Image Scientist at Northstrat Inc. hereinafter referred to as “Northstrat”) and Senior Staff Scientist at ITT Exelis, Space Sciences Division (hereinafter referred to as “ITT Exelis”) in a similar capacity. In my role at ITT Exelis and similarly Northstrat, I led research and development efforts with respect to all high technology development, including in the areas of video processing, compression and standards.

10. ITT Exelis and Northstrat expanded their business into product-based services and as such utilized my innovative approach to develop high technology products that carried a service-based revenue model. ITT Exelis (now part of Harris Corporation) was a leader in Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (“C4ISR”) related products and systems and information and technical services, supplying military,

government, and commercial customers in the United States and globally. ITT Exelis was a pure-play aerospace, defense, and information solutions company with strong positions in enduring and emerging global markets, some 20,000 employees, and 2010 revenues of about \$6 billion.

11. Also at ITT Exelis, I served as one of the leading experts in image and computer vision related activities. In particular I designed the camera processing for a large field of view, multi-sensor camera with field-steerable mirrors to be used in an Unmanned Aerial Vehicle (UAV). I also served as the video processing subject matter expert to address all aspects of video coding and decoding as it pertains to image quality, channel model, display, format, indexing, error recovery and transmission.

12. Prior to joining ITT, I served as the Chief Scientist at Imaging Sciences International, Inc. where my efforts catapulted the company into the leading Cone Beam Computed Tomography (CBCT) provider in the world. The application of CBCT was targeted for the general dental market with first adopters including Implantologists but later to other providers. I also served as the primary Intellectual Property Manager for all patent related work for Imaging Sciences and its affiliates, as well as a subject matter expert for all efforts involving digital imaging. Prior to joining Imaging Sciences, in my roles at Sigma Vision, Portis, and IMACOM, I researched and developed numerous medical and consumer

technologies, involving imaging and signal processing, video processing, Video On Demand, video surveillance, and multimedia communication systems. These activities included hardware and software design throughout the entire system development cycle, including networking and user interface solutions.

13. Also, prior to that, and immediately after my graduation, I continued work in media compression and processing at the Compression Group in the Information Technology Laboratory of the National Institutes of Standards and Technology. In this role, I continued my research and expanded on similar topics across several media forms. In particular, I served as the United States Government ambassador to the MPEG standardization group. I also expanded on my thesis research topic to exploit compressed-domain processing of media for images, video and multimedia content. I worked with engineers who utilized the MPEG standardization body's source code for performance, quality and testing.

14. In these capacities, I have worked on many aspects of video and content systems, including algorithm development, software development, hardware development, networking architecture, and system design. I have also implemented video processing baselines for various products including performance criteria such as video quality, processing and communication requirements.

III. LEGAL PRINCIPLES

15. When interpreting a patent, it is my understanding that it is important to view the disclosure and claims of that patent from the level of ordinary skill in that art at the time of the invention. My opinion of the level of ordinary skill in the art is based on my personal experience working and teaching in the technical field of Internet communications, my knowledge of colleagues and others working in that field, my study of the '685 Patent and its file history, and my knowledge of:

- a. The level of education and experience of persons actively working in the field at the time the subject matter at issue was developed;
- b. The types of problems encountered in the art at the time the subject matter was developed;
- c. The relevant prior art patents and publications;
- d. The activities of others working in that field;
- e. The prior art solutions to the problems addressed by the relevant art; and,
- f. The sophistication of the technology at issue in this case.

16. In determining the level of ordinary skill in the art, I have also considered, among other things: (1) the sophistication of the relevant technology; (2) the rapidity with which innovations are made in that field; and (3) the educational level of active workers in that field. I also understand that these

factors are not exhaustive and are merely a useful guide to determining the level of ordinary skill in the art.

17. Taking the above factors into account, based on my experience in the art and my study of the Internet communication systems disclosed in the '685 Patent, in my opinion a person of ordinary skill in the art (a "POSA" hereafter) would be an individual who, as of July 11, 2006, the filing date of the provisional application, had an electrical engineering degree and three years of relevant experience. I understand this was the POSA definition used by the district court in the case of *Optimum Imaging Technologies LLC v. Canon Inc.*, No. 2:19-cv-00246 (E.D. Tex.). EX. 1027 at 6. I exceeded that level of skill in the relevant time frame.

18. I also note that Petitioner's expert was aware of the district court's claim construction order (EX. 1003 at page 191)(identifying EX. 1027 as reviewed) and did not address the district court's POSA definition. Petitioner's expert did not explain whether his opinions would change under the district court's POSA definition.

19. I understand that Petitioner proposed a POSA would be an individual who had "a bachelor's degree in electrical engineering, physics, or a related field, with at least two years of industry experience and/or research, both concerning digital camera system design and image processing." Petition at 7. I understand

that the Board preliminarily adopted Petitioner's definition in the Institution Decision. Paper 11 at 13.

20. My analysis is the same under either POSA definition. With that said, I disagree with Petitioner's definition at least because it is unbounded regarding what constitutes a related field and unbounded regarding the amount of experience/research. I also disagree with Petitioner's definition because it contradicts the district court's POSA definition. Petitioner's definition requires only two years of industry experience/research whereas the district court's POSA definition requires three years of relevant experience. Petitioner's expert testified that "the relevant experience is vital because of the need to understand the optics as well as the electronics of the – of the devices toward which these claims are referred." Laub Depo Tr. at 14:9-12.

21. Based on the foregoing, I believe that I am qualified to provide reliable opinions in the technical field of the '685 Patent, including regarding what a POSA would have understood from the specification, drawings, claims, and file histories, as well as from the prior art in the field at the time of the invention (July 11, 2006).

22. When offering opinions about how a POSA would evaluate or understand a particular issue, I have placed myself in the mindset of such a POSA, basing my opinions on the relevant education and skillset of such a POSA.

A. ANTICIPATION

23. It is my understanding that “anticipation” exists only if a single alleged prior art reference discloses each and every limitation of the claim at issue, either expressly or inherently. In other words, every limitation of the claim must appear in a single prior art reference for the reference to anticipate that claim. I also understand that all limitations of the claim must be disclosed in the reference as they are arranged in the claim. I also understand that a requirement of a claim that is missing from a prior art reference may be disclosed inherently if that missing requirement is necessarily present in the prior art. I also understand that to be considered anticipatory, the prior art reference must be enabling and must describe the patentee’s claimed invention with sufficient specificity to have placed it in the possession of a POSA. I also understand that a POSA must be able to at once envisage the claimed invention based on the prior art reference without any need for picking, choosing, and combining various disclosures.

B. OBVIOUSNESS

24. I also understand that a patent may be rendered “obvious” based on an alleged prior art reference or a combination of such references plus what a POSA would understand based on his or her knowledge and those references at the time of the alleged invention. It is also my understanding that in assessing the obviousness of claimed subject matter a POSA should evaluate obviousness over

the prior art from the perspective of one of ordinary skill in the art at the time the invention was made (and not from the perspective of either a layman or a genius in that art).

25. It is my further understanding that the question of obviousness is to be determined based on:

- a. The scope and content of the prior art;
- b. The difference or differences between the subject matter of the claim and the prior art (whereby in assessing the possibility of obviousness one should consider the manner in which a patentee and/or a Court has construed the scope of a claim);
- c. The level of ordinary skill in the art at the time of the alleged invention of the subject matter of the claim; and,
- d. Any relevant objective factors (the “secondary indicia”) indicating non-obviousness as I discuss further below.

26. It is also my understanding that the United States Supreme Court clarified the law of obviousness in *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. at 398 and 419 (2007) case (“KSR”), which I have read and incorporate herein by reference. Based on KSR, it is my understanding that to determine whether it would have been obvious to combine known limitations in a manner claimed in a patent, one may consider such things as the interrelated teachings of multiple

patents, the effects of demands known to the design community or present in the marketplace, and the background knowledge of a POSA.

27. It is my further understanding that for a claim to be found invalid as obvious, it must be obvious to a POSA at the relevant time. I also understand that the existence of each and every limitation of the claimed invention in multiple prior art references/systems does not necessarily prove obviousness since most, if not all, inventions rely on building blocks of prior art. Obviousness may be found where, for example, the differences between the subject matter sought to be patented 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 person having ordinary skill in the art to which said subject matter pertains.

28. It is my further understanding that I should consider whether there was a reason that would have prompted a POSA to combine the known limitations in a way the claimed invention does, taking into account such factors as: (1) whether the claimed invention was merely the predictable result of using prior art limitations according to their known function(s); (2) whether the claimed invention provides an obvious solution to a known problem in the relevant field; (3) whether the prior art teaches or suggests the desirability of combining limitations claimed in the invention; (4) whether the prior art teaches away from combining limitations in the claimed invention; (5) whether it would have been obvious to try the

combinations of limitations, such as when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions; and (6) whether the change resulted more from design incentives or other market forces. I also understand that to render a claim obvious, the cited combination of prior art must provide a reasonable expectation of success for the proposed combination.

29. It is also my understanding that in developing opinions as to whether or not certain claimed subject matter would have been obvious, each claim of a given patent should be considered in its entirety and separately from any other claims. In so doing, it is my understanding that while I should consider any differences between the claimed invention and the prior art, I should also assess the obviousness or non-obviousness of the entirety of a claim covering an alleged invention, not merely some portion of it.

30. It is my further understanding that although the KSR decision I identified above has led to the elimination of the “teaching, suggestion or motivation” test as the sole test for judging whether the prior art can be combined for the purposes of an obviousness assertion, the use of “impermissible hindsight” is still inappropriate when making such an assertion. For example, § 2142 of the Manual of Patent Examining Procedure (“MPEP”) includes a specific direction to Patent Examiners that: “[t]he tendency to resort to “hindsight” based upon

applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.” In my opinion, this direction to Examiners is equally applicable to experts who assert that the general knowledge of a POSA and/or a combination of references invalidates a patent claim through obviousness.

31. I have also been informed that in cases such as the decision *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), the Court of Appeals for the Federal Circuit (the “CAFC”) has stated that, “[c]are must be taken to avoid hindsight reconstruction by using the patent in suit as a guide through the maze of prior art references, combining the right references in the right way so as to achieve the result of the claims in suit.” In my opinion, this is also important because, as the Supreme Court also stated in *KSR* at pp. 418-19, “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building

blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.”

32. Additionally, and also relevant to the above caution to avoid hindsight, it is my understanding that it is not enough to find that prior art references could be combined, and that to show obviousness one must prove that a POSA would actually combine the multiple references to arrive at the claimed invention, including showing that a POSA would be motivated to do so. For example, in the case *PersonalWeb Technologies, LLC v. Apple, Inc.*, 848 F.3d 987, 994 (Fed. Cir. 2017), the Federal Circuit clarified that “obviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.” (Emphasis in original.)

33. It is also my understanding that I should consider any secondary considerations that may shed light on the non-obviousness of the claims, such as:

- a. Whether the invention was commercially successful as a result of the merits of the claimed invention (rather than the result of design needs or market-pressure advertising or similar activities);
- b. Whether the invention satisfied a long-felt need;
- c. Whether others had tried and failed to make the invention;
- d. Whether others invented the invention at roughly the same time;

- e. Whether others copied the invention;
- f. Whether there were changes or related technologies or market needs contemporaneous with the invention;
- g. Whether the invention achieved unexpected results;
- h. Whether others in the field praised the invention;
- i. Whether persons having ordinary skill in the art of the invention expressed surprise or disbelief regarding the invention;
- j. Whether others sought or obtained rights to the patent from the patent holder; and,
- k. Whether the inventor proceeded contrary to accepted wisdom in the field.

IV. PRIORITY DATE OF THE ‘685 PATENT

34. The Petition acknowledges that the ‘685 Patent claims priority to the provisional application filed July 11, 2006. Petition at page xiii.

35. Neither Petitioner nor its expert identified any limitations of the claims of the ‘685 Patent that allegedly lack written description support.

36. In my analysis herein, the relevant time of invention is July 11, 2006. In contrast, Petitioner’s expert analyzed the time of invention as July 11, 2007. EX. 1003 at ¶¶50, 52. Petitioner’s expert stated that “the earlier date would change the scope of the POSITA’s background knowledge by limiting it to subject matter that

would have been known to practitioners on July 11, 2006, rather than July 6, 2007.” EX. 1003 at ¶56. Petitioner’s expert did not identify what background knowledge would change including as it relates to, for example, reasonable expectation of success.

V. **BACKGROUND TO THE FIELD OF TECHNOLOGY**¹

37. A POSA would understand that all digital cameras are designed to capture images by focusing light through a lens which usually includes an aperture that adjusts the amount of light reaching the sensor.

38. A POSA would understand that the materials used to manufacture a lens affect the size, weight, price, and performance of a particular lens. An image captured through a lens will have certain optical aberrations. The nature and degree of the optical aberrations may be affected by the quality of the glass, lens coatings, and other materials used to manufacture the lens; as well as the capture settings of the camera including focal length, focusing distance, and aperture value.

39. A POSA would understand that even the highest quality and most expensive lenses are unable to capture “perfect” images and there will always be certain optical aberrations in images captured by digital cameras.

¹ I note that this section includes citations to the ‘805 Patent and that the ‘805 Patent shares a common specification with the related ‘339 and ‘685 Patents.

40. A POSA would understand that optical aberrations relate to optical problems caused by, for example, lens-specific imperfections, whereas digital aberrations relate to digital problems caused by, for example, dust on the digital sensor (e.g., CCD or CMOS), hot (e.g., too bright) or dead (e.g., too dark) pixels, or resulting moire patterns or aliasing. This understanding is consistent with the disclosure in the common specification. *See, e.g.*, ‘805 Patent at 3:23-4:38 (discussing optical problems); 4:40-6:59 (discussing digital problems); 8:4-8 (discussing optical aberrations versus digital aberrations); 11:49-59 (listing exemplary optical aberrations including spherical, comatic, astigmatism, distortion (pin cushion and barrel distortion), curvature of field, chromatic, etc.); 16:21-46 (discussing dust on a digital sensor); 16:47-57 (discussing hot/dead pixels).

41. Petitioner’s expert stated that “the person reading this [patent specification] is left uncertain as to what the inventor means by digital aberrations.” Laub Depo Tr. at 17:6-8; *see also* Laub Depo Tr. at 16:3-17:8 (context for question “in your opinion, is there a difference between an optical aberration and a digital aberration”). When referred to the exemplary discussion in the patent specification (‘805 Patent at 8:4-8), the expert testified that “because these are nonlimiting, there is no indication that a full list of either of those might include some items present in the other.” Laub Depo Tr. at 17:9-18:15. I disagree with Petitioner’s expert at least because a POSA would understand the difference

between optical aberrations and digital aberrations, particularly given the discussion in the patent specification.

42. A POSA would understand that, historically, post-production digital editing software (e.g., Adobe Photoshop) was used to correct optical and digital aberrations. However, as disclosed in the common specification, using post-production software was time-consuming, expensive, and requires considerable skill. *See, e.g.*, ‘805 Patent at 6:33-44.

43. A POSA would be familiar with a digital signal processor (“DSP”) generally. This is a term of art and refers to a specific type of hardware component. As discussed below, the claimed DSP must be capable of specific functionality.

44. A POSA would be familiar with an application specific integrated circuit (“ASIC”) generally. This is a term of art and refers to a specific type of hardware component.²

45. I disagree that an ASIC is an “off-the shelf” component. IPR2024-00924, Petition at 14; IPR2024-00924, Paper 10 at 18. An ASIC is a custom designed integrated circuit, designed for a specific application as the name itself states. In the digital camera industry, ASICs are usually proprietary and specific to

² During deposition, Petitioner’s expert would not answer whether ASIC is or is not a term of art. Laub Depo Tr. at 46:15-50:10. I disagree. An ASIC is a term of art and refers to a specific type of hardware as discussed herein. This is also consistent with the knowledge of a POSA including as described in the Ralston reference (IPR2024-00924, EX. 1081) discussed herein.

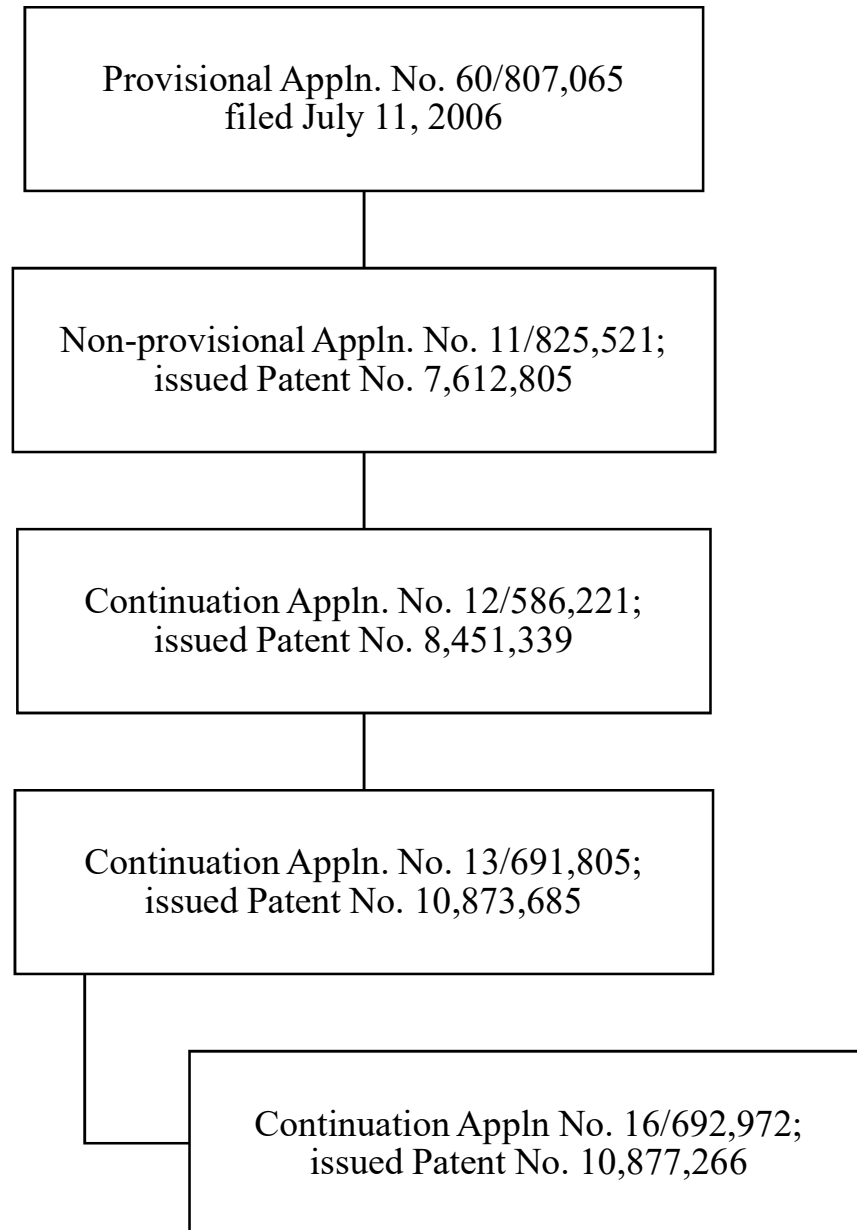
the camera manufacturer and for example, a product line. The design process is complex and expensive. A POSA would not simply take discrete circuits and stick them together to form an integrated circuit, let alone an application specific integrated circuit. Typically, a POSA would start with a requirements document, then create an engineering specification, and then proceed with research/development/design of an appropriate architecture and fabrication. This is a significant undertaking often involving many engineers. Once the specific application (or applications plural) are defined, the engineers must figure out the right design often requiring revision before fabrication. The fabrication process, a completely different engineering task, is at the subatomic level so the engineers must consider cross coupling effects in an integrated circuit given that the circuits themselves create an electro-magnetic field. Cross coupling effects can cause unwanted changes or interference in the performance. If the resulting prototype is unsuccessful, then the whole process must begin again.

VI. INTRODUCTION TO THE CHALLENGED PATENT³

46. All of the patents claiming priority to Provisional Application No. 60/807,065 filed on July 11, 2006 share the same specification. I understand that Petitioner has challenged Patent No. 7,612,805 in IPR2024-00924, Patent No.

³ I note that this section includes citations to the '805 Patent and that the '805 Patent shares a common specification with the related '339 and '685 Patents.

8,451,339 in IPR2024-00925, Patent No. 10,873,685 in IPR2024-00923, and Patent No. 10,877,266 in IPR2024-01046. The relevant portion of the family tree is shown below:



47. Petitioner challenges claims 1-19 and 22-30 of the '685 Patent in this IPR. Petition at 1. Challenged claims 1, 6, and 14 are independent.

48. The '685 Patent claims systems and methods that perform in-camera aberration correction using novel and non-obvious combinations of hardware and software. '805 Patent at Abstract (“A system is disclosed for the automated correction of optical and digital aberrations in a digital imaging system.”)

49. As explained in the specification:

- “Though every major advance in photography has solved an important problem, there are still remaining photographic problems to be solved in order to meet the goals of optimizing optical imaging quality while increasing simplicity and efficiency and lowering cost.” ‘805 Patent at 3:13-17 (emphasis added).
- “The present system dramatically improves image quality. This digital imaging system eliminates, or minimizes, post-production processes. In addition, the system presents substantial cost savings as well as time savings relative to existing digital imaging systems because of the automation of integrated in-camera optical and digital corrections of aberrations.” ‘805 Patent at 7:13-20.

50. As further explained in the specification, “[t]his in-camera corrective feature provides a powerful tool to rapidly manipulate an image without using post-production editing software tools.” ‘805 Patent at 16:8-11.

51. The specification discloses various embodiments that use specific hardware with specific functionality. The specific hardware disclosed in the specification includes, for example, a digital camera mechanism, an optical lens mechanism, a digital sensor, a microprocessor, a digital signal processor (DSP), and an application specific integrated circuit (ASIC). For example, the specification explains that “[d]igital filtration is performed by employing the **DSP hardware** as well as specific software in order to attain specific aberration corrections.” ‘805 Patent at 31:1-3 (emphasis added). The specification also explains that an ASIC is hardware. ‘805 Patent at 12:2-5. This is consistent with the knowledge of a POSA understanding DSP and ASIC to refer to hardware as discussed above. This is also consistent with the petition’s characterization of an ASIC as “dedicated hardware”. IPR2024-00924, Petition at 12 (citing EX. 1081 “Ralston” at 7:48-8:23). This is also consistent with Ralston’s characterization of ASICs as “fixed hardware”. IPR2024-00924, EX. 1081 at 8:5-16.

52. The inventor, Neal Solomon, realized the claimed technology efficiently balances competing considerations including space, cost, time, and power in camera design. As recognized by Petitioner’s expert, there is a balance between “cost and manufacturing efficiencies” in camera design. EX. 1003 at ¶ 107; IPR2024-00924, EX. 1003 at ¶ 111; Laub Depo Tr. at 20:16-21:8. Petitioner’s expert testified that, for example, computation time would be considered by a

POSA as a factor when designing a camera, “if there is a consideration for how quickly a finished result can be delivered.” Laub Depo Tr. at 24:5-8. Petitioner’s expert testified that, for example, memory storage capacity would be considered by a POSA as a factor when designing a camera, “generally having to do with how high performance the camera and its internal processes are to be.” Laub Depo Tr. at 25:1-5.

53. In general, a POSA designing a camera would always want a smaller, less expensive, faster, and more powerful camera, but how to balance these competing considerations is complex. The claimed technology provides a novel and non-obvious solution to this problem. In particular, the claimed in-camera aberration correction systems provide an efficient distribution of the workload using the claimed hardware and software.

VII. CLAIM CONSTRUCTION⁴

54. It is my understanding that the first step in a proper invalidity analysis requires construing the relevant claims to determine their scope and meaning in view of the patent’s specification, file history, and the understanding of a POSA.

55. I understand the Court previously construed certain terms of the ‘805 and ‘339 Patents. EX. 1027.

⁴ I note that this section includes citations to the ‘805 Patent and that the ‘805 Patent shares a common specification with the related ‘339 and ‘685 Patents.

56. I understand that in IPR2024-00923, Petitioner identified the below terms/phrases for construction.

- “uses ... software to identify at least one optical image aberration” is met by “software accessing a database to obtain correction parameters based on particular optical system parameters like the lens and focal length”
- “vignetting” means “an effect in which the edges of an image are darker than the image’s center”

Petition at 7-8.

57. I understand that in the Institution Decision in IPR2024-00923, the Board did not expressly construe any claim terms/phrases identified by Petitioner Paper 11 at 14.

58. The terms/phrases identified by Petitioner do not affect my analysis herein. I use the plain and ordinary meanings of all terms/phrases in my analysis. In my opinion, the Court’s construction of “vignetting” identified by Petitioner is consistent with the plain meaning of the term.

A. “DATABASE MANAGEMENT SYSTEM” AND “DATABASE”

59. I understand that Petitioner did not propose a construction for either “database management system” or “database”. I interpret these terms to have their plain and ordinary meaning in the context of the ‘685 Patent.

60. I understand that Petitioner analyzed a database management system as “software used to create, store, retrieve, change, manipulate, sort, format and print... information in a database.” Petition at 18. I do not disagree with the basic premise of this definition as it is generally consistent with the plain and ordinary meaning of “database management system”, except that the meaning of “print” is unclear in the context of the ‘685 Patent. I do not offer that definition as an express construction for “database management system” because I believe the plain and ordinary meaning is sufficient and would be understood by a POSA in the context of the ‘685 Patent.

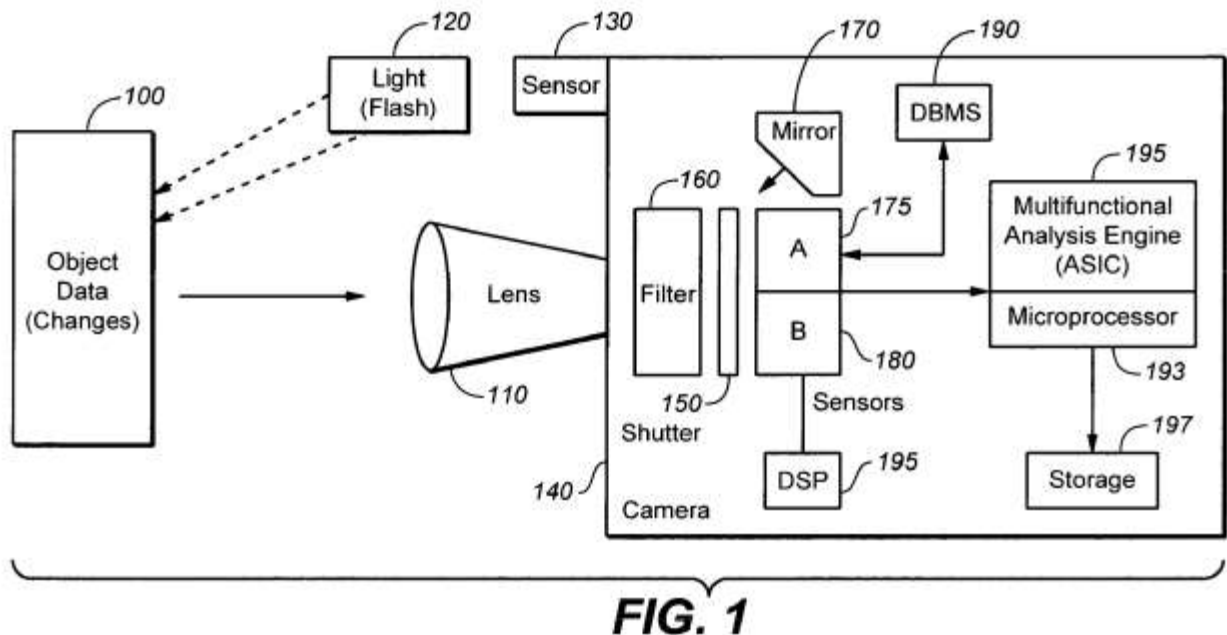
61. I understand that the Board preliminarily interpreted claim 1 of the ‘685 Patent to equate “database management system” and “database” due to antecedent basis. Paper 11 at 22-24.⁵ I address the Board’s preliminary analysis of claim 1 as discussed herein.

62. The use of the claimed DBMS/database is not merely executing code, running on a main CPU, to access a fixed look-up table of parameters as discussed herein with respect to for example Watanabe. A POSA would understand that the DBMS operates in conjunction with the database as discussed herein. In my

⁵ I understand that the Board preliminarily found in IPR2024-00925 that Petitioner’s contentions that “Watanabe’s tables comprise a database” and that “Watanabe describes using a database” were sufficient to meet the reasonable likelihood standard of showing that Watanabe teaches a DBMS. IPR2024-00925, Paper 10 at 19. I respectfully disagree as discussed herein.

opinion, a POSA would not interpret the claims as merely requiring executable code, running on a main CPU, that accesses a fixed look-up table as discussed herein with respect to for example Watanabe.

63. I understand that the Board reviewed FIG. 1 of the '685 Patent and specifically referred to reference number 190 identifying "DBMS". In my opinion, a POSA would understand that DBMS is the acronym for database management system which operates with database 190.



'805 Patent, FIG. 1

64. In the specification, reference number 190 describes "a database". '805 Patent at 29:65-66 ("A database (190) is connected to at least one sensor (A or B) as well."). Although the same reference number 190 is used for DBMS in the figure and database in the description, a POSA would understand that a DBMS is

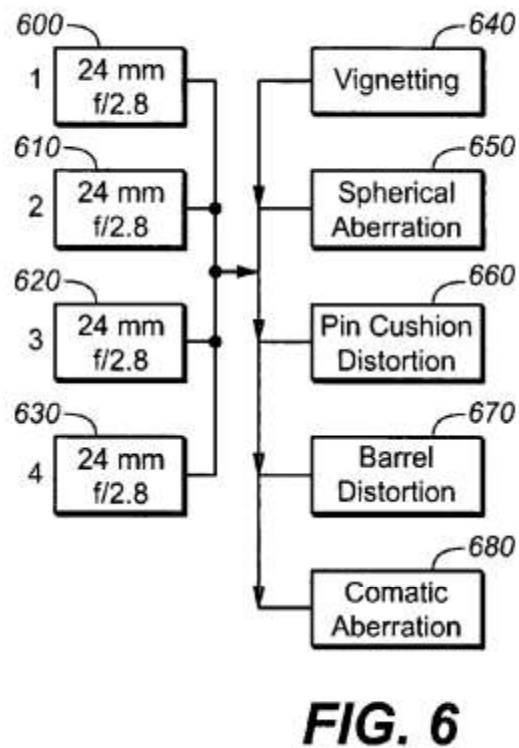
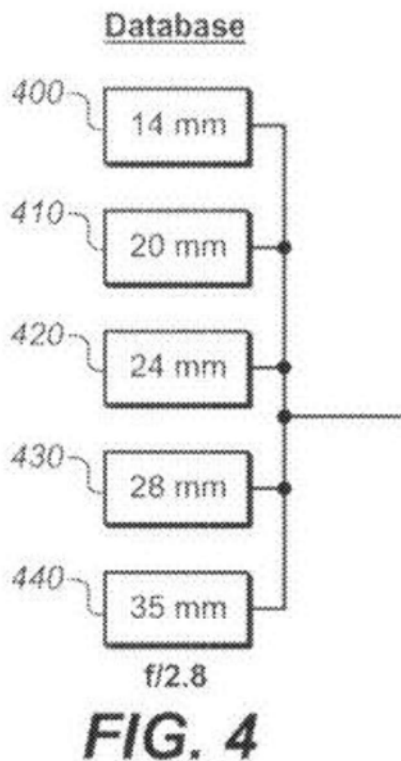
used to organize/manage/update the database. A POSA would understand that the DBMS and the database may be located on the same hardware component.

65. The specification also describes for example:

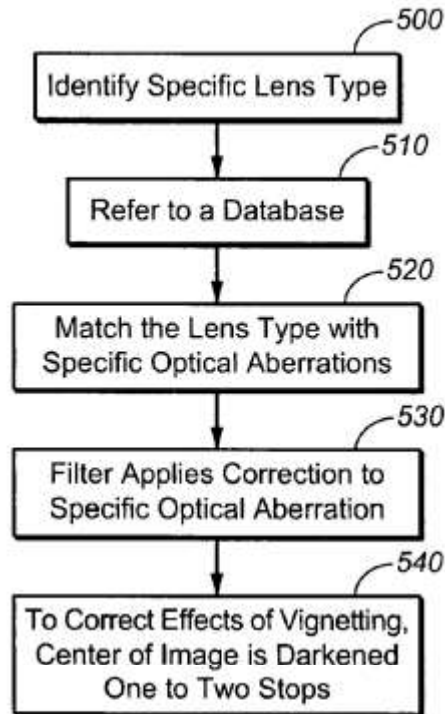
- “[T]he camera identifies a specific lens and refers to a database that matches the lens type with the specific aberrations.” ‘805 Patent at 10:49-51.
- “The in-camera digital process works by identifying a specific lens and comparing the lens pattern to an internal database.” ‘805 Patent at 10:63-65.
- “[E]ach lens with a unique optical formula will have specific aberrations, the corrections for which will be accessible in a database.” ‘805 Patent at 11:13-15.
- “The dynamics of correcting multiple simultaneous aberrations may be complex, but since the number and type of aberrations are constrained to a specific lens type, a centralized database may be accessed with specific corrections for each respective aberration.” ‘805 Patent at 12:32-37.
- “For a fixed focal length lens, the camera refers to a database of information to provide information to correct specific types of aberrations; for a zoom lens, the camera's database contains multiplex information for each focal length in each respective zoom lens type.” ‘805 Patent at 26:24-29.

66. FIG. 4 shows an exemplary “database” with a list of several different wide angle lenses, each with f/2.8 apertures. ‘805 Patent at 30:38-41. FIG. 6 also

shows an exemplary “database” configured for “several different types of 24 mm f/2.8 lenses (600 to 630) with different optical configurations” and the specification explains that “[t]he database is accessed to provide the multi-objective optimization solution for correcting several different optical aberrations for each specific lens formula.” ‘805 Patent at 30:51-59.



67. FIG. 5 also shows an exemplary “digital corrective process” where “[a]fter a specific lens type is identified (500) and a database is referenced (510), the lens type is matched with the specific optical aberrations (520).” ‘805 Patent at 30:44-47.

**FIG. 5**

68. The specification also describes that though multiple aberrations may be corrected simultaneously, it is possible to omit a specific correction in order to induce a particular creative effect. *See, e.g.*, ‘805 Patent at 12:21-27.

69. The specification also describes the database is updatable:

- “[S]oftware files are periodically downloaded to the camera in order to update the camera settings and the database system.” ‘805 Patent at 28:44-46.
- For example, “as the camera manufacturer provides new lenses for the camera, it becomes necessary to load new updated settings to accommodate corrections for the new lenses.” ‘805 Patent at 28:46-49.

- As another example, “as the camera requires new software updates with improved algorithms to further optimize the corrective functions of both the optical and digital mechanisms, the camera will automatically accept these.” ‘805 Patent at 28:49-52.

70. The specification explains that the updatable database is a “particularly important” feature to both the manufacturer and the user. ‘805 Patent at 28:53-56 (“This feature is particularly important to both manufacturer and user because the ability to update software capability periodically will protect a user from needing to upgrade major hardware such as with a lens replacement.”)

71. Because the database may contain many different lens types (that the camera owner may utilize, add, or remove from their inventory) and many different aberration corrections for each lens type, and because the database may be used to correct multiple simultaneous aberrations, and because the database is updatable, the database is used with a DBMS to organize/manage/update the information. This is similar to Petitioner’s expert opinion that a DBMS would be understood as being used to create, store, retrieve, change, manipulate, sort, and format information in the database. EX. 1003 at ¶175. This is also similar to Petitioner’s statement that the “DBMS is software interfacing between an application and a database – not a database itself.” Petition at 22.

72. I also understand that the Board preliminarily rejected requiring the “database” to be updatable. Paper 11 at 23. I disagree with the Board’s analysis as discussed herein. The claims expressly recite a DBMS, and in context of the ‘685 Patent, a POSA would understand that the claimed database is updatable. Updating the database is one of the functions performed by the DBMS.

73. Using a DBMS allows flexibility, updatability, and scalability of the data in the database. In my opinion, the claimed DBMS/database is unconventional as further discussed herein and the inventor recognized the functional benefits of the claimed DBMS/database including flexibility, updatability, and scalability as discussed herein. In my opinion, a POSA reading the specification would understand that the claimed DBMS facilitates organizing/managing/updating the data in the database in a more efficient way to achieve compactness of data, without unnecessarily duplicating data in tables and increasing the memory requirements. Furthermore, the ability to organize/manage/update a database with the DBMS allows continued efficient organization/management of data as new data is introduced.

B. “AN INTEGRATED CIRCUIT INCLUDING; A DIGITAL SIGNAL PROCESSOR CONFIGURED TO ACCESS A DATABASE MANAGEMENT SYSTEM”

74. Claim 1[a] recites: “an integrated circuit including; a digital signal processor configured to access a database management system”.

75. Claim 6[a] recites: “an integrated circuit including a digital signal processor configured to access a database management system”.

76. Claim 14[a] recites: “an integrated circuit including a digital signal processor configured to access a database management system”.

77. I understand that in the Institution Decision, the Board stated that “Petitioner’s contentions inherently construe the term to mean an IC that includes a DSP, where the IC is configured to access a DBMS” (Paper 11 at 19-20) and that “Patent Owner’s contentions inherently construe the term to mean an IC that includes a DSP, where the DSP is configured to access a DBMS” (Paper 11 at 20).

78. The Board preliminarily agreed with Petitioner’s interpretation. Paper 11 at 20; *see also, e.g.*, claim 14[e] (“wherein the integrated circuit uses system software to access the database...”).

79. I use Petitioner’s interpretation in my analysis herein.

VIII. INTRODUCTION TO THE GROUNDS

80. I understand that the following grounds are at issue in this IPR. In this declaration, I use the same claim annotations as Petitioner for convenience and clarity during review. Petition at 78-82.

Ground	Claims	35 U.S.C. §	References
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1	1, 2, 5–7, 11, 12, 14, 15, 17, 27, 29	103	Watanabe (EX. 1005)
2	3, 13, 19	103	Watanabe + Kishida (EX. 1007)
3	4, 8, 9, 16	103	Watanabe + Kita (EX. 1008)
4	10, 18, 28, 30	103	Watanabe + Takane (EX. 1009)
5	22, 23, 25	103	Watanabe + Hisamatsu (EX. 1010)
6	24	103	Watanabe + Turner (EX. 1011)
7	26	103	Watanabe + Liege (EX. 1012)
8	1, 2, 6, 7, 10, 12, 14, 15, 17, 18, 27, 28, 30	103	Takane + Watanabe

81. I have reviewed the Patent Owner Preliminary Response in this IPR and I agree with the arguments that are incorporated and further addressed herein.

IX. GROUND 1 BASED ON WATANABE

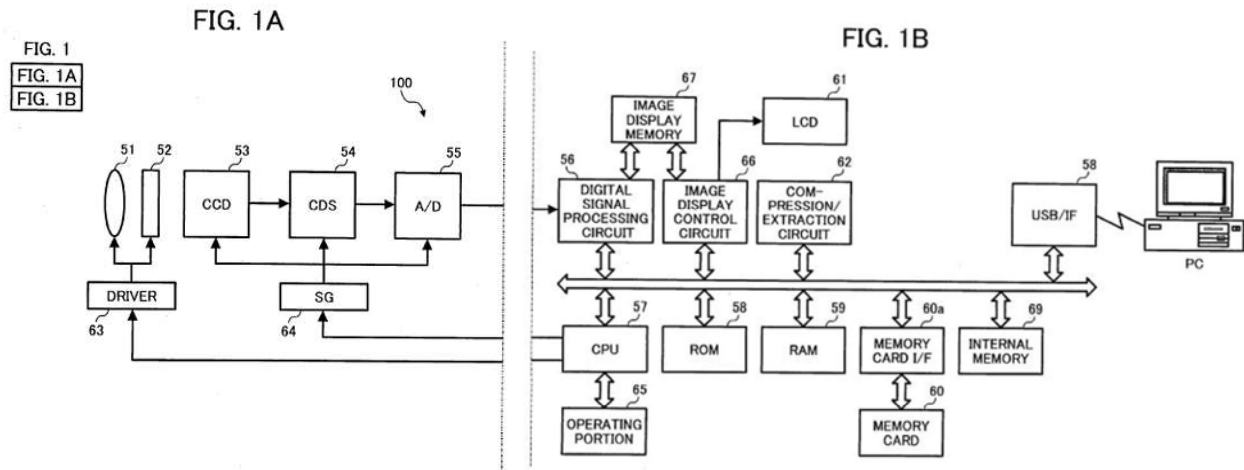
Ground	Claims	35 U.S.C. §	References
1	1, 2, 5–7, 11, 12, 14, 15, 17, 27, 29	103	Watanabe (EX. 1005)

A. OVERVIEW OF WATANABE (EX. 1005)

82. Watanabe discloses two embodiments that use different process information.

1. The relied-upon first embodiment of Watanabe

83. Petitioner relies on the first embodiment of Watanabe related to a “digital still camera”. EX. 1005 at [0040] and [0042]. With respect to FIGS. 1A-1B, reproduced below, Watanabe discloses a digital still camera 100:



See also EX. 1005, [0035].

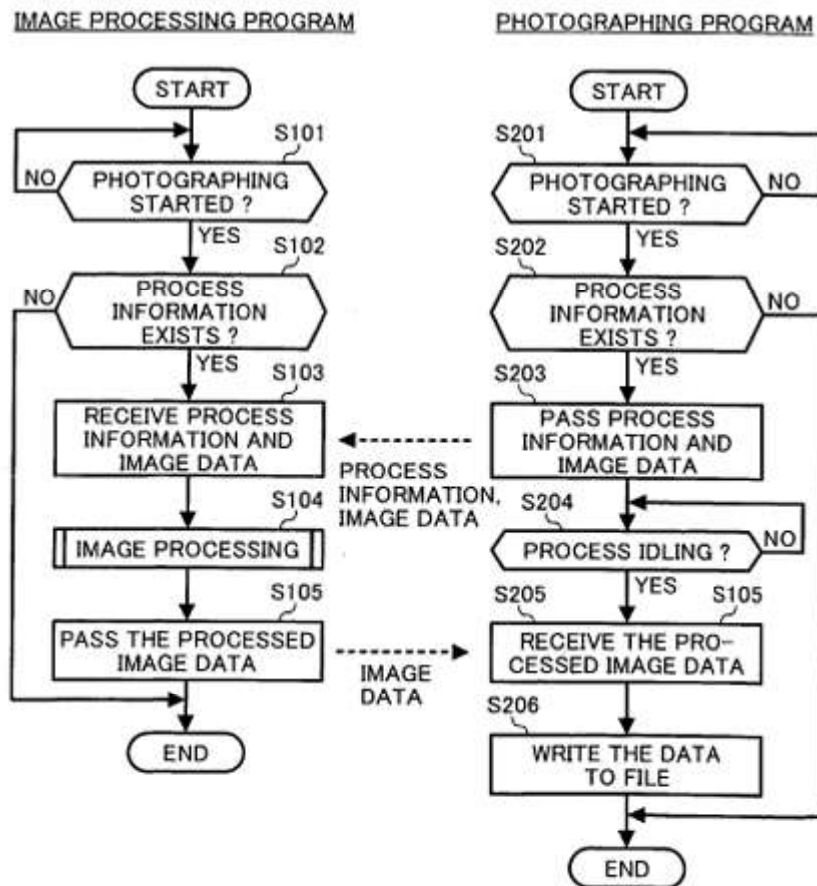
84. Operating portion 65 includes buttons for selecting a function by the operator, e.g., a release button used at the time of photographing. EX. 1005 at [0041].

85. ROM 58 stores a control program that includes an “imaging processing program” and a “photographing program”. EX. 1005 at [0042].⁶ The CPU 57 executes both programs. EX. 1005 at [0060].

86. FIG. 4 (below) shows the steps performed by the “imaging processing program” versus the “photographing program”.

⁶ CPU 57 “controls operation of each part of the digital still camera... by way of an [sic – a] photographing program”. EX. 1005 at [00042]. CPU 57 “processes image data by way of an image processing program.” *Id.*

FIG. 4



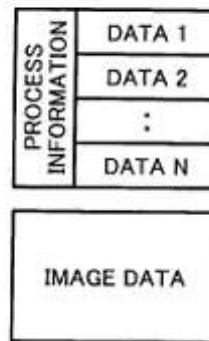
87. When the release button is pushed (S101 and S201), and when process information exists (S102 and S202), the image data is produced and transferred together with the process information from the photographing program to the image processing program (S103 and S203). EX. 1005 at [0058] and [0061].

88. The image processing program executes an image process on the image data in accordance with the process information (S104). EX. 1005 at [0062].

89. The processed image data is then transferred from the image processing program to the photographing program (S105). EX. 1005 at [0062]. The processed image data is then recorded (S206). EX. 1005 at [0063].

90. With respect to FIG. 2, reproduced below, Watanabe explains that “various data (data 1-data N) are added to image data as process information”. EX. 1005 at [0046]. For example, information of a lens type, a focusing point, and a zoom position may correspond to data 1, data 2, and data 3, respectively. EX. 1005 at [0047]; FIG. 3.

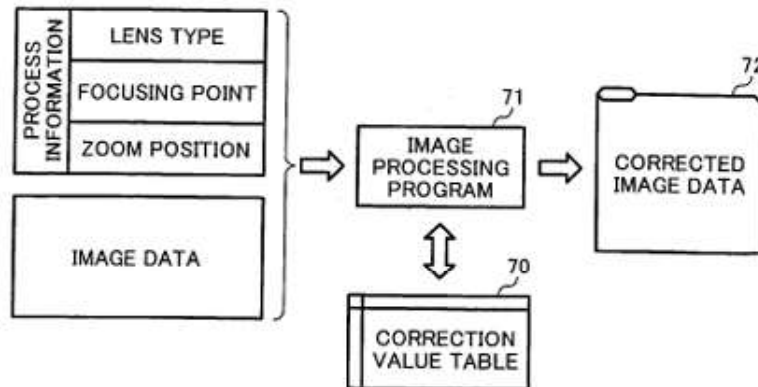
FIG. 2



91. With respect to FIG. 3, reproduced below, Watanabe discloses tables 70 with correction values, prepared in advance, for each lens type. EX. 1005 at [0047]. The CPU 57 determines a table according to lens type (data 1) and then, determines the correction values according to the focusing point (data 2) and zoom

position (data 3). EX. 1005 at [0047]. Thus, the image process performed by the image processing program, discussed above with respect to FIG. 4, step 104, is selected based on data 1-data 3. EX. 1005 at [0047].

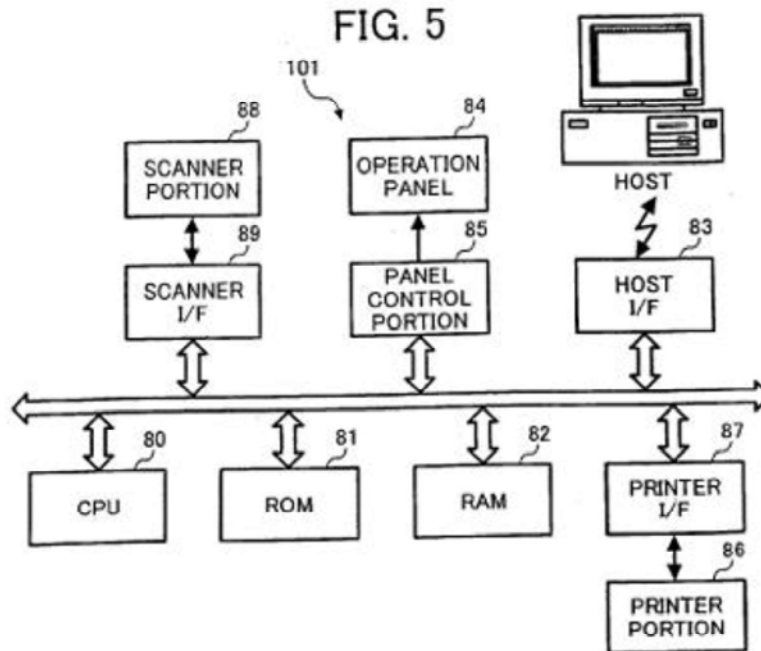
FIG. 3



2. The second embodiment of Watanabe

92. In context of Watanabe, the patentee expressly distinguished the process information of the first embodiment (identifying capture conditions) from the process information of the second embodiment (identifying aberrations). Watanabe teaches identification of capture conditions should be used with a look-up table (in the relied-upon first embodiment), while identification of aberrations should not use a look-up table (in the second embodiment).

93. The second embodiment of Watanabe relates to a multifunction printer 101 as the image recording apparatus. EX. 1005 at [0067]; FIG. 5.⁷

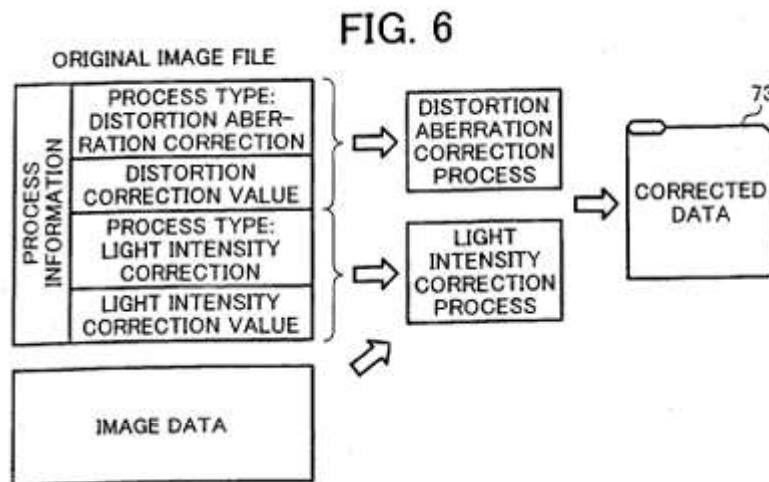


94. Like in the first embodiment, Watanabe discloses that in the second embodiment, “the CPU 80 executes a distortion aberration correction process and a peripheral light intensity correction process according to the image correction processing program 71”. EX. 1005 at [0070]. In both embodiments, the CPU executes the aberration correction process.

95. Like in the first embodiment, Watanabe discloses that in the second embodiment, process information is added to image data. EX. 1005 at [0070].

⁷ As discussed herein, the second embodiment of Watanabe does not disclose at least the use of a digital signal processor, a database, or a database management system as claimed in the ‘685 Patent.

However, the process information in the second embodiment is different from the process information in the first embodiment. In the second embodiment, “the process information is relative to a process type of distortion aberration correction, a correction value concerning distortion aberration, a process type of peripheral light intensity correction, and a correction value concerning peripheral light intensity.” EX. 1005 at [0070]; FIG. 6.



96. The EPO prosecution history makes clear that in the second embodiment, the process information includes values that “represent an aberration directly (i.e., the “information of distortion aberration”)”. EX. 2005 at 2. The patentee distinguished this type of process information from data referring to “capture conditions” such as focusing point (subject distance) and zoom position (focal length). EX. 2005 at 2. The patentee therefore distinguished the process information of the second embodiment from the process information of the first

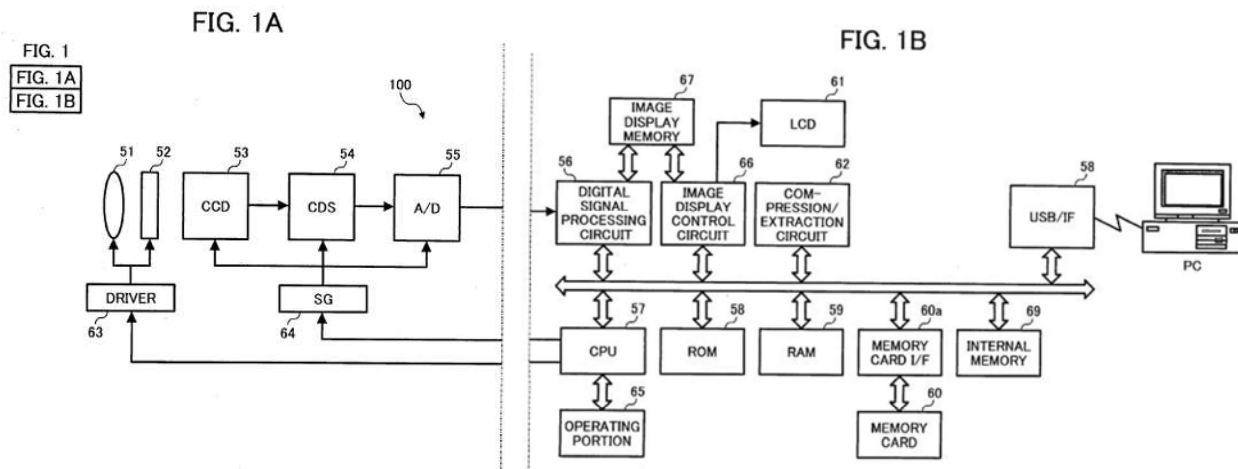
embodiment. The patentee explicitly refers to differences in these two approaches by comparing FIGS. 3 and 6 and FIGS. 11 and 13 of Watanabe. EX. 2005 at 3.

97. The patentee explicitly stated that the process information of the second embodiment avoids the use of a look-up table. EX. 2005 at 3. The patentee stated that with the process information of the second embodiment (i.e., the “information of distortion aberration”), that “it is no longer necessary to refer to a look-up table in order to carry out the image processing using the process information.” EX. 2005 at 3. In contrast, the process information of the first embodiment (e.g., focusing point, zoom position) does use a look-up table.

B. CLAIM 1 OF THE ‘685 PATENT

1. Claim 1[pre]: “A digital imaging system for correcting optical image aberrations in a digital video...” and Claim 1[a]: “a digital video camera including in-camera software, an optical lens mechanism, at least one digital sensor for capturing the digital video, an integrated circuit including; a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and a memory storage sub-system”

98. Petitioner relies on Watanabe’s digital camera 100 of FIGS. 1A and 1B, including for example lens 51, CCD 53, A/D converter 53, CPU 57, and digital signal processing circuit 56. In my opinion, a POSA would understand these are hardware components of Watanabe’s digital camera 100.



99. Petitioner's expert referred to this disclosure in Watanabe as "a digital camera **hardware** implementation." EX. 1003 at ¶134 (emphasis added).

100. Petitioner does not rely on inherency arguments in the petition. Therefore, Petitioner relies on modifications to Watanabe's disclosed digital camera 100 as discussed herein. For example, Petitioner's expert opined that "Watanabe does not limit such a hardware implementation to discrete versus integrated components" (EX. 1003 at ¶135) and that "Watanabe's schematic arrangements ... could be adapted or modified without issue" (EX. 1003 at ¶137). I disagree. Watanabe expressly discloses discrete components so Petitioner must show there is a motivation to modify Watanabe to use, for example, integrated components. I understand that just because a POSA "could" do so is not enough to show that a POSA "would" do so. In my opinion, a POSA would not perform the proposed modifications as discussed herein. Petitioner is using hindsight bias.

101. Petitioner's expert opined for example that "Watanabe does not specify how the hardware components of digital camera 100 are implemented". EX. 1003 at ¶163. I disagree. Watanabe discloses a complete hardware diagram of digital camera 100 in FIGS. 1A and 1B. A POSA would be familiar with the hardware components disclosed in Watanabe and a POSA reading Watanabe would understand the hardware capabilities and required resources. A POSA would have understood that modifying these hardware components would affect at least the size, weight, and power-requirements of the modified camera, as well as speed and processing capabilities of the modified camera, and a POSA cannot ignore the impact of these modifications.

102. Petitioner's expert opined that "Watanabe's hardware and processes are easily programmable to perform a multitude of different tasks". IPR2024-00924, EX. 1003 at ¶236 (citing EX. 1005 at [0038]). I disagree. The cited paragraph of Watanabe does not suggest that the disclosed hardware has the expanded capabilities or unlimited resources supporting Petitioner's modifications as discussed herein. In my opinion, each of Petitioner's proposed modifications is hindsight.

103. Petitioner's expert opined that "[i]mplementing Watanabe's system with any combination of microprocessors, DSPs, or application specific integrated circuits was well-within the POSITA's ordinary skill." IPR2024-00924, EX. 1003

at ¶161. I disagree. I note that unlike the ‘805 Patent, the challenged independent claims of the ‘685 Patent do not require an ASIC. The claims of the ‘685 Patent recite an integrated circuit including a DSP. In my opinion, Petitioner’s expert is using hindsight bias and redesigning Watanabe’s camera using the challenged claims as a roadmap. Petitioner’s expert does not explain why a POSA would be motivated to arrive at the various proposed implementations. Petitioner’s expert testimony hindsight bias is evidenced by the expert’s inconsistent testimony regarding how or why a POSA would allegedly modify Watanabe to arrive at the claimed inventions of the ‘805, ‘339, and ‘685 Patents. Also, there is hindsight bias in that Petitioner’s expert fails to consider the competing considerations in camera design discussed above. Petitioner’s expert testifies that a POSA “could” perform various modifications, in hindsight, but Petitioner’s expert fails to explain why a POSA would do so upon reading Watanabe. Petitioner’s expert fails to explain the requisite motivation for a POSA to modify Watanabe’s system as proposed. Just because a POSA “could” do so, does not show that a POSA “would” do so. Petitioner’s expert also fails to show a POSA would have made the proposed modifications with a reasonable expectation of success and/or predictable results in context of Watanabe and the limited functionality of the hardware components discussed in Watanabe. Again, Petitioner’s expert does not address the competing considerations of for example size, weight, and power-requirements. In my

opinion, a POSA would not perform the proposed modifications as discussed herein. Petitioner is using hindsight bias.

a. “digital video camera” and “digital video”

104. Claim 1[pre] recites “digital video”. Claim 1[a] recites “a digital video camera” and “digital video”.

105. With respect to the first embodiment, Watanabe repeatedly refers to a “digital still camera.” *E.g.*, EX. 1005 at [0040] and [0042]. In a second embodiment, Watanabe refers to a multifunction printer EX. 1005 at [0067]. Watanabe never refers to a “video camera” or “videography.”⁸ Watanabe never refers to “frame” or “video frame”. Watanabe suggests that the present invention could be applied to a copier, a printer, or a facsimile, none of which are directed to video or a digital video camera. EX. 1005 at [0080].

106. Watanabe refers to JPEG. EX. 1005 at [0038]. Watanabe never refers to MPEG. A POSA would understand that JPEG is used for still images, while MPEG is used for video.

107. Petitioner argues that Watanabe’s digital camera “is a ‘digital video camera’ because it captures video with a CCD and digitizes its output.” Petition at

⁸ There is a single reference to “video data converted to a print pattern” in the printer embodiment of FIG. 5. EX. 1005 at [0067]. This does not disclose “digital video” as recited and claimed in the ‘685 Patent.

12. I disagree. Petitioner relies on the translation of JP-872 (EX. 1006) which appears incorrect.

108. Petitioner's translation of JP-872 reads: "The CCD 3 is a circuit that converts the **video input through the lens unit** into an electrical signal (analog image data), and the CDS circuit 4 is a circuit for reducing noise for the CCD type image sensor." EX. 1006 at 7 (emphasis added). Petitioner's translation refers to "video input."

109. The EPO translation of JP-872 reads: "The CCD 3 is a circuit for converting **an image input through the lens unit** to electrical signals (analogue image data), and the CDS circuit 4 is a circuit for reducing noise for the CCD-type image pickup device." EX. 2004 at 8:11-14 (emphasis added). The EPO translation's reference to "image input," as opposed to "video input," appears correct and is consistent with Watanabe itself.

110. Watanabe reads: "The CCD 53 is a circuit for converting **an image inputted through the lens unit** to electrical signals (analogue image data), and the CDS circuit is a circuit for reducing noise for the CCD-type image photographing device." EX. 1005 at [0037](emphasis added). Again, Watanabe refers to image input and not video input.

111. A POSA would understand that Watanabe's CCD captures still image input, not video input. Petitioner's expert agreed that a CCD captures still image

input. Laub Depo Tr. at 149:1-11; 149:22-150:13. Therefore, the translation of JP-872 is not correct.⁹

112. Petitioner also argues that Watanabe's digital camera is a digital video camera "because Watanabe describes digitizing video at sampling frequencies optimized 'for an NTSC signal.'" Petition at 12. I disagree.

113. Watanabe discloses: "[O]utput signals from the CCD 53 pass through the CDS circuit 54 and are converted by the A/D converter to digital signals at optimum sampling frequency (e.g. an integral multiple of sub-carrier frequency of an NTSC signal)." EX. 1005 at [0037].

114. Watanabe's CCD 53 is a charge coupled device. EX. 1005 at [0035]. A POSA would understand that a CCD uses an array of pixels, where each pixel is exposed to light photons that generate a charge. More light means more charge and less light means less charge.

115. At the time of invention, a POSA would understand the need for signal control to read out the charge accumulated in the CCD at least because each pixel acts as a capacitor and charge is accumulated relative to the received photons. Biasing the capacitor and transferring the charge requires delicate and precise timing control to achieve a harmonious operation. Watanabe discloses signal

⁹ A POSA would understand that even in a video camera, the CCD captures still image input, not video input.

generator 64 which a POSA would understand is the primary source of this coordination and control.

116. As disclosed, Watanabe's signal generator 64 is connected to and also has the requirement of driving the CDS¹⁰, which also requires precise timing to remove the dark noise from the pixel values and present it to the A/D converter. Again, this requires precision to be sampled appropriately by the A/D converter.

117. Watanabe's A/D converter 55 is an analog-to-digital converter. *See* EX. 1005 at [0037]. The A/D converter 55 will convert each pixel's charge into a digital value by measuring the amount of charge at each pixel. A POSA would understand that the A/D converter will "sample" (i.e., measure) each pixel at a particular rate, known as the sampling rate or sampling frequency.

118. Petitioner's expert agreed that "sampling" refers to measuring the amount of charge at each pixel. Laub Depo Tr. at 150:14-151:6. Petitioner's expert testified that "sampling frequency" means the A/D converter is investigating the analog signal at intervals and the intervals are spaced in time by the period of the sampling frequency. Laub Depo Tr. at 152:2-8.

119. In my opinion, a POSA would understand that the sampling rate of the A/D converter relates to sampling the pixels in a single image, not multiple images. Therefore, in my opinion, Watanabe's reference to an "optimum sampling

¹⁰ CDS means Correlated Double Sampling and is a term known in the art.

frequency” refers to fast processing by an A/D converter.¹¹ A POSA would understand that Watanabe suggests the A/D converter could take 14 million samples of the pixels in a CCD sensor in one second **for each single image**. The sampling rate of the A/D converter does not suggest that Watanabe’s digital still camera is a digital video camera. Contrary to Petitioner’s arguments, a POSA would understand that Watanabe does not disclose a digital video camera for at least the reasons discussed herein.

120. A POSA would understand that a CCD in a video camera must capture multiple images every second. Laub Depo Tr. at 149:22-150:10 (“a CCD image sensor in a video camera must capture a rapid succession of images. Each one is a still image.”). A POSA would understand that the CCD will capture a still image, the charge will be converted by the A/D converter, and then the CCD must reset to capture the next still image. Petitioner’s expert agreed that the CCD must reset after each image. Laub Depo Tr. at 150:11-13.

121. A POSA would understand that image data for a video requires the use of a frame buffer.¹² For example, Petitioner’s expert relies on EX. 1041

¹¹ According to NTSC, a sampling rate of 14.32 MHz (four times the color subcarrier frequency) is the accepted standard. EX. 1015 at 1 (section 1.1). In the NTSC standard, color information is carried on a “color subcarrier” of 3.579545 MHz. EX. 1017 at 2 (section III.A).

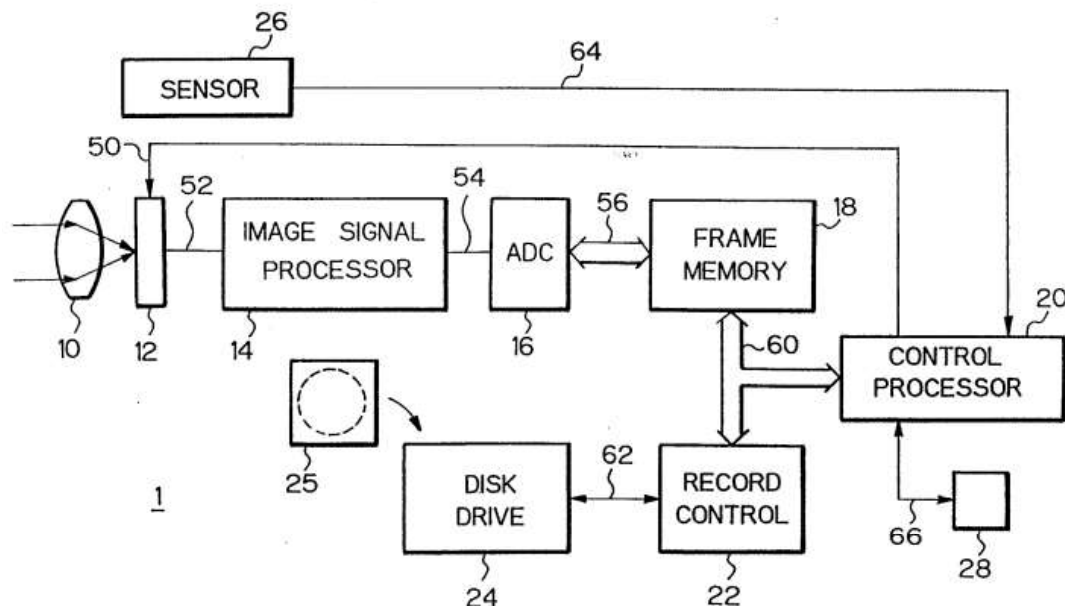
¹²Petitioner admits a POSA would have known a temporary buffer was used to facilitate “synchronous control of the whole camera” and that buffer capacity

(“Misawa”) and EX. 1040 (“Labaziewicz”) to describe a POSA’s knowledge of video. EX. 1003 at ¶102. Both Misawa and Labaziewicz disclose a buffer from the A/D converter because these references relate to a video capture device.

Watanabe does not disclose a frame buffer. The omission of this key element shows that Watanabe is not meant for video.

122. FIG. 1 of Misawa discloses frame memory 18 for temporarily storing the image data output from the A/D convert (ADC 16). EX. 1041 at 2:61-66.

Fig. 1



EX. 1041 at FIG. 1.

accounts for data volume and system processing power. Petition at 31. Watanabe does not disclose a temporary buffer for video.

123. FIG. 1 of Labaziewicz also shows DRAM buffer memory 38 that stores digital data provided by the A/D converter 36. EX. 1040 at 12:65-67.

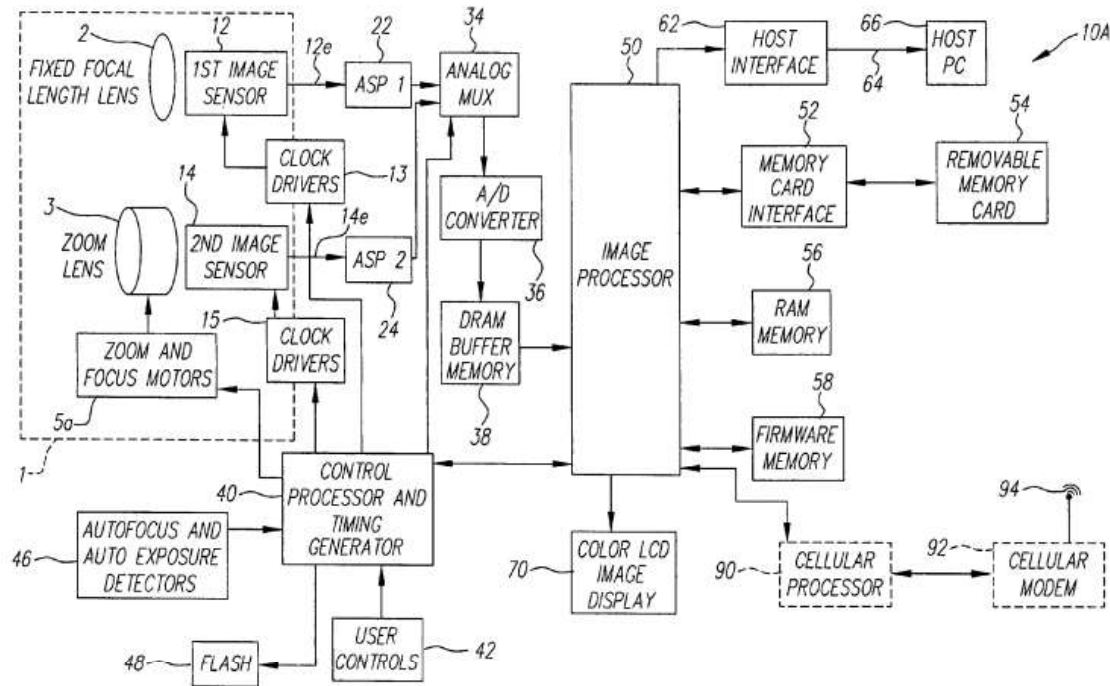


FIG. 1

EX. 1040 at FIG. 1.

124. A POSA would understand that a video camera capable of capturing sequential frames to form a video is also capable of capturing still images, **but not the other way around**. A POSA would have to solve numerous problems to modify a still camera into a video camera, including particularly data throughput, which requires a buffer to hold at least one frame. Because Watanabe does not disclose at least a frame buffer, and because Petitioner provides no analysis for modifying Watanabe to be a digital video camera, including how a POSA would

redesign the internal components of Watanabe's digital still camera, Petitioner's analysis fails to meet claim 1 of the '685 Patent.

125. Considering the hardware disclosed in FIGS. 1A and 1B of Watanabe and the data path from the CCD, a POSA would understand that only one image is processed, corrected and stored, before the next image is captured. During deposition, Petitioner's expert testified that a POSA reading Watanabe would understand that a first image would be captured and corrected and then the system would capture the next image and correct it. Laub Depo Tr. at 154:18-155:11. I agree. This would have taken a lot of processing time in Watanabe's system.

126. On redirect, Petitioner's expert also testified that there is nothing that would prevent Watanabe from processing a first image while also capturing the next image. Laub Depo Tr. at 169:19-170:2. I disagree. Watanabe does not disclose for example the capability to keep up with the data throughput. Watanabe does not describe any type of buffer or temporary memory capable of supporting this modification.¹³ Watanabe does not disclose any video-related functionality requiring higher data throughput requirements.

127. Petitioner also argues that if Watanabe does not disclose a video camera "then POSAs would nonetheless have understood it would have been

¹³ The data path from for example the CCD to the LCD has no access to RAM 59 and the compression/extraction circuit 62 for video capabilities.

routine to use a digital video camera to achieve what Watanabe describes.” Petition at 12. I disagree. For at least the reasons discussed herein, there are engineering challenges for modifying a still camera into a video camera, none of which are addressed by Petitioner. The proposed modification requires a redesign of Watanabe’s still camera and Petitioner fails to explain why or how a POSA would do so upon reading Watanabe. Petitioner is using hindsight bias.

128. Not only are there higher data throughput requirements for video, there are also additional operations to accommodate for example, changes of the focusing point and zoom position of subjects. As noted in the ‘685 Patent, Petitioner’s proposed modification would not have been routine for a POSA. See, e.g., ‘685 Patent at 27:29-41 (“...video presents new classes of dynamic problems, most notably regarding the matter of tracking changing subjects in real time...”). This additional functionality is not disclosed in Watanabe.

129. Petitioner’s expert opined that “[e]ach frame of a digital video can be aberration corrected by Watanabe in the same manner as each still image.” EX. 1003 at ¶133. The architecture of Watanabe is not designed to capture/correct successive frames of a digital video for at least the reasons discussed herein.

130. For at least these reasons, Watanabe does not disclose or render obvious a “digital video camera” or “digital video” as recited in the claims of the ‘685 Patent. Petitioner and its expert fail to establish that it would have been within

the ordinary skill of a POSA to modify Watanabe as proposed or that a POSA would have a reasonable expectation of success in doing so. Petitioner and its expert are using hindsight bias.

2. “integrated circuit”

131. Claim 1[a] recites “an integrated circuit”. Petitioner alleges that a POSA would have implemented Watanabe’s CPU 57 and circuit 56 as an integrated system-on-chip. Petition at 15-17.

132. Petitioner argues that “Watanabe leaves CPU and DSP implementation details to the POSA because it does not describe whether they are provided as discrete components or integrated in a system-on-chip.” Petition at 15. I disagree for at least the reasons discussed herein. Also, during deposition, Petitioner’s expert confirmed it is NOT his opinion that a POSA would have implemented the CPU and DSP of Watanabe as a system-on-chip. Laub Depo Tr. at 82:10-13; *see also* Laub Depo Tr. at 84:6-12.

10	Q	And is it your opinion that a POSITA
11		would have implemented the CPU and DSP of Watanabe
12		as a system-on-chip?
13	A	No.

133. During deposition, Petitioner’s expert repeatedly answered no to questions regarding what a POSA “would” do. Petitioner’s expert explained his

opinions addressed the knowledge of a POSA and what could be done or would be useful, but not necessarily what would be used in a particular reference. See, e.g., Laub Depo Tr. at 117:1-118:9 (“POSITAs would have had several reasons to use those teachings. None of this compels the POSITA, and none of those, no specific one of those, is -- would reach to the word “would” that you have been continually using, which is why you have heard so many no’s from me.”); Laub Depo Tr. at 131:8-20 (“these are ways that were available as choices, implementation choices, to a POSITA”); Laub Depo Tr. at 137:3-19 (explaining that “‘would be useful’ is different from ‘would be used.’”). Therefore, Petitioner fails to establish that a POSA would have implemented Watanabe’s CPU 57 and circuit 56 in an integrated system-on-chip.

134. As discussed above, Watanabe discloses CPU 57 and circuit 56 as discrete components. EX. 1005, [0035], FIG. 1B. Petitioner does not explain why a POSA reading Watanabe would have integrated these components on a system-on-chip. In my opinion, a POSA would not have been motivated to implement Watanabe’s CPU 57 and circuit 56 in an integrated system-on-chip. A POSA would understand that a system-on-chip is usually designed for a very specific purpose. However, Watanabe’s CPU 57 and circuit 56 serve different purposes and perform multiple different functions. Watanabe discloses that CPU 57 “controls operation of each part of the digital still camera... by way of an [sic – a]

photographing program.” EX. 1005 at [0042]. Therefore, it would not have been obvious to implement CPU 57 and circuit 56 as a system-on-chip. The CPU 57 does not only control circuit 56. CPU 57 processes and executes programs stored in ROM and RAM. *Id.* at [0039]. CPU 57 also controls each part of the system according to the photographing program. *Id.* at [0059]. The overall efficiency of the camera would be reduced as a CPU would still be required to control other functions within the camera. There would be slower communication and less efficient memory sharing between CPU 57 and the other camera components. Therefore, a POSA would not be motivated to combine Watanabe’s CPU 57 and circuit 56 as an integrated system-on-chip.

135. Further, Petitioner’s expert relied on a RISC processor in an exemplary system-on-chip in Texas Instruments TMS320C8x. EX. 1003 at ¶¶163-164. Petitioner’s expert offered no opinion on whether Watanabe’s CPU is a reduced instruction set (RISC) computer. Laub Depo Tr. at 35:9-22. Petitioner’s expert clarified that he has “made no such proposal” to modify Watanabe’s CPU to be a RISC processor. Laub Depo Tr. at 38:20-39:1. Petitioner’s expert testified that a RISC would have been known to a POSA and that a POSA “could very well have chosen to use” a RISC in order to implement Watanabe. Laub Depo Tr. at 36:14-38:19. Thus, Petitioner’s expert testified that a POSA “could” have done so, but did not opine or explain that a POSA would have done so.

136. In particular, Petitioner fails to explain how modifying Watanabe to use an integrated system-on-chip as proposed would reduce cost. Petition at 16. Also, Petitioner fails to explain how the alleged benefits of a system-on-chip would be applicable to Watanabe's modified system. Petition at 16. Petitioner fails to explain how the proposed modification would have been routine or within the ordinary skill of a POSA and that a POSA would have been motivated to make the proposed modification upon reading Watanabe. Petitioner is using hindsight bias.

137. Moreover, if a POSA were to redesign Watanabe's camera, implementing Watanabe's CPU and DSP as an integrated system-on-chip is not one of only two alternatives. Petitioner is using hindsight bias. Petitioner does not explain why a POSA would have selected these two components and implemented them as proposed. Petitioner does not address the other components disclosed in Watanabe (e.g., circuit 66, circuit 62, ROM 58, RAM 59) and/or explain whether they would also be implemented on the system-on chip. Petitioner is using the claims of the '685 Patent as a roadmap. Petitioner's analysis is inconsistent where Petitioner alleges that "implementation details" are left to a POSA (Petition at 15) without addressing all possible implementations of a redesigned camera of Watanabe.

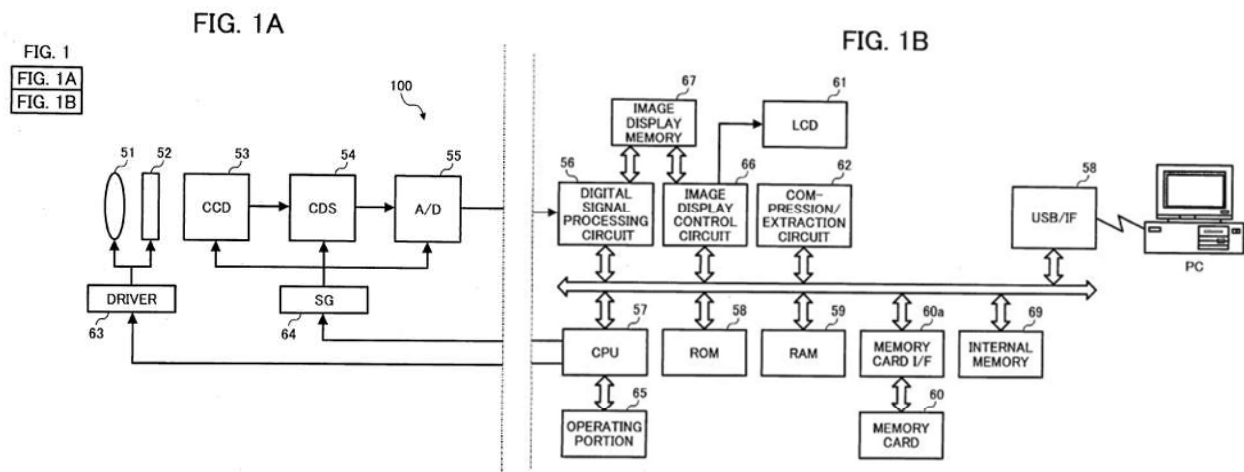
138. Additionally, Petitioner argues that a system-on-chip was "known and used for video processing" (Petition at 17) but for at least the reasons discussed

above, Watanabe does not disclose or render obvious video processing. Therefore, Petitioner fails to establish that a POSA would have used a system-on-chip as proposed.

139. For at least these reasons, Petitioner fails to establish that Watanabe discloses or renders obvious an “integrated circuit” as claimed in the ‘685 Patent.

b. “digital signal processor” (DSP)

140. Claim 1[a] recites “a digital signal processor”. Petitioner relies on Watanabe’s digital signal processing circuit 56. Petition at 24.



141. In my opinion, a POSA would understand that Watanabe’s digital signal processing circuit 56 is a hardware component. Interpreting a circuit to be a functional block contradicts the common understanding of a POSA of the word

“circuit” which refers to hardware.¹⁴ Petitioner’s expert testified that Watanabe’s digital signal processing circuit 56 is a “functional block.” Laub Depo Tr. at 166:3-11. I disagree because this contradicts the common understanding of a POSA. A POSA reading Watanabe would that the circuit 56 has limited functionality, that is just sufficient for its purpose in the context of Watanabe’s system, with certain interface requirements as dictated by the figure. A POSA would further understand the various input and output requirements dictated by the type of data that is discussed in Watanabe. Petitioner’s expert fails to explain that a POSA would be motivated to modify Watanabe’s circuit 56 to meet the claimed DSP.

142. Petitioner’s expert agreed that a digital signal processor “generally was well-known.” Laub Depo Tr. at 27:7-15. Petitioner’s expert admitted that “the specification of the patent presumes that a person reading that patent would understand what is referred to when the phrase ‘digital signal processor’ is used.” Laub Depo Tr. at 28:17-29:10. However, Petitioner’s expert opined that anything that processes digital signals is a digital signal processor. EX. 1003 at ¶¶157, 161; IPR2024-00924, EX. 1003 at ¶¶ 142, 146. Petitioner’s expert repeatedly confirmed during deposition that Petitioner’s analysis of a digital signal processor was “anything that processes a signal in a digital manner.” Laub Depo Tr. at 27:16-

¹⁴ Petitioner’s expert agreed that the word “circuit” refers to an electrical or electronic circuit. Laub Depo Tr. at 31:8-18.

28:12; *see also* Laub Depo Tr. at 56:14-15. I disagree with Petitioner's expert's analysis. A digital signal processor is a term of art and refers to a specific type of hardware. The claims recite DSP hardware with specific functionality.

143. In my opinion, Petitioner fails to establish that Watanabe's circuit 56 corresponds to a digital signal processor as claimed. For example, Petitioner fails to show that Watanabe's circuit 56 has flexible programming or uses software as opposed to fixed functionality hard-coded into the circuit itself. Petitioner's expert admits that a POSA would understand differences between a DSP and an ASIC based on flexible programming using software. IPR2024-00924, EX. 1003 at ¶157. Petitioner's expert testified that a "DSP is capable of being programmed in any of a variety of ways. So the DSP is flexible in terms of programs provided to it." Laub Depo Tr. at 52:15-53:11.

144. Petitioner stated in IPR2024-00924 that: "a DSP provides known advantages where a programmable upgrade in processing function (such as image optimization) may be desirable" and that "DSPs provide upgrade benefits as compared to ASICs based on software programming" IPR2024-00924, Petition at 12. Petitioner also states that "a POSITA would recognize that while lens aberrations were known, optimization schemes may require the flexible programming of a DSP." *Id.*

145. In IPR2024-00924, Petitioner relied on EX. 1081 (“Ralston”) which explains that:

- “Codec functions running on RISC [Reduced Instructions Set] processors or DSPs are typically software routines, with the advantage that they can be modified in order to correct programming errors or upgrade functionality.” IPR2024-00924, EX. 1081 at 7:65-8:1.
- “The disadvantage of implementing certain complex, repetitive codec functions as software is that the resulting overall processor resource and power consumption requirements typically exceeds those available in mobile communications devices.” IPR2024-00924, EX. 1081 at 8:1-5.
- “Codec functions running on ASICs and multimedia processors are typically fixed hardware implementations of complex, repetitive computational steps, with, typically, the advantage that specially tailored hardware acceleration can substantially reduce the overall power consumption of the codec.” IPR2024-00924, EX. 1081 at 8:5-10.
- “The disadvantages of implementing certain codec functions in fixed hardware include longer and more expensive design cycles, the risk of expensive product recalls in the case where errors are found in the fixed silicon implementation, and the inability to upgrade fixed silicon functions

in deployed products in the case where newly developed features are to be added to the imaging application.” IPR2024-00924, EX. 1081 at 8:10-16.

146. Petitioner’s expert stated his opinions do not address whether Watanabe’s circuit 56 is capable of being flexibly programmed. Laub Depo Tr. at 58:15-59:3; *see also* IPR2024-00924, EX. 1003 at ¶158 (“optimization schemes may require the flexible programming of a DSP”). In view of a POSA’s knowledge of a DSP, Petitioner fails to show that Watanabe’s circuit 56 corresponds to the claimed DSP. In my opinion, a POSA reading Watanabe would understand that Watanabe discloses the use of a simple circuit 56 with limited functionality in the context of a closed, self-contained system.

147. For at least these reasons, in my opinion, Petitioner fails to show that Watanabe discloses or renders obvious the claimed DSP.

c. “database management system” (DBMS)

148. Claim 1[a] recites “a database management system”. Petitioner relies on Watanabe’s control program that allows the CPU 57 to access tables 70. Petition at 18-20. Petitioner argues that the “control program” comprises a DBMS at least because it is software that retrieves image correction data associated with lens-specific focusing points and zoom positions from the database. Petition at 19. I disagree.

149. Watanabe describes that tables 70 are prepared in advance. EX. 1005 at [0047]. There is no disclosure that Watanabe's control program creates, stores, changes, manipulates, sorts, formats, or prints information in tables 70 under Petitioner's expert's definition of DBMS. There is no disclosure that Watanabe's control program organizes/manages/updates the information in tables 70 as would be understood by a POSA.

150. As discussed above, in my opinion, a POSA would understand that the claimed DBMS is not merely executable code, running on a main CPU, that accesses a fixed look-up table as described in Watanabe.

151. In the Institution Decision, the Board appeared to preliminarily find that accessing Watanabe's tables 70 satisfies the claimed DBMS. Paper 11 at 23. I respectfully disagree. Even if the Board found that Watanabe's tables 70 correspond to the claimed database, with which I disagree, accessing Watanabe's tables 70 as described in Watanabe does not disclose or render obvious the claimed DBMS.

152. Watanabe's tables 70 are "prepared in advanced" (EX. 1005 at [0047]) and include predetermined correction values for a distortion aberration. *See also* EX. 1005 at [0006]. As discussed above, in my opinion, a POSA would understand that the use of the claimed DBMS/database is not merely executing code, running on a main CPU, to accesses a fixed look-up table of parameters as

described in Watanabe. A POSA reading Watanabe would understand that tables 70 are stored in read-only memory (ROM) 58. EX. 1005 at [0039] (“The ROM 58 stores programs, data necessary for executing programs, etc.”). Watanabe only discloses fixed tables that are prepared in advance. Watanabe’s tables 70 are not updatable and are not organized/managed/updated by Watanabe’s control program. For example, Watanabe does not disclose the tables can be updated for new lenses. Watanabe highlights one of the problems the ‘685 Patent was designed to avoid. For at least these reasons Watanabe fails to disclose or render obvious the claimed DBMS/database.

3. Claim 1[d]: “to correct the at least one optical image aberration in at least one frame of the digital video using at least one of the plurality of optical image aberration corrections in the database”

153. I incorporate my discussion of claim 1[pre] and 1[a] above in Ground 1 herein.

154. Claim 1 recites “database”. Petitioner relies on Watanabe’s tables 70. Petition at 22-23. Watanabe describes that tables 70 are prepared in advance. EX. 1005 at [0047]. Petitioner does not show that Watanabe’s tables 70 are updatable. As discussed above, in my opinion, a POSA would understand that the use of the claimed DBMS/database is not merely executing code, running on a main CPU, to access a fixed look-up table of parameters as described in Watanabe. A POSA

reading Watanabe would understand that tables 70 are stored in read-only memory (ROM) 58. EX. 1005 at [0039] (“The ROM 58 stores programs, data necessary for executing programs, etc.”). Watanabe only discloses fixed tables that are prepared in advance. Watanabe’s tables 70 are not updatable and are not organized/managed/updated by Watanabe’s control program. For example, Watanabe does not disclose the tables can be updated for new lenses. Watanabe highlights one of the problems the ‘685 Patent was designed to avoid. For at least these reasons Watanabe fails to disclose or render obvious the claimed DBMS/database.

4. Claim 1[ff]: “wherein the video image file with the at least one optical image aberration is corrected by applying digital filtration using the digital signal processor”

155. I incorporate my discussion of claim 1[pre] and 1[a] above in Ground 1 herein.

156. Petitioner relies on Watanabe’s circuit 56 as allegedly performing digital filtration to correct an optical image aberration as claimed. Petition at 24-25; Paper 11 at 27. I disagree as discussed herein.

a. Watanabe’s CPU 57 executes a correction process

157. Watanabe expressly discloses that “CPU 57 executes... a correction process on image data...” EX. 1005 at [0042].

158. Watanabe also discloses that “RAM 59 temporarily stores data to be processed by the CPU 57”. EX. 1005 at [0039].

159. Watanabe further discloses that CPU 57 “processes image data by way of an image processing program.” EX. 1005 at [0042]. Watanabe further discloses that “CPU 57 executes the image processing program” including step 104 for “image processing” shown in FIG. 4. EX. 1005 at [0060]; *see also* FIG. 3 (image processing program 71 accessing correction value table 70). The CPU 57 also executes step 105 of the image processing program to pass the processed image data to the photographing program. EX. 1005 at [0058], [0062].

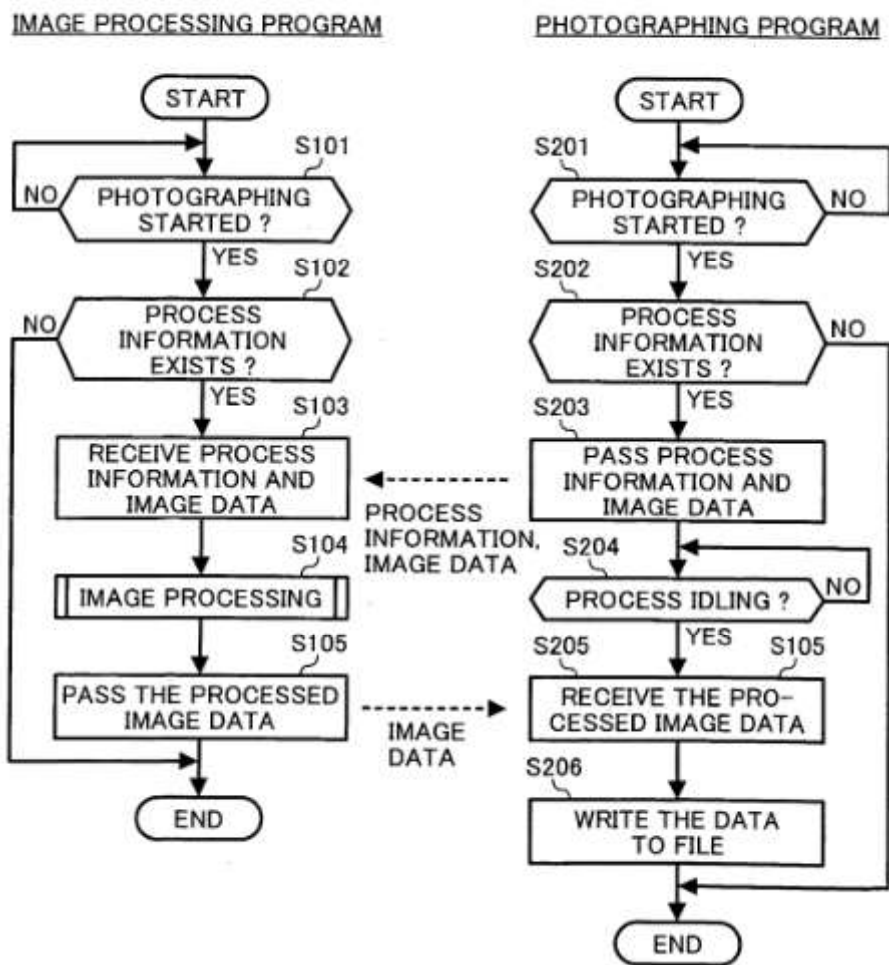
160. A POSA reading Watanabe would understand that it is Watanabe’s CPU 57 that executes aberration correction, not circuit 56.¹⁵ Watanabe relies heavily on CPU 57 which has more functionality and in turn, requires more processing power, than circuit 56. Watanabe’s heavy dependence on the CPU 57 is contrary to the claimed inventions of the ’339 Patent that efficiently distribute the workload by using the claimed DSP for specific functions.

¹⁵ This understanding is consistent with the second embodiment of Watanabe as well. With respect to the second embodiment, Watanabe expressly discloses “the CPU 80 executes a distortion aberration correction process and a peripheral light intensity correction process according to the image correction processing program 71.” EX. 1005 at [0070].

161. Watanabe does not disclose that circuit 56 corrects an aberration by applying digital filtration, or that circuit 56 corrects an aberration using the correction values in tables 70.

162. Watanabe does not disclose Watanabe's CPU 57 passing correction values to Watanabe's circuit 56. Watanabe expressly teaches away from transmitting process data "between apparatuses" because the process becomes "complicated". EX. 1005 at [0008]. Instead, Watanabe teaches the image processing program and the photographing program can be executed in a single component, the CPU 57. The photographing program passes process information and image data to the image processing program (steps 103, 203), the image processing program performs image processing (step 104), and the image processing program passes the processed image data to the photographing program (steps 105, 205), all of which is done within the CPU 57. EX. 1005, FIG. 4.

FIG. 4



163. In my opinion, Petitioner misinterprets Watanabe's one sentence disclosure that "the digital signal processing circuit 56 sorts out the image data inputted from the A/D converter 55 into color-difference data and brightness data, and executes various process, correction and a data process for image compressing/extracting." EX. 1005 at [0038]. This sentence does not disclose that circuit 56 performs aberration correction to image data based on the process information. Nor does this sentence disclose that circuit 56 obtains correction

values from tables 70. Regardless of whatever “correction” may be performed by Watanabe’s circuit 56, there is no disclosure that circuit 56 performs the functions of the claimed “digital signal processor” in the ’685 Patent.

164. A POSA would understand that the output from the A/D converter will be subject to certain digital “corrections” including, for example, gamma correction.¹⁶ A POSA would understand that brightness is not perceived by humans in a linear manner and so gamma correction can be used to correct a pixel’s numerical value and luminance value according to a mathematical curve. Without gamma correction, the image can appear too dark or washed out. These digital “corrections” are distinct from the optical image aberration correction as claimed in the ’685 Patent. These digital “corrections” are necessary because the sensor does not detect light the same way as the human eye.

165. Watanabe further confirms my opinion that it was conventional thinking to use CPU-intensive processes to perform aberration correction, which is opposite to the claimed inventions of the ’685 Patent. At the time of invention, a POSA would understand that a CPU has significant power and processing

¹⁶ This understanding is consistent with, e.g., Takane’s disclosure of signal processing circuit 50 which processes the data, e.g., white balance adjustment, gamma correction, sharpness correction, and converts the RGB data into a YC signal, prior to further processing by distortion correction circuits 56/58. EX. 1009 at [0044]. Signal processing circuit 50 of Takane does not perform optical image aberration correction as claimed in the ’339 Patent.

capabilities. The claimed inventions of the '685 Patent are unconventional in that they rely on the claimed DSP for aberration correction.

b. Watanabe's CPU executes distortion correction OR peripheral light intensity correction

166. Watanabe discloses distortion correction using a distortion rate formula. EX. 1005 at [0050]-[0053]; *see also* EX. 1005 at [0006]. As disclosed, this distortion rate formula would not correct peripheral light intensity correction. These are different correction processes.

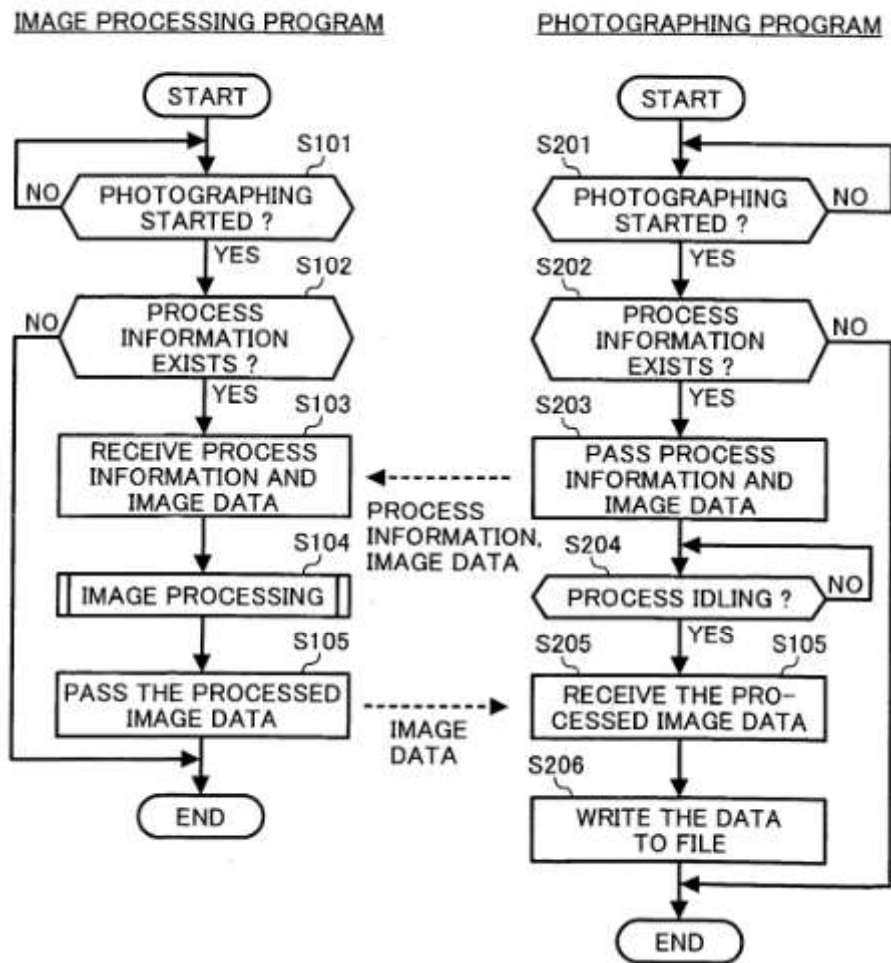
167. Watanabe discloses peripheral light intensity correction based on the cosine fourth law. EX. 1005 at [0054]-[0056]; *see also* EX. 1005 at [0007]. As disclosed, the correction based on the cosine fourth law would not correct distortion. These are different correction processes.

168. Watanabe discloses “an image process such as distortion aberration correction or peripheral light intensity correction can be executed.” EX. 1005 at [0064](emphasis, underline added). Watanabe discloses CPU 57 executes “a correction process” on image data. EX. 1005 at [0042]. Watanabe discloses “a predetermined correction process” is executed “in conformity with the process information”. EX. 1005 at [0058].

169. Petitioner's expert agreed that the correction values for distortion aberration correction are not the same as the correction values for peripheral light intensity correction. Laub Depo Tr. at 90:15-19.

170. Petitioner's expert did not opine on whether the executed correction process would be distortion correction or peripheral light intensity correction, or both, or something else. Laub Depo Tr. at 92:22-94:11. Petitioner's expert testified that "whatever needs to be corrected within the scope of what can be retrieved from the tables 70 is going to be corrected." *Id.* Based on the disclosure of Watanabe, in my opinion, a POSA reading Watanabe would understand that these are different correction processes. At step 104 of FIG. 4, the image processing program of Watanabe does not perform both distortion correction and peripheral light intensity correction.

FIG. 4



171. There is no disclosure in Watanabe that a hard-coded digital signal processing circuit 56 could perform more than one correction process. The fact that Watanabe discloses two different correction processes further shows that the correction processes are executed by Watanabe's CPU 57, not circuit 56.

172. In my opinion, a POSA reading Watanabe would understand that Watanabe discloses the CPU 57 executes the correction processes and performs

distortion correction or peripheral light intensity correction.¹⁷ Watanabe does not disclose circuit 56 performs the functionality of the claimed DSP.

173. Petitioner alleges that “Watanabe does not explain where it stores the algorithms that its DSP applies, leaving this detail to a POSA.” Petition at 36. Petitioner states that there were two known alternatives: (1) storing the algorithm as executable code in Watanabe’s circuit 56 or (2) storing the algorithm in some other memory and loading the algorithm into the circuit 56 as needed. Petition at 36. I disagree.

174. The first proposed “alternative” is a modification to Watanabe. Watanabe’s circuit 56 would be understood by a POSA to be a hard-coded circuit. There is no suggestion in Watanabe that circuit 56 includes software comprising executable code. A POSA would have understood that using a hard-coded circuit, such as circuit 56, provides for fast computation. Petitioner’s expert testified that computation time would be considered by a POSA as a factor when designing a camera, “if there is a consideration for how quickly a finished result can be delivered.” Laub Depo Tr. at 24:5-8.

175. The second proposed “alternative” is a modification to Watanabe. Watanabe’s circuit 56 would be understood by a POSA to be a hard-coded circuit

¹⁷ During deposition, Petitioner’s expert confirmed that the CPU selects the image process to perform. Laub Depo Tr. at 73:3-11.

and there is no suggestion that a POSA would load an algorithm into circuit 56 “as needed”. Petitioner fails to establish that a POSA would have been motivated to modify Watanabe in this manner. Also, for at least the reasons discussed above, Watanabe’s circuit 56 does not perform the aberration correction process as alleged.

176. Contrary to Petitioner’s arguments, there are not only “two” alternatives. A POSA would have understood that Watanabe’s circuit 56 is a hard-coded circuit. Even if the Board finds that Watanabe’s circuit 56 performs the alleged correction process, with which I disagree, Watanabe’s CPU 57 would select correction values and use them in a hard-coded correction algorithm in circuit 56.¹⁸ Watanabe expressly distinguishes prior art “where process data need[s] to be transmitted between apparatuses” because “the process becomes complicated.” EX. 1005 at [0008]. Therefore, a POSA reading Watanabe would not be motivated to have Watanabe’s CPU 57 select correction values/algorithms and pass them to Watanabe’s circuit 56 for processing. As discussed above, the selection and processing is all done by Watanabe’s CPU 57.

¹⁸ Watanabe discloses tables 70 with correction values, prepared in advance, for each lens type. EX. 1005 at [0047]. The CPU 57 determines a table according to lens type (data 1) and then determines the correction values according to the focusing point (data 2) and zoom position (data 3). EX. 1005 at [0047].

177. In addition to storing correction values in Watanabe's tables 70, Petitioner argues that a POSA would store a filtration algorithm for a particular aberration in Watanabe's tables 70. Petition at 37. Petitioner provides no motivation for a POSA to do so. Petitioner provides no reason a POSA would use Watanabe's tables 70 to store filtration algorithms as opposed to some other memory. Petitioner fails to explain whether Watanabe's tables 70 are organized in such a way as to include filtration algorithms. For at least the reasons discussed above, a POSA would not have modified Watanabe to have Watanabe's CPU select correction values/algorithms and pass them to Watanabe's circuit 56 for processing. Storing a filtration algorithm in Watanabe's tables 70 and loading the algorithm into Watanabe's circuit 56 as needed would also have taken more processing time such that a POSA would not be motivated to do so.

178. Petitioner also states that "Watanabe's IC would 'obtain' the correction algorithm by accessing the database for information identifying the algorithm (or the algorithm itself) then 'forward' the algorithm to the DSP so that it could apply the filter and correct the aberration." Petition at 37. I disagree. For at least the reasons discussed above, a POSA would not be motivated to modify Watanabe to implement Watanabe's CPU 57 and circuit 56 as an integrated circuit. Moreover, this is yet another proposed modification to Watanabe and I disagree

that a POSA would have been motivated to make this modification for the reasons discussed herein. Petitioner is using hindsight bias.

C. CLAIM 2 OF THE '685 PATENT

1. *Claim 2: “The system of claim 1: wherein the optical image aberrations include at least one of spherical, comatic, lens distortion, astigmatism, curvature of field, pin cushion, barrel distortion, chromatic aberrations, scattered light, and/or flare types of optical image aberrations.”*

179. In incorporate my discussion of claim 1 above in Ground 1 herein.

180. Petitioner alleges that claim 2 recites “optical aberrations” and that this plural recitation has no antecedent basis in claim 1. Petition at 26. I disagree. The preamble of claim 1 recites: “A digital imaging system for correcting optical image aberrations” where aberrations is plural. Therefore, I disagree that there is an antecedent basis issue for claim 2 as alleged by Petitioner.

181. Petitioner alleges that Watanabe discloses correcting “curvature aberration” and “lens distortion”. Petition at 27. I disagree.

182. Petitioner relies on the translation of JP-872 (EX. 1006) as allegedly disclosing “curvature aberration” which appears incorrect. The EPO translation of JP-872 reads “distortion aberration correction” (EX. 2004 at 10:10-11) and Watanabe reads “distortion aberration correction” (EX. 1005 at [0046]). Petitioner therefore relies on an incorrect translation of JP-872. Neither the EPO translation of JP-872 nor Watanabe refer to “curvature aberration correction.”

183. In the Institution Decision, I understand that the Board interpreted claim 2 of the '685 Patent to differentiate “lens distortion” aberration and “curvature of field” aberration. Paper 11 at 30.

184. In the Institution Decision, the Board interpreted JP-872 as failing to disclose “curvature of field” correction. Paper 11 at 30. I agree. Neither JP-872 nor Watanabe disclose “curvature aberration” as alleged by Petitioner.

D. CLAIM 5 OF THE '685 PATENT

1. Claim 5[a]: “wherein each lens type is registered in the camera database”

185. I incorporate my discussion of claim 1 above in Ground 1 herein.

186. Watanabe's tables 70 “are prepared in advance on a lens to lens basis” and Watanabe's CPU 57 “determines a table according to a lens type”. EX. 1005 at [0047].

187. Petitioner does not show that Watanabe's control program, the alleged DBMS, registers each lens type in tables 70.

188. In my opinion, registering each lens type, especially new lenses, is one of the functions of the claimed DBMS. Watanabe does not disclose or render obvious the claimed DBMS/database at least because Watanabe only discloses fixed tables that are prepared in advance. This highlights one of the problems that the '685 Patent was designed to avoid.

2. Claim 5[b]: “wherein the multiple optical aberrations of each lens is listed in the database” and Claim 5[c]: “wherein the filtration solutions to the lens optical aberrations are listed in the database”

189. I incorporate my discussion of claim 2 above in Ground 1 herein.

Petitioner fails to establish that Watanabe discloses corrections for curvature aberration.

190. Claim 5 depends from claim 1 and therefore claim 5 is necessarily narrower than claim 1. I also incorporate my discussion of claim 1 above in Ground 1 herein.

191. For both claims 5[b] and 5[c], Petitioner relies on Watanabe’s disclosure of storing correction values in tables 70. Petition at 28.

192. Petitioner fails to explain how Watanabe’s correction values meet both “multiple optical aberrations” in claim 5[b] and “filtration solutions” in claim 5[c]. Claims 5[b] and 5[c] recite **listing** “multiple optical aberrations” and **listing** “filtration solutions” in the database. Petitioner fails to show that Watanabe meets claims 5[b] and 5[c].

3. ***Claim 5[d]: “wherein the filtration of each lens optical aberration is applied by the digital signal processor” and Claim 5[e] “wherein after the digital signal processor applies the filtration to correct the optical aberrations the corrected digital file is forwarded to storage in memory”***

193. I incorporate my discussion of claim 1 above in Ground 1 herein. For at least the reasons discussed above, Watanabe discloses the CPU performs the alleged correction, not circuit 56, the alleged DSP.

E. CLAIM 6 OF THE ‘685 PATENT

1. ***Claim 6[a]: “a digital video camera including in-camera software, an optical lens mechanism, at least one digital sensor for capturing digital video, an integrated circuit including a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and a memory storage sub-system”***

194. I incorporate my discussion of claim 1[pre] and claim 1[a] above in Ground 1 herein.

2. ***Claim 6[e]: “wherein the at least one optical aberration from the optical lens mechanism of at least two frames of the digital video are corrected by using the digital signal processor to apply at least one digital filtration algorithm”***

195. I incorporate my discussion of claim 1[f] above in Ground 1 herein.

F. CLAIM 7 OF THE ‘685 PATENT

196. Petitioner relies on its analysis of claim 2 for claim 7. Petition at 32.

197. I incorporate my discussion of claim 2 above in Ground 1 herein.

G. CLAIM 12 OF THE '685 PATENT

198. I incorporate my discussion of claim 1[a] above in Ground 1 herein.

For at least the reasons discussed above, I disagree that “an SoC is an obvious design choice for implementing Watanabe” as alleged by Petitioner.

H. CLAIM 14 OF THE '685 PATENT

1. *Claim 14[a]: “a digital video camera including in-camera software, an optical lens mechanism, at least one digital sensor for capturing digital video, an integrated circuit including a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and a memory storage sub-system”*

199. I incorporate my discussion of claim 1[pre] and claim 1[a] above in Ground 1 herein.

2. *Claim 14[e]: “wherein the integrated circuit uses system software to access the database to identify at least one optical aberration in at least one frame of the video at any focal length of a zoom lens configuration” and Claim 14[f]: “wherein the integrated circuit accesses the database to obtain at least one filtration correction algorithm to the optical image aberration of at least one frame in the video file and forwards the at least one filtration algorithms to the digital signal processor”*

200. I incorporate my discussion of claim 1[d] above in Ground 1 herein.

For at least the reasons discussed above, Watanabe does not disclose or render obvious the claimed DBMS/database.

201. I also incorporate my discussion of claim 1[f] above in Ground 1 herein. For at least the reasons discussed above, Petitioner fails to show that Watanabe's circuit 56 meets the claimed DSP. Additionally, for at least the reasons discussed above, Petitioner fails to show that there are only two design choices as alleged.

3. Claim 14[g]: “wherein the digital video is forwarded to the digital signal processor which applies at least one filtration algorithm to optimize the digital video and corrects the at least one optical image aberration in at least one video frame for the at least one focal length in the zoom lens configuration”

202. I incorporate my discussion of claim 1[f] above in Ground 1 herein.

I. CLAIM 15 OF THE ‘685 PATENT

203. Petitioner relies on its analysis of claim 2 for claim 15. Petition at 38.

204. I incorporate my discussion of claim 2 above in Ground 1 herein.

J. CLAIM 29 OF THE ‘685 PATENT

1. Claim 29: “The system of claim 1, wherein the system includes machine readable instructions for the system to correct for curvature of field aberrations”

205. Petitioner alleges that Watanabe discloses correcting “curvature aberrations”. Petition at 39. I disagree. I incorporate my discussion of claim 2 above in Ground 1 herein.

206. I also note that in the Institution Decision, the Board agreed with Patent Owner that Petitioner failed to establish Watanabe meets claim 29 as alleged. Paper 11 at 29-30.

X. GROUND 2 BASED ON WATANABE + KISHIDA

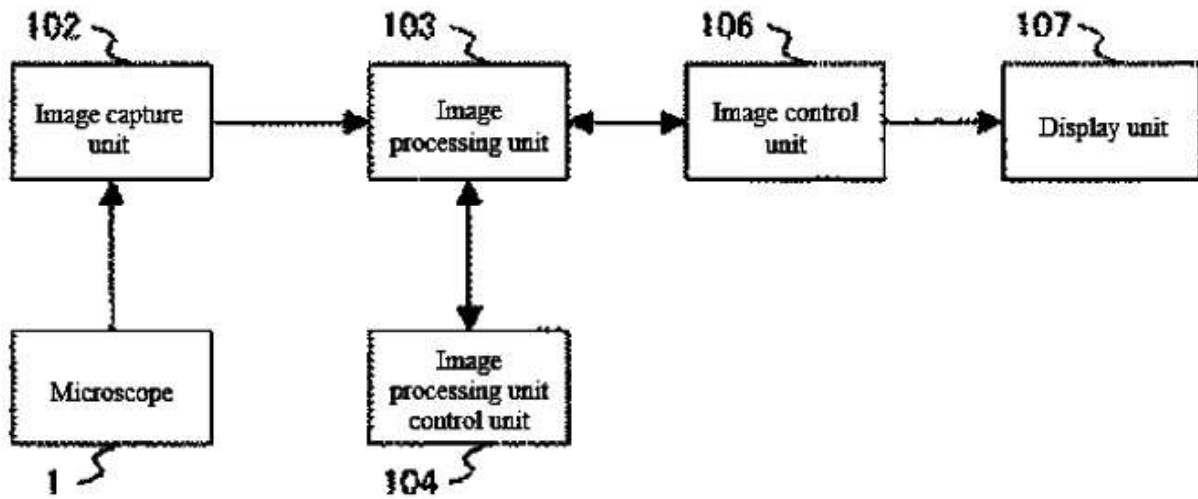
Ground	Claims	35 U.S.C. §	References
2	3, 13, 19	103	Watanabe + Kishida (EX. 1007)

A. OVERVIEW OF KISHIDA (EX. 1007)

207. Kishida relates to correction of an observation image by **a microscope**

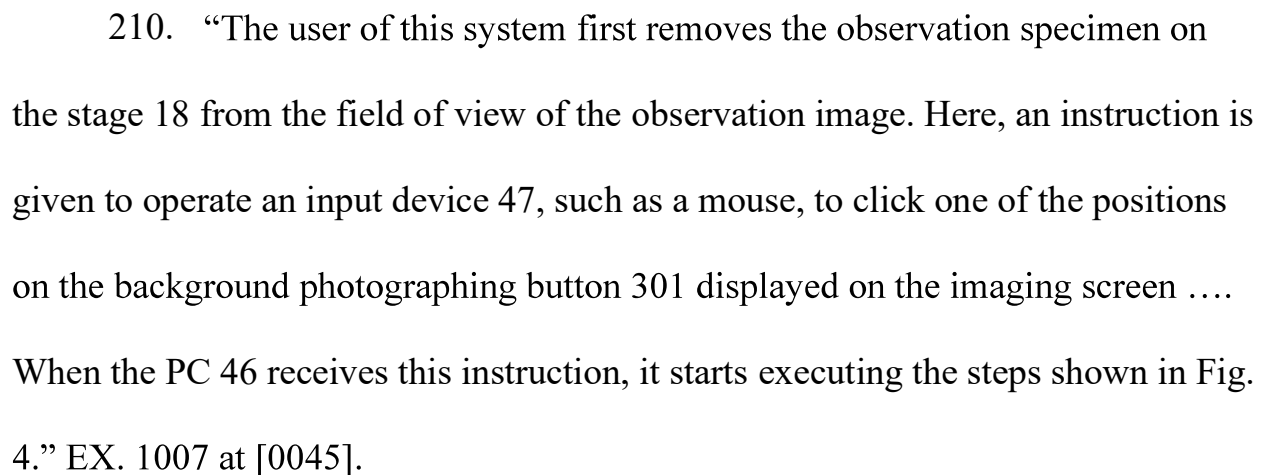
1. EX. 1007 at Abstract. Kishida does not teach in-camera aberration correction as claimed in the '339 Patent. Kishida teaches exposure or white balance correction based on a shading prediction result. EX. 1007, [0010]. Kishida explains that the shading prediction result is predicted from the background image, **which is an image captured separately from the object image and does not represent the object**. EX. 1007, [0015]. Kishida teaches the use of two images, one without the object and one with the object on the same background.

208. FIG. 1 of Kishida showing the schematic configuration is shown below. EX. 1007 at 23. The microscope 1 is in the bottom left corner.

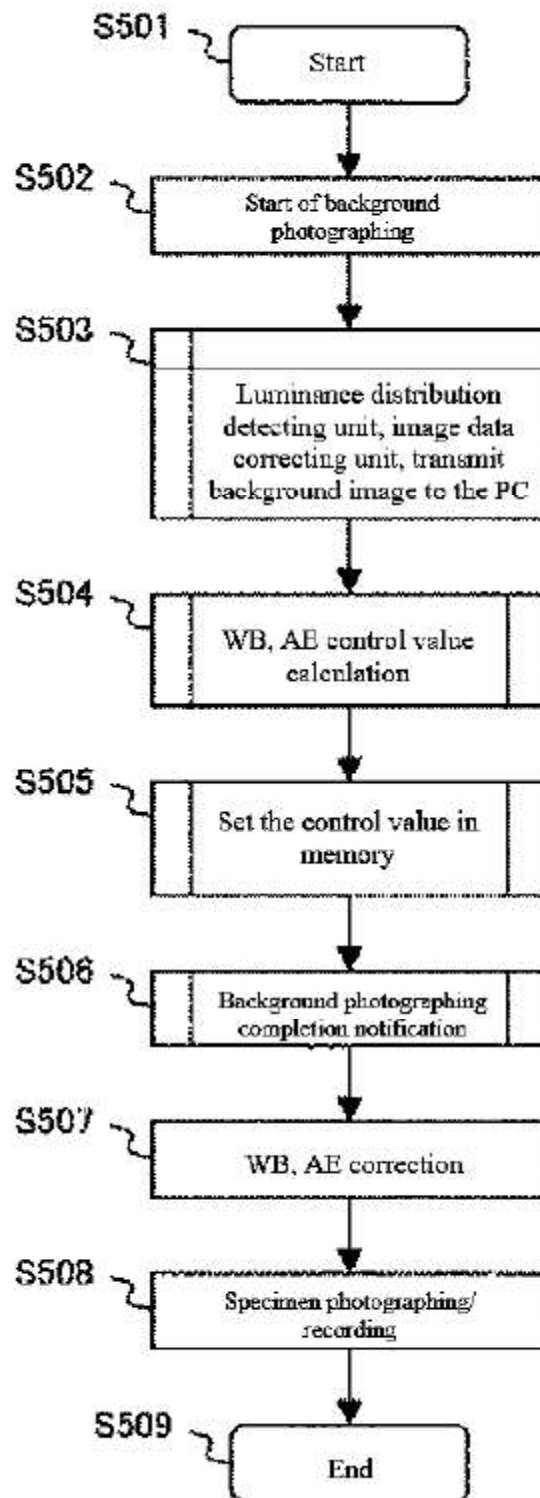


209. FIG. 2 of Kishida showing the detailed configuration is shown below.

EX. 1007 at 23. The microscope 1 is in the bottom left corner.



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212. “[T]he PC 46 executes the process of sending the initial values of the white balance correction value and exposure correction value to the memory

controller 42 via the I/F unit 45 and the process of sending the instruction to turn off the image data correcting unit 44.” EX. 1007, [0046].

213. After the PC 46 executes a process to disable the clicking of buttons, the values are sent from the PC 46 to the memory controller 42. EX. 1007, [0047].

214. “[T]he memory controller 42 causes the image processing unit 103 to capture a background image in which the observation specimen is not shown.” EX. 1007, [0048].

215. “[T]he memory controller 42 sends the image data and address data for one frame, which is the background image stored in the frame memory 41 by this image capture operation, to the PC 46 [and to the luminance distribution detecting unit 43 and the image data correcting unit 44]”. EX. 1007, [0049].

216. PC 46 stores the data.

217. “[T]he luminance distribution detecting unit 43 will calculate the control value for exposure correction control based on the data received.” EX. 1007, [0050].

218. “[T]he luminance distribution detecting unit 43 calculates the average luminance values” of different rectangular areas and stores the averages in the image data correcting unit 44. EX. 1007, [0051].

219. The image data correcting unit 44 calculates the difference of the luminance average values in a specific manner in order to use the difference as a control value for exposure correction control. EX. 1007, [0052]

220. The memory controller 42 notifies the PC 46 that the capturing of the background image has been completed. EX. 1007, [0054].

221. When the specimen is placed back in the field of view, the image data correcting unit 44 uses the control value to determine the amount of exposure correction in the specified area 305. EX. 1007 at [0058]. This control value is specific to the background in the background image.

222. Kishida teaches exposure or white balance correction based on a shading prediction result. EX. 1007, [0010]. Kishida explains that the prediction result is predicted from the background image, **which is an image captured separately from the object image and does not represent the object**. EX. 1007, [0015]. Kishida explains that the background image, which is the image that is stored in a memory unit of the PC 46 itself. EX. 1007, [0043].

B. THE PROPOSED COMBINATION OF WATANABE + KISHIDA

223. Petitioner admits that Watanabe “does not disclose optimizing exposures, alone or in cooperation with shading corrections.” Petition at 40. Petitioner alleges that “POSAs would have had reasons to use Kishida’s exposure and shading correction teachings with Watanabe to improve Watanabe’s image

processing with autoexposure functionality.” Petition at 10. I disagree. As discussed herein, Petitioner fails to address the technological incompatibility of Watanabe and Kishida. Petitioner fails to establish that a POSA interested in optimizing a digital camera would look to a reference focused on an exemplary microscope. Kishida’s teachings relate to a static subject and a static background and Watanabe’s teachings relate to photography with a digital camera. Additionally, Kishida does not disclose a digital signal processor and Petitioner does not address the different hardware components of Kishida or how they would be incorporated into Watanabe’s system.

224. Petitioner alleges that “[u]sing Kishida’s teachings in Watanabe would provide an imaging system that could correct exposure and vignetting problems while avoiding the known problems with processing requirements for prior approaches.” Petition at 40.¹⁹ I disagree. Petitioner does not explain how Kishida’s techniques avoid the “known problems with processing requirements.” Petitioner also does not explain how Watanabe + Kishida avoids the “known problems with processing requirements.” Petitioner’s expert also does not explain how implementing Kishida’s techniques in Watanabe’s system does not require

¹⁹ Petitioner’s expert opined that “POSITAs would have used Kishida’s teachings in Watanabe’s system to extend Watanabe’s image processing functionality and provide a solution to correcting overall exposure of images without requiring ‘huge’ additional processing power.” EX. 1003 at ¶325.

“huge” additional processing power. As discussed herein, Kishida’s techniques are executed by an external PC, not the microscope. Petitioner does not explain how Kishida’s use of an external PC could be implemented in Watanabe’s digital camera.

225. Petitioner’s expert alleges that “Kishida implemented its techniques in software” and that the software “could [be] incorporated in Watanabe’s ‘control program stored in the ROM 58’ running on Watanabe’s ‘CPU 57’.” EX. 1003 at ¶¶326-327 (citing EX. 1007 at [0020]). I disagree. For at least the reasons discussed above, a POSA would not be motivated to modify Watanabe to implement Watanabe’s CPU 57 and circuit 56 as an integrated circuit. Moreover, this is yet another proposed modification to Watanabe and I disagree that a POSA would have been motivated to make this modification for the reasons discussed herein. Petitioner is using hindsight bias. The cited paragraph 20 of Kishida does not support Petitioner’s proposed modification. Kishida discloses “executing this program with a computer”. EX. 1007 at [0020]. As discussed herein, Petitioner and its expert are using hindsight bias to allege that Watanabe’s camera is capable of performing Kishida’s techniques without “huge” additional processing power. There is no evidence to support Petitioner’s allegations. To the contrary, as discussed above, a POSA would understand how the proposed modifications would negatively impact at least the size, weight, and power-requirements of the

digital camera. In my opinion, a POSA would not be motivated to make the proposed modifications.

226. During deposition, Petitioner's expert opined that "the approach that Kishida discloses to apply that correction is the same approach that Watanabe uses." Laub Depo Tr. at 143:4-21. I disagree. As discussed herein, the approach disclosed in Kishida is inapposite to the approach disclosed in Watanabe. For example, Kishida teaches the use of a background image and a control value that is specific to the background in the background image, neither of which is disclosed in Watanabe and is not a normal procedure in photography. Petitioner fails to explain how or why a POSA would implement Kishida's techniques in Watanabe's system. Petitioner and its expert fail to show that Kishida and Watanabe use the same approach.

227. In my opinion, there is no teaching in Watanabe or Kishida that would have motivated a POSA to arrive at the claims of the '685 Patent. In my opinion, Petitioner and its expert fail to establish that it would have been within the ordinary skill of a POSA to combine the references or that a POSA would have a reasonable expectation of success in doing so. Petitioner and its expert fail to establish that the proposed combination would have yielded predictable results. Petitioner and its expert are using hindsight bias.

1. Technological incompatibility of Watanabe and Kishida

228. Petitioner fails to explain how Kishida’s techniques are combinable with Watanabe’s system. Petitioner simply argued it would be obvious to implement shading correction in Watanabe’s control program, without considering how that shading correction is actually performed by Kishida. For example, Petitioner does not explain the required “background image”, an image of an empty field within the microscope’s field of view, for predicting the prediction result as taught by Kishida. There is nothing to suggest that a POSA would have implemented Kishida’s techniques, software or otherwise, into Watanabe’s system.

229. Petitioner relies on exposure correction control based on shading prediction as taught by Kishida. Petition at 40. However, the exposure correction control based on shading prediction is performed by the external PC 46 of Kishida. EX. 1007 at [0044] (“...in the following explanation, the processing performed by the PC 46 is realized by the CPU of the PC 46...”). Thus, the process of Kishida does not relate to in-camera correction. Moreover, Petitioner fails to show that Watanabe’s CPU has the same processing capabilities as Kishida’s CPU and Petitioner fails to show that modifying Watanabe as proposed would not require “huge” additional processing power.

230. A POSA would not be motivated to implement Kishida’s techniques in Watanabe’s system and Petitioner does not show otherwise. For example, in

Kishida, “[t]he user of this system first removes the observation specimen on the stage 18 from the field of view of the observation image. Here, an instruction is given to operate an input device 47, such as a mouse, to click one of the positions on the background photographing button 301 displayed on the imaging screen When the PC 46 receives this instruction, it starts executing the steps shown in Fig. 4.” EX. 1007 at [0045]; see also FIG. 4, [0046]-[0058].

231. Petitioner fails to address a background image as taught by Kishida and Petitioner fails to explain how this technique would be implemented in Watanabe’s system, or why a POSA would be motivated to do so. Kishida teaches exposure or white balance correction based on a shading prediction result. EX. 1007 at [0010]. Kishida explains that the prediction result is predicted from the background image, which is an image of an empty field captured separately from the object image and does not represent the object. EX. 1007 at [0015]. Kishida explains that the background image is an image that is stored in a memory unit of the PC 46 itself. EX. 1007 at [0043].

232. Petitioner fails to address why a POSA reading Watanabe would be motivated to use a background image as described in Kishida in order to predict the prediction result. In the context of microscopes, there is a consistent, static background and it is possible to capture a background image **in which the observation specimen is not shown**. *See, e.g.*, EX. 1007 at [0048]. “Moreover, it

is desirable that the photographing environment (amount of irradiation light, focal point, etc.) during the capturing of this background image be the same as that during the capturing of the observation specimen image to be performed later.”

EX. 1007 at [0048]. **In the context of digital cameras, there is not a consistent background and it is unlikely a background image without the subject could be obtained. Further, it is unlikely an image with the subject would have the exact same background as the background image.** Moreover, for at least the reasons discussed above, Watanabe does not disclose or render obvious techniques for digital video and there is nothing in Kishida, which is directed at a microscope, to suggest to a POSA that Kishida’s techniques could apply to video. In the context of a microscope, the device is stationary, situated on a workbench with a target image area that has consistent and repeatable imaging characteristics. **In the context of digital video cameras, the use of a background image as disclosed in Kishida is even more technologically incompatible.**

233. Petitioner fails to address a control value as taught by Kishida and Petitioner fails to explain how this technique would be implemented in Watanabe’s system, or why a POSA would be motivated to do so. Kishida teaches calculating a control value for exposure correction control based on the difference of the luminance average values, where the control value is used to determine the amount of exposure correction in the specified area 305. EX. 1007 at [0052], [0058].

Kishida's control value is specific to the background in the background image.

While this control value may be suitable for a microscope with a static background, it would not be practical for a digital camera.

234. Petitioner fails to address user selection taught by Kishida and Petitioner fails to explain how this technique would be implemented in Watanabe's system, or why a POSA would be motivated to do so. Kishida explains "[t]he user of this system specifies this specified area 305 as an area for performing automatic exposure correction or white balance correction." EX. 1007 at [0035]. Thus, Kishida relies on user-intervention and Petitioner does not explain how user-intervention would be incorporated into Watanabe's system.

235. As discussed above, Watanabe discloses process information that is added to image data and used by the CPU to determine the correction values.²⁰ Petitioner fails to address how the background image taught by Kishida relates to the process information of Watanabe. Petitioner does not address how the "imaging processing program" or the "photographing program" of Watanabe

²⁰ Watanabe explains that "various data (data 1-data N) are added to image data as process information". EX. 1005 at [0046]. For example, information of a lens type, a focusing point, and a zoom position may correspond to data 1, data 2, and data 3, respectively. EX. 1005 at [0047]; FIG. 3. The CPU 57 determines a table according to lens type (data 1) and then, determines the correction values according to the focusing point (data 2) and zoom position (data 3). EX. 1005 at [0047].

would implement Kishida's shading correction consistent with the teachings of Watanabe as they relate to process information and tables 70.

236. Petitioner also fails to address the order of corrections in Watanabe + Kishida. Kishida warns that if the shading correction is applied to an image after an exposure or white balance correction has already been applied to the image, there is a risk of over-correction. EX. 1007 at [0007]. Watanabe does not disclose performing different corrections in a different order. Petitioner does not address how Watanabe's control program would purposefully order the corrections allegedly performed by Watanabe's circuit 56, consistent with the teachings of Kishida.

C. CLAIM 3 OF THE '685 PATENT

1. *Claim 3[b]: "wherein the digital signal processor applies neutral density filtration from one third of a stop to three stops in the center of the image and/or wherein the digital signal processor applies an algorithm to lighten the comers [sic] of the image or the digital signal processor applies both neutral density filtration in the image center and/or an algorithm to lighten the comers [sic] of the image"*

237. Petitioner alleges that Watanabe's circuit 56 applies an algorithm to lighten the corners of the image. Petition at 42-43. I disagree. I incorporate my discussion of claim 1 above in Ground 1 herein. For at least the reasons discussed above regarding claim 1, Petitioner fails to establish that Watanabe's circuit 56

corresponds to the claimed DSP. Kishida does not cure these deficiencies and Petitioner does not argue otherwise.

2. Claim 3[c]: “wherein the image exposure is optimized to correct the vignetting.”

238. Petitioner alleges that Watanabe + Kishida performs exposure correction control based on shading prediction to correct vignetting. Petition at 43.

239. Petitioner is using hindsight bias. Petitioner alleges that Watanabe alone discloses correction of vignetting based on correction values stored in tables 70. *See, e.g.*, Petition at 40 (“Watanabe describes correcting peripheral lighting (e.g., shading or vignetting) in digital images”). Petitioner further alleges that Kishida discloses correction of vignetting. Petition at 43. Petitioner fails to explain how Watanabe’s vignetting correction technique is properly combinable with Kishida’s alleged vignetting correction technique. For at least the reasons discussed above, in my opinion, the techniques of Watanabe and Kishida are technologically incompatible.

D. CLAIM 13 OF THE ‘339 PATENT

240. I incorporate my discussion of claim 3 above in Ground 2 herein.

E. CLAIM 19 OF THE ‘685 PATENT

241. I incorporate my discussion of claim 3 above in Ground 2 herein.

XI. GROUND 3 BASED ON WATANABE + KITA

Ground	Claims	35 U.S.C. §	References
3	4, 8, 9, 16	103	Watanabe + Kita (EX. 1008)

A. OVERVIEW OF KITA (EX. 1008)

242. Kita discloses “a method to restore the lost high-frequency-domain frequency characteristics... using the inverse function of the lens MTF characteristics.” EX. 1008 at [0078].

243. “[A]n image of a certain block is cropped from the original image, and a frequency-domain image is generated from the cropped time-domain image” and “this frequency-domain image is multiplied by the filter of the inverse function of the transfer function according to the amount of optical adjustment for the optical system using a multiplier.” EX. 1008 at [0010]. Then, “the result of this multiplication is converted from the frequency domain back to the time domain.” *Id.*

244. For example, Kita teaches that a 512x512 image B is cropped from the original image A. EX. 1008 at [0026]. Then, Kita describes the following steps:

- a fast Fourier transform (FFT) is applied to image B to generate FFT image 4;
- the FFT image 4 is multiplied by the MTF filter 5;
- an inverse Fourier transform (IFFT) is applied to generate IFFT image 8.

Id.; see also FIG. 1 of Kita (reproduced below).²¹

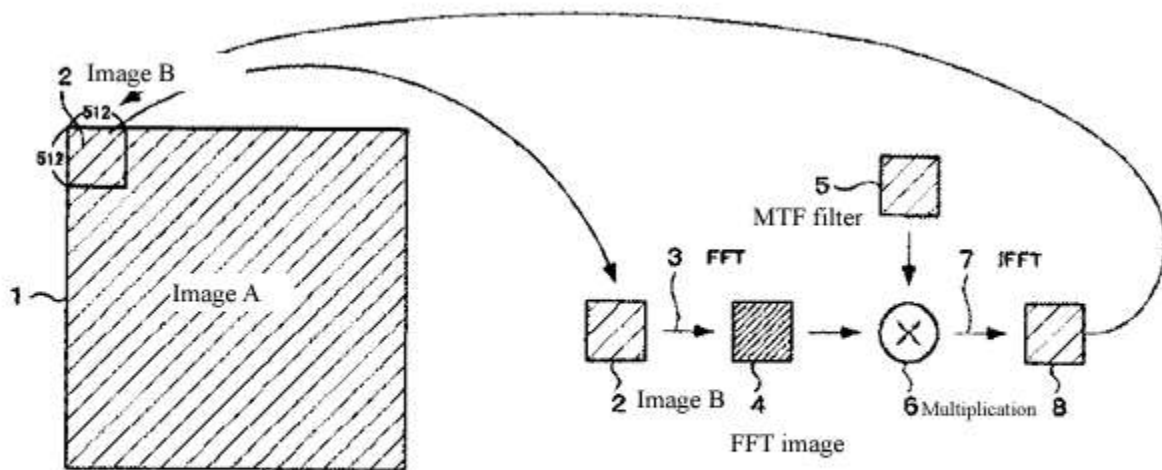
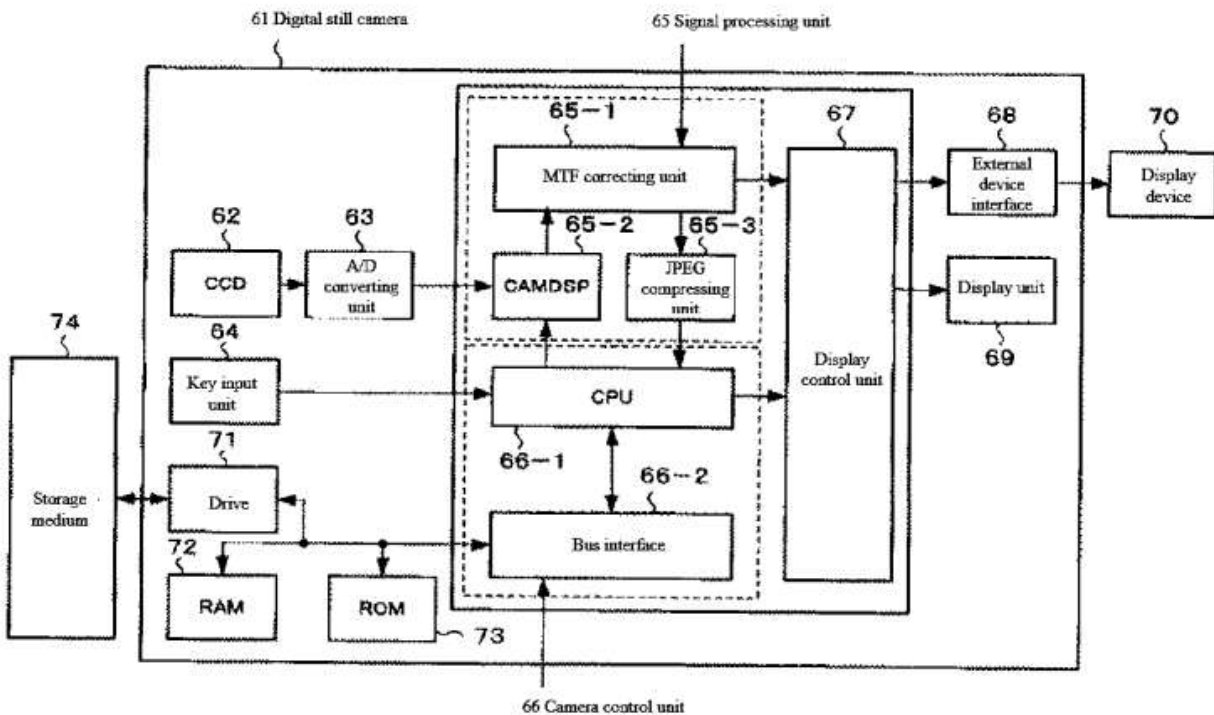


Diagram of generating a lens-filtered image

245. FIG. 6 of Kita shows an exemplary digital still camera 61. Kita discloses “digital still camera 61 consists of a charge coupled device (CCD) 62, an analog to digital (A/D) converting unit 63, and a signal processing unit 65 in the camera system. The signal processing unit 65 consists of a camera processing unit (CAMDSP: Camera Digital Signal Processor) 65-2, an MTF correcting unit 65-1, and a JPEG (Joint Photograph Experts Group) correcting unit 65-3.” EX. 1008 at [0043]

²¹ MTF is an acronym for “modulation transfer function.” See, e.g., EX. 1008 at [0002].

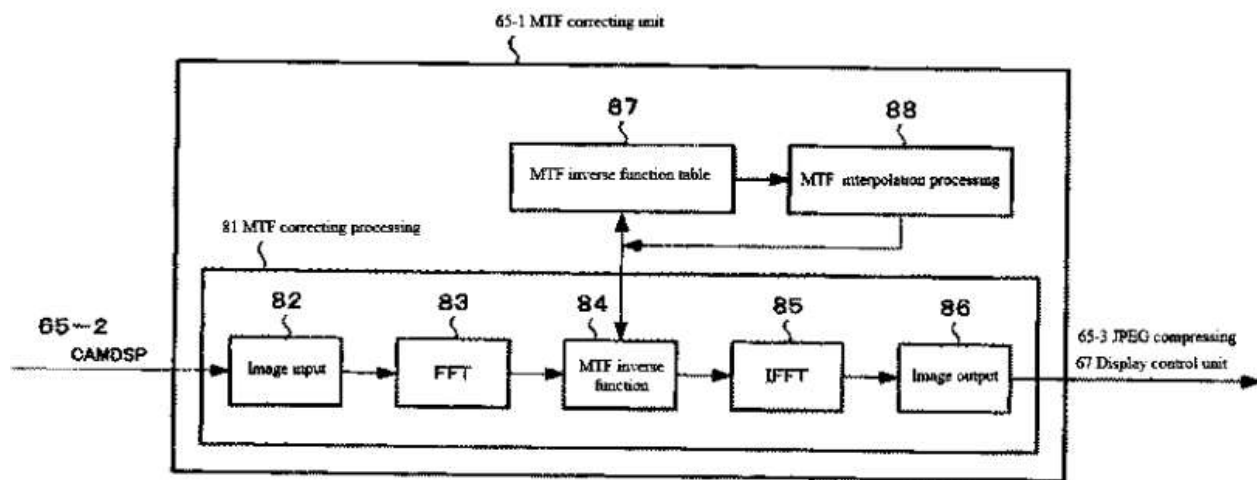


246. With respect to FIG. 6 of Kita (shown above), Kita discloses signal processing unit 65 including MTF correcting unit 65-1, camera processing unit (CAMDSP) 65-2, and JPEG compression unit 65-3. Camera signal processing by the CAMDSP 65-2 is applied to the A/D converted image. EX. 1008 at [0054]. Kita teaches the zooming amount, defocusing amount, and diaphragming amount are determined by an exchange between CAMDSP 65-2 and camera control unit 66. EX. 1008 at [0049]. The image information output from CAMDSP 65-2 is input to the MTF correcting unit 65-1 at the same time as the zooming amount, defocusing amount, and diaphragming amount (e.g., aperture of an iris diaphragm). EX. 1008 at [0057]; EX. 1003 at ¶85. The zooming amount, defocusing amount,

and diaphragming amount are used as keys to select MTF correction filters. EX.

1008 at [0059]. The MTF correction filter is determined from table 87 according to each parameter. EX. 1008 at [0059]. **The MTF correction filter is applied by the MTF correction unit 65-1.** EX. 1008 at [0046].

247. FIG. 8 of Kita shows internal processing of MTF correcting unit 65-1. EX. 1008 at 16.



B. THE PROPOSED COMBINATION OF WATANABE + KITA

248. Petitioner alleges that “POSAs would have had reasons to apply Kita’s filtering and image restoration teachings in Watanabe’s system to implement Watanabe’s aberration corrections (a detail left to POSITAs[.]”. Petition at 45 (citing EX. 1003 at ¶357). I disagree. First, the cited paragraph of the expert declaration does not opine that Watanabe’s correction methods are a detail left to a POSA. Also, Watanabe discloses a complete system for performing

limited corrections. Watanabe's method for performing corrections is not a detail left to a POSA. As discussed herein, Watanabe's method uses correction values in tables 70. There is nothing in Watanabe to suggest or otherwise invite a POSA to use Kita's techniques in the frequency domain. Also, as discussed herein, Petitioner fails to establish that Watanabe's system could implement the functionality discussed in the cited portions of Kita. MTF compensation as considered by Kita is completely different than the teachings of Watanabe. Petitioner fails to establish that Watanabe's circuit 56, the alleged DSP, could implement the functionality discussed in the cited portions of Kita.

249. Petitioner's expert alleges that "POSITAs would have had reasons to use Kita's filtering and image restoration teachings in Watanabe's system to achieve corrections for certain aberrations in addition to those explicitly addressed in Watanabe." EX. 1003 at ¶357. I disagree. Petitioner and its expert fail to show that Watanabe's circuit 56, the alleged DSP, is capable of performing additional corrections for at least the reasons discussed above. Petitioner also fails to establish a POSA would have been motivated to add additional correction capabilities to Watanabe in view of at least the competing considerations of size, weight and power. Moreover, Kita discloses the use of a MTF correction filter which is the algorithm used to correct the MTF. Kita does not disclose correcting specific aberrations and therefore a POSA would not think to incorporate Kita's teachings

in Watanabe's system to achieve corrections for certain or specific aberrations that are not already addressed by Watanabe.

250. Petitioner further alleges that "POSAs would have known that Kita's technique applied to Watanabe's digital video captures because Kita's technique applied to images and the digital video is a series of images." Petition at 45. I disagree. Petitioner fails to consider the different hardware used in Kita and Watanabe. Just because the techniques apply to images is not sufficient to show that a POSA would have implemented Kita's techniques in Watanabe's system. Moreover, for at least the reasons discussed above, Watanabe does not disclose or render obvious techniques for digital video and there is nothing in Kita, to suggest to a POSA that Kita's techniques could apply to video in Watanabe's modified system. As discussed herein, Petitioner fails to address the technological incompatibility of Watanabe and Kita. The technological incompatibility is even more severe in the context of video. A POSA would not be motivated to apply Kita's techniques to video as proposed at least because of the time and processing power that would be required.

251. Petitioner alleges that "Kita's techniques used software that could be implemented in Watanabe's system" and Petitioner's expert opined that "Watanabe already provided the hardware supporting Kita's techniques." Petition at 45; EX. 1003 at ¶359. I disagree. Neither Petitioner nor its expert identify the alleged

software disclosed in Kita. Neither Petitioner nor its expert address the hardware disclosed in Kita. Petitioner fails to establish that a POSA would have implemented Kita's techniques, software or otherwise, into Watanabe's system.

252. As discussed above, Kita discloses performing its restoration/correction process on cropped blocks of the original image. This is extremely time consuming and power consuming and even moreso in the context of video. A POSA would not have been motivated to incorporate Kita's teachings into Watanabe's digital camera.

253. In my opinion, Petitioner and its expert fail to establish that it would have been within the ordinary skill of a POSA to combine the references or that a POSA would have a reasonable expectation of success in doing so. Petitioner and its expert fail to establish that the proposed combination would have yielded predictable results. Petitioner and its expert are using hindsight bias.

1. Technological incompatibility of Watanabe and Kita

254. Petitioner does not explain how a POSA would implement Kita's techniques in Watanabe's system. Petitioner does draw any correspondence between Watanabe and Kita except that they both apply to images. In my opinion, a POSA would not think to combine the teachings of these references because they are technologically incompatible. The references are even more technologically incompatible in the context of video.

255. Petitioner argues that a POSA would implement Kita's techniques in Watanabe's control program, without considering how Kita actually uses FFT for its intended purpose. A POSA would understand that FFT is a way to represent data in the frequency domain to then further process the image data. The FFT itself does not perform any correction. In Kita, it is the use of the MTF filter in the frequency domain that enables its intended corrections. Watanabe does not consider manipulating data in this manner for processing using a MTF filter. A POSA reading Watanabe would not consider doing so either.

256. Petitioner fails to explain how the alleged DSP of Watanabe would be modified to perform the functionality recited in the challenged claims. Petitioner is using hindsight bias. Petitioner does not identify a digital signal processor in Kita that would suggest to a POSA that the alleged DSP in Watanabe would be capable of implementing the same functionality. To the extent Petitioner argues that Kita's CAMDSP corresponds to a digital signal processor because of Kita's choice in terminology (DSP), the CAMDSP is a different component than the MTF correcting unit 5-1. Thus, Kita teaches that the component specifically identified as a digital signal processor in Kita is not itself involved with the application of a fast Fourier transform and thus, teaches away from the claims of the '339 Patent.

257. As discussed herein, Petitioner does not address Watanabe's circuit 56, the alleged DSP, in its analysis. Petitioner also does not address the hardware

components of Watanabe or explain how Watanabe's hardware supports Kita's techniques. Petitioner further does not address Kita's hardware used for Kita's techniques.

258. Kita's teachings rely on distinct hardware elements that are not present or discussed in Watanabe's system. Petitioner does not address Kita's hardware components that are necessary to perform MTF correction using frequency domain processing. Petitioner does not explain how Kita's hardware components would be incorporated into Watanabe's system.

259. As explained above with respect to FIG. 6 of Kita (shown above), Kita discloses signal processing unit 65 including MTF correcting unit 65-1, camera processing unit (CAMDSP) 65-2, and JPEG compression unit 65-3.²² Petitioner does not explain that a POSA would find any similarity between Kita's signal processing unit 65 and Watanabe's digital signal processing circuit 56.

²² As described above, Camera signal processing by the CAMDSP 65-2 is applied to the A/D converted image. EX. 1008 at [0054]. Kita teaches the zooming amount, defocusing amount, and diaphragming amount are determined by an exchange between CAMDSP 65-2 and camera control unit 66. EX. 1008 at [0049]. The image information output from CAMDSP 65-2 is input to the MTF correcting unit 65-1 at the same time as the zooming amount, defocusing amount, and diaphragming amount (e.g., aperture of an iris diaphragm). EX. 1008 at [0057]; EX. 1003 at ¶85. The zooming amount, defocusing amount, and diaphragming amount are used as keys to select MTF correction filters. EX. 1008 at [0059]. The MTF correction filter is determined from table 87 according to each parameter. EX. 1008 at [0059]. The MTF correction filter is applied by the MTF correction unit 65-1. EX. 1008 at [0046].

Petitioner does not explain why a POSA would even consider incorporating any functionality of Kita's signal processing unit 65 into Watanabe's system, let alone that a POSA would be motivated to do so. Kita's signal processing circuit 65 includes JPEG compression unit 65-3. Kita discloses that "[w]hen all blocks have been processed, the JPEG compression process is performed." EX. 1008 at [0063]. However, Watanabe already includes JPEG compression/extraction circuit 62, which is separate and distinct from circuit 56. A POSA would not think to incorporate the functionality of Kita's signal processing unit 65 into Watanabe's circuit 56, the alleged DSP, because it would not make sense to perform compression (as done by Kita's unit 65-3) and then send the compressed data to Watanabe's JPEG compression/extraction circuit 62. This would be highly inefficient. Petitioner also fails to explain why a POSA would have incorporated some, but not all, functionality of Kita's signal processing circuit 65 into Watanabe's system.

260. Further components of the MTF correcting unit 65-1 are shown in FIG. 8 of Kita (shown above), including, for example, FFT calculation unit 83, IFFT calculation unit 85, table 87, and MTF interpolation processing unit 88. Each of these components performs a specific function in Kita's system. EX. 1008 at [0057] – [0063]; FIG. 11. None of these components are present in Watanabe and Petitioner does not explain how Watanabe's existing hardware supports these

functions. To the extent that Petitioner suggests modifying Watanabe's hardware, that explanation is not present in the petition.

261. To the extent Petitioner alleges incorporating the functionality of Kita's MTF correcting unit 65-1 into Watanabe's system, I also disagree. For at least the reasons discussed above, Petitioner fails to establish that Watanabe's system is capable of supporting the functionality of Kita's MTF correcting unit 65-1.

262. Petitioner also does not explain how Kita's techniques, software or otherwise, could be implemented in Watanabe's system, at least because Kita's approach is so different from that of Watanabe. For example, Petitioner does not explain the use of Kita's table 87. Petitioner does not explain how the information in Kita's table 87 could be used or stored with respect to Watanabe's table 70.

263. Moreover, Kita teaches that table 87 is part of MTF correcting unit 65-1. A POSA would understand that this design is more efficient.²³ However, Watanabe does not disclose that table 70 is part of circuit 56 or stored in circuit 56. The teachings of Kita are technologically incompatible with Watanabe.

264. Moreover, Petitioner alleges an ASIC would be used for repetitive and labor intensive functions. IPR2024-00925, Petition at 47. Here, however, Petitioner

²³ This understanding is consistent with, e.g., Takane's disclose of correction parameters that are set in advance and stored in the correction circuits 56/58 themselves. *See, e.g.*, EX. 1009 at [0054],[0059].

alleges that the alleged DSP of Watanabe would be modified to perform FFT processing. Petitioner's analysis is inconsistent. Petitioner fails to explain how or why a POSA would be motivated to make the proposed modification.

265. In my opinion, there is no teaching in Watanabe or Kita that would have motivated a POSA to arrive at the claims of the '685 Patent.

2. Watanabe + Kita changes Watanabe's principle of operation

266. As discussed above, Kita's MTF filter does not correct certain aberrations. Kita does not disclose correcting specific aberrations and therefore a POSA would not think to incorporate Kita's teachings in Watanabe's system to achieve corrections for certain or specific aberrations

267. To the extent a POSA were motivated to incorporate Kita's teachings in Watanabe's system, with which I disagree, doing so would change Watanabe's principle of operation. Petitioner argues that "The inverse MTF filter corrects for the optical aberrations introduced by the lens." Petition at 46.²⁴ Aberrations, such as vignetting, contribute to degradation of the MTF and the MTF reflects their total effect. Therefore, based on the teachings of Kita, the MTF correction filter would correct vignetting and there would be no need to perform the vignetting correction methods disclosed in Watanabe. Petitioner fails to explain why incorporating the

²⁴ The Petition refers to an inverse MTF filter, but Kita discloses an MTF correction filter.

teachings of Kita into Watanabe's system would add additional correction capabilities to the methods disclosed in Watanabe, as opposed to a wholesale replacement of the methods disclosed in Watanabe. Petitioner is using hindsight bias.

C. CLAIM 4 OF THE '685 PATENT

1. Claim 4: "The system of claim 1: wherein the digital signal processor applies at least one fast Fourier transform (FFT) algorithm to correct the at least one optical aberration."

268. I incorporate my discussion of claim 1 above in Ground 1 herein. For at least the reasons discussed above regarding claim 1, Petitioner fails to establish that Watanabe's circuit 56 corresponds to the claimed DSP. Kita does not cure these deficiencies and Petitioner does not argue otherwise.

269. In the analysis of claim 4, at no point does Petitioner address Watanabe's circuit 56, the alleged DSP. Petition at 46. There is nothing in Watanabe or Kita to suggest that Watanabe's circuit, the alleged DSP, is capable of applying FFT-based image processing as disclosed in Kita. Petitioner therefore fails to explain how Watanabe + Kita meets claim 4.

270. Petitioner's expert opines that "[a] POSA would understand this software [Kita's software] could [be] incorporated in Watanabe's 'control program stored in the ROM 58' running on Watanabe's 'CPU 57'." EX. 1003 at ¶359.

Petitioner's expert fails to show that even if a POSA were motivated to do so, with

which I disagree, that Watanabe's circuit 56, the alleged DSP, would have applied a FFT algorithm as required by claim 4.

271. At no point does Petitioner's expert address Watanabe's circuit 56, the alleged DSP. EX. 1003 at ¶¶365-370. Petitioner's expert therefore fails to explain how Watanabe + Kita meet claim 4.

272. In my opinion, Petitioner and its expert are using hindsight bias. Petitioner and its expert are pointing to discrete teachings in each reference without considering claim 4 as a whole. Petitioner' and its expert do not explain how these discrete teachings would have been combined to arrive at the claims of the '685 Patent. In my opinion, the teachings of Watanabe and Kita are technologically incompatible such that a POSA reading Watanabe would not have been motivated to use FFT-based image processing as disclosed in Kita. A POSA would understand that Watanabe's circuit 56 is not capable of FFT-based image processing as disclosed in Kita.

273. Petitioner fails to explain why or how a POSA would have modified Watanabe to perform FFT generally, or modified Watanabe's circuit 56 to perform FFT specifically. Watanabe's circuit 56 is the alleged DSP. Petitioner fails to explain that modifying Watanabe's circuit 56 to perform FFT was within the ordinary skill of a POSA at least because of the processing power required for FFT. Petitioner fails to establish that the proposed modification to Watanabe's

circuit 56 would have been routine and Petitioner fails to address how the proposed modification would affect, for example, the power consumption of the modified digital camera.

274. Kita does not disclose the limitations of claim 4. The combination of Watanabe + Kita does not meet this limitation.

D. CLAIM 8 OF THE ‘685 PATENT

275. I incorporate my discussion of claim 4 above in Ground 3 herein.

E. CLAIM 9 OF THE ‘685 PATENT

276. I incorporate my discussion of claim 4 above in Ground 3 herein.

F. CLAIM 16 OF THE ‘685 PATENT

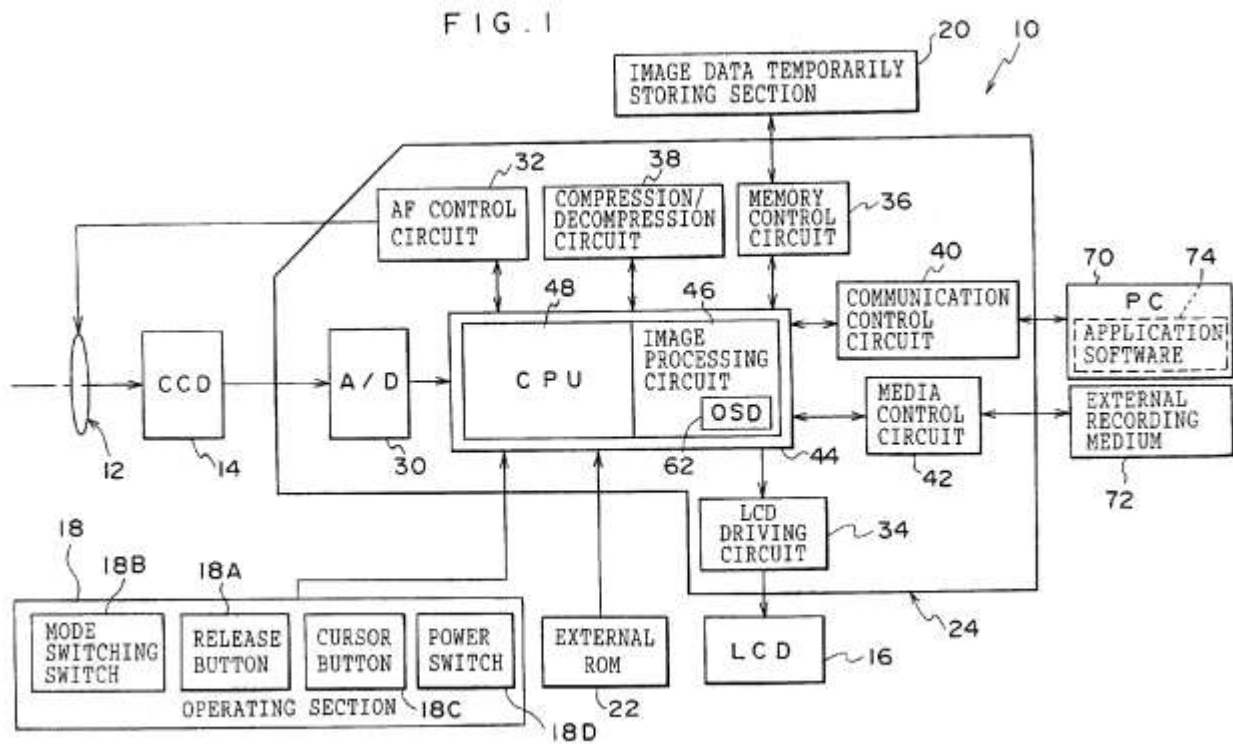
277. I incorporate my discussion of claim 4 above in Ground 3 herein.

XII. GROUND 4 BASED ON WATANABE + TAKANE

Ground	Claims	35 U.S.C. §	References
4	10, 18, 28, 30	103	Watanabe + Takane (EX. 1009)

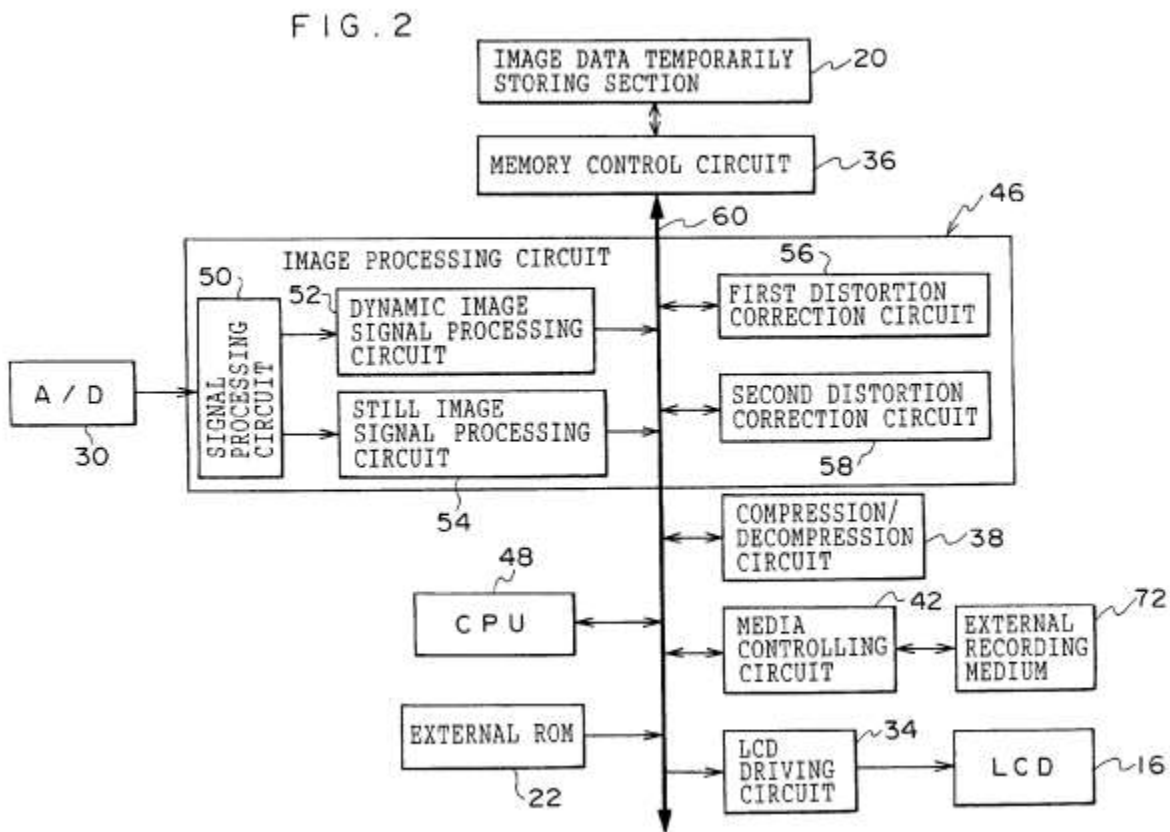
A. OVERVIEW OF TAKANE (EX. 1009)

278. Takane’s FIG. 1 shows a digital camera 10 including image processing circuit 46.



EX. 1009, FIG. 1

279. Takane's imaging processing circuit 46 is further shown in FIG. 2.



EX. 1009, FIG. 2

280. Takane discloses the signal processing circuit 50 inputs digital image data from the A/D converter, processes the data, e.g., white balance adjustment, gamma correction, sharpness correction, and converts the RGB data into a YC signal. EX. 1009 at [0044]. The output of circuit 50 is connected to the dynamic image signal processing circuit 52 and the still image signal processing circuit 54. EX. 1009 at [0044]-[0045]. The signal processing circuit 52/54 converts the gradation such that the image size becomes a predetermined image size set in advance. EX. 1009 at [0047]. Then, the data is input to the first distortion

correction circuit 56 or the second distortion correction circuit 58. EX. 1009 at [0053].

281. Takane expressly distinguishes the first distortion correction circuit 56 and the second distortion correction circuit 58.

282. The first distortion correction circuit 56 can carry out processing at a low correction accuracy. EX. 1009 at Abstract, [0061], [0115]. The first distortion correction 56 carries out processing when the release button 18A is depressed halfway for a “preview display.” EX. 1009 at [0091]; see also EX. 1009 at [0117].

283. “The correction accuracy is intentionally lowered, and the processing time can be shortened and the circuit structure of the first distortion correction circuit 56 can be made simple.” EX. 1009 at [0061]. For example, in the described embodiment, “only the distortion in the horizontal direction is corrected at the first distortion correction circuit 56.” EX. 1009 at [0062]; see also EX. 1009 at [0080] (“Correction of the optical distortion is carried out at the relatively low correction accuracy of only horizontal direction correction, by the first distortion correction circuit 56.”); see also EX. 1009 at [0102] (“...correction processing is carried out by the first distortion correction circuit 56 such that the optical distortion in the horizontal direction is corrected.”).

284. The second distortion correction circuit 58 can carry out processing at a high correction accuracy. EX. 1009 at Abstract. The second distortion correction

58 carries out processing when the release button 18A is fully depressed at the time of “actual photographing.” EX. 1009 at [0092], [0117].

285. The parameters stored in the second distortion correction circuit 58 give priority to the quality of each image and provide a high correction accuracy. EX. 1009 at [0063]. Unlike the first distortion circuit 56, the second distortion circuit 58 will correct optical distortion in both the horizontal and vertical directions. EX. 1009 at [0094].

B. THE PROPOSED COMBINATION OF WATANABE + TAKANE

286. Petitioner argues that “POSAs would have had reasons to use Takane’s white balance adjustment and distortion correction teachings with Watanabe’s image processing in order to improve and extend Watanabe’s functionality.” Petition at 48. I disagree. Petitioner does not explain how Takane’s techniques actually work and Petitioner does not explain how or why a POSA would have incorporated those teachings into Watanabe’s system.

287. Takane teachings signal processing circuit performs white balance adjustment. EX. 1009 at [0044].

288. Takane teachings distortion correction circuits 56/58 perform distortion correction. EX. 1009 at [0054].

289. Petitioner fails to address that Takane teaches the use of different circuits with different functionality. Petitioner fails to explain how these

functionalities could or would be incorporated in Watanabe's circuit 56, the alleged DSP. Petitioner is using hindsight bias. In my opinion, a POSA would not have been motivated to make the proposed modification to Watanabe. There is nothing to suggest that Watanabe's circuit 56, the alleged DSP, is capable of performing the techniques as disclosed in Takane.

290. Takane's circuits 56/58 provide different levels of correction and use different parameters. *See, e.g.*, EX. 1009 at [0059]. Takane's circuit 56 is intentionally designed to use fewer parameters and provide low correction accuracy. Takane's circuit 56 is used to provide a "preview" image when the release button 18A is depressed halfway. EX. 1009 at [0085], [0086], [0087].

291. Petitioner does not explain how Watanabe's circuit 56, the alleged DSP, is capable of incorporating the functionality of these different circuits. Petitioner also does not explain how Watanabe's system would be modified to provide "preview" displays. Watanabe does not disclose depressing a release button only halfway for a preview display. Petitioner does not explain how Takane's teachings could be incorporated into Watanabe. Petitioner does not explain how Watanabe's system would be modified to perform Takane's techniques.

292. Takane teaches the second distortion correction circuit 58 can carry out processing at a high correction accuracy. EX. 1009 at Abstract. The second

distortion correction 58 carries out processing when the release button 18A is fully depressed at the time of “actual photographing.” EX. 1009 at [0092], [0117].

Unlike the first distortion circuit 56, the second distortion circuit 58 will correct optical distortion in both the horizontal and vertical directions. EX. 1009 at [0094].

293. In particular, as it relates to Takane’s distortion correction circuits 56/58, Takane teaches the correction parameters are stored in the distortion correction circuits themselves. Takane expressly teaches away from using tables and for at least this reason a POSA would not be motivated to combine the teachings of the two references. Takane’s teachings are not properly combinable with Watanabe because it would change Watanabe’s principle of operation, specifically with respect to tables 70. Petitioner fails to explain why a POSA would be motivated to combine inapposite teachings of two references that describe completely different approaches. Petitioner fails to explain how Watanabe’s system, using tables, is properly combinable with Takane’s techniques. A POSA would not be motivated to incorporate Takane’s teachings into Watanabe’s system, which uses correction values in tables 70.

294. Petitioner’s expert opines that Takane’s software could be added to Watanabe’s control program, **without requiring additional circuitry**. EX. 1003 at ¶¶380, 386, 389, 390. Petitioner and its expert fail to explain how the proposed combination would not require additional circuitry. Petitioner and its expert fail to

establish that Watanabe's circuit 56, the alleged DSP, is capable of incorporating this additional functionality.

295. Petitioner argues that POSAs could "add[] Takane's corrections to software that executed corrections in Watanabe's DSP." Petition at 48. I disagree. Petitioner fails to establish that Takane's techniques are simply software instructions that could be added to Watanabe's control program. For example, Takane discloses the correction parameters are stored in the circuits 56/58. EX. 1009 at [0054]. This is opposite to the teachings of Watanabe and for at least this reason, incorporating Takane's techniques into Watanabe would change Watanabe's principle of operation. Watanabe relies on the use of tables 70.

296. Additionally, even if it was a simple software addition, with which I disagree, Petitioner fails to explain why a POSA would be motivated to do so.

297. Petitioner and its expert fail to establish that it would have been within the ordinary skill of a POSA to combine the teachings of the references or that a POSA would have a reasonable expectation of success in doing so. Petitioner and its expert fail to establish that the proposed combination would have yielded predictable results. Petitioner and its expert are using hindsight bias.

C. CLAIM 10 OF THE '685 PATENT

1. Claim 10: “The system of claim 6: wherein the digital signal processor applies color filtration to at least two frames of the digital video image.”

298. Petitioner relies on the functionality of Takane’s signal processing circuit 50, added to Watanabe’s circuit 56. Petition at 48.

299. Petitioner fails to explain why a POSA would be motivated to implement the functionality of Takane’s circuit 50 into Watanabe’s circuit 56.

300. Petitioner fails to explain how Takane performs, e.g., white balance adjustment. Petitioner therefore fails to explain that incorporating Takane’s teachings into Watanabe would have been within the ordinary skill of a POSA.

301. Also, as discussed above, Petitioner fails to establish that Takane’s techniques are simply “software instructions” that could be added to Watanabe’s control program.

302. Even if it was a simple software addition, with which I disagree, Petitioner fails to establish that Watanabe’s circuit 56 would perform color filtration as claimed, as opposed to for example CPU 57.

D. CLAIM 18 OF THE '685 PATENT

303. Petitioner relies on its analysis of claim 10 for claim 18.

304. I incorporate my analysis of claim 10 above in Ground 4 herein.

E. CLAIM 28 OF THE '685 PATENT

1. *Claim 28: “The system of claim 1, wherein the system includes machine readable instructions for the system to correct for pin cushion aberrations.”*

305. Petitioner relies on the functionality of Takane’s correction circuits 56/56. Petition at 49.

306. Petitioner does not address the different functionality of Takane’s circuit 56 and circuit 58. As discussed above, Petitioner fails to explain how and why a POSA would be motivated to make the proposed modification. Also, as discussed above, Petitioner fails to establish that Takane’s techniques are simply “software instructions” that could be added to Watanabe’s control program.

F. CLAIM 30 OF THE '685 PATENT

1. *Claim 30: “The system of claim 1, wherein the system includes machine readable instructions for the system to correct for barrel distortion aberrations.”*

307. Petitioner relies on the functionality of Takane’s correction circuits 56/56. Petition at 49.

308. Petitioner does not address the different functionality of Takane’s circuit 56 and circuit 58. As discussed above, Petitioner fails to explain how and why a POSA would be motivated to make the proposed modification. Also, as discussed above, Petitioner fails to establish that Takane’s techniques are simply “software instructions” that could be added to Watanabe’s control program.

XIII. GROUND 5 BASED ON WATANABE + HISAMATSU

Ground	Claims	35 U.S.C. §	References
5	22, 23, 25	103	Watanabe + Hisamatsu (EX. 1010)

A. OVERVIEW OF HISAMATSU (EX. 1010)

309. Hisamatsu expressly relates to a “still camera”. EX. 1010 at [0002], [0005]. Hisamatsu discloses an “arithmetic operation unit” that performs “data arithmetic operation processing”. Hisamatsu at [0005], [0019].

B. PROPOSED COMBINATION OF WATANABE + HISAMATSU

310. Hisamatsu states that:

- “Conventionally, the optical lens provided in a conventional electronic still camera exhibits a characteristic that the amount of light at the periphery of the lens is reduced compared to the center of the lens, and also has aberrations such as spherical aberration, coma aberration, and chromatic aberration.” EX. 1010 at [0002]

311. Just because these aberrations were known does not show that Hisamatsu corrects these aberrations. Petitioner does not establish that Hisamatsu discloses how to correct these aberrations. For example, Petitioner does not describe or otherwise explain the “data arithmetic operation processing” for correcting these aberrations. Hisamatsu, [0019].

312. Petitioner alleges that “POSAs would have had reasons to include Hisamatsu’s spherical, chromatic, or coma aberration corrections in Watanabe because this would have improved Watanabe’s system and extended its distortion

correction capabilities to include other known imaging defects.” Petition at 50.

Petitioner does not explain how Hisamatsu corrects spherical, chromatic, or coma aberrations. Petitioner is using hindsight bias.

313. Because Petitioner does not explain how Hisamatsu operates, Petitioner fails to establish that Hisamatsu’s teachings could have or would have been incorporated into Watanabe’s system.

314. Petitioner alleges that “the programming to implement Hisamatsu’s corrections on a DSP was within the POSA’s ordinary skill” (Petition at 51), but at no point does Petitioner identify Hisamatsu’s corrections or explain how Hisamatsu performs corrections. Petitioner fails to establish that a POSA would have been motivated to incorporate Hisamatsu’s teachings in Watanabe’s system. Petitioner fails to establish that Watanabe’s circuit 56, the alleged DSP, is capable of performing Hisamatsu’s alleged corrections. Petitioner fails to establish that it would have been within the ordinary skill of a POSA to combine the teachings of the references or that a POSA would have a reasonable expectation of success in doing so. Petitioner and its expert fail to establish that the proposed combination would have yielded predictable results. Petitioner and its expert are using hindsight bias.

315. Because Petitioner does not identify Hisamatsu’s corrections or explain how they are performed, Petitioner has no basis to allege that Hisamatsu’s

corrections would work with digital video. Petition at 51. Neither Watanabe nor Hisamatsu disclose digital video.

C. CLAIM 22 OF THE '685 PATENT

1. Claim 22: “The system of claim 1, wherein the system includes machine readable instructions for the system to correct for spherical aberrations.”

316. Petitioner alleges that “Watanabe in view of Hisamatsu meets claims 22-23 and 25 because it includes machine readable instructions to correct these distortions.” Petition at 51 (citing EX. 1010 at [0002]). Petitioner fails to establish that Hisamatsu discloses machine readable instructions or that Hisamatsu’s techniques are implemented using software. Petitioner fails to establish that Hisamatsu discloses correcting for spherical, chromatic, or coma aberrations.

317. Petitioner fails to explain how a POSA would have incorporated Hisamatsu’s teachings into Watanabe’s system. Petitioner is using hindsight bias. Petitioner fails to establish that Watanabe + Hisamatsu meets claim 23.

D. CLAIM 23 OF THE '685 PATENT

1. Claim 23: “The system of claim 1, wherein the system includes machine readable instructions for the system to correct for chromatic aberrations.”

318. I incorporate my discussion of claim 22 above in Ground 5 herein. Petitioner fails to establish that Watanabe + Hisamatsu meets claim 23.

E. CLAIM 25 OF THE ‘685 PATENT

- 1. Claim 25: “The system of claim 1, wherein the system includes machine readable instructions for the system to correct for comatic aberrations.”*

319. I incorporate my discussion of claim 22 above in Ground 5 herein.

Petitioner fails to establish that Watanabe + Hisamatsu meets claim 25.

XIV. GROUND 6 BASED ON WATANABE + TURNER

Ground	Claims	35 U.S.C. §	References
6	24	103	Watanabe + Turner (EX. 1011)

A. OVERVIEW OF TURNER (EX. 1011)

320. Turner explains “[l]ight scattering effects are removed from the corrected image frame **based upon characteristics of the digital sensor.**” EX. 1011 at Abstract (emphasis added).

321. Turner requires selecting a stable region of interest in a received image frame. EX. 1011 at FIG. 3 (block 154); [0020] and [0021].

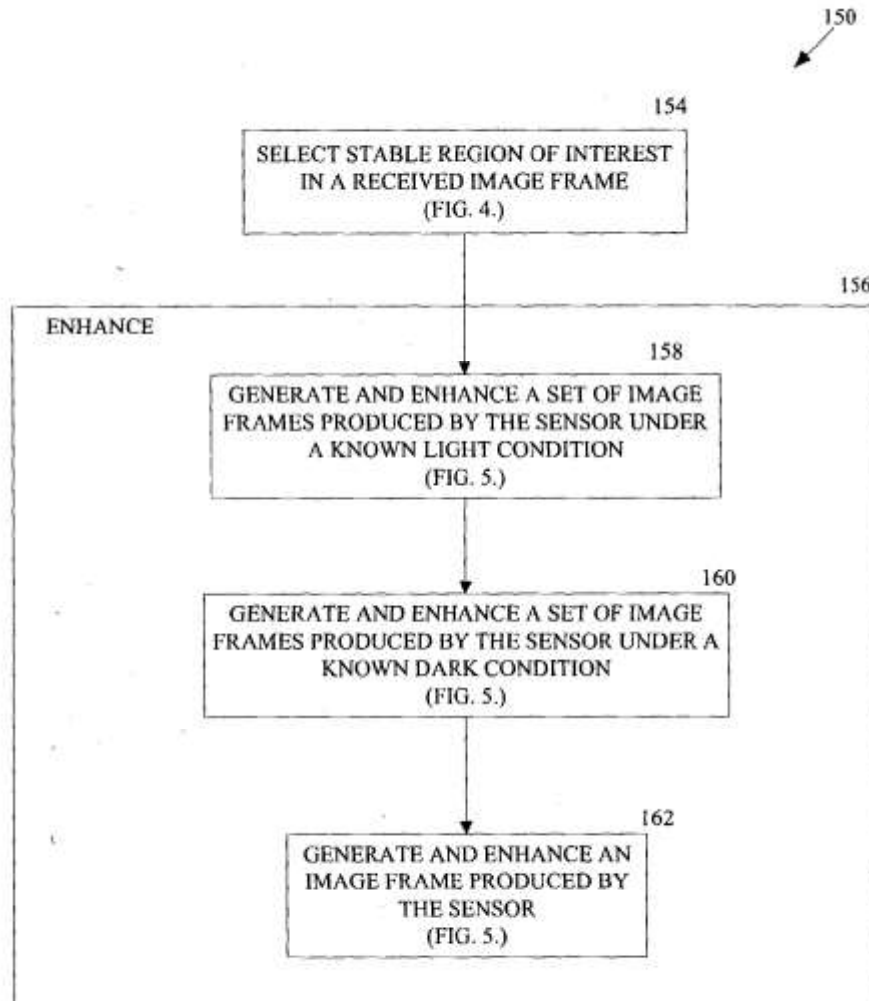


FIG. 3.

322. Then, Turner receives a plurality of images frames from the digital sensor when exposed to a known light quality. EX. 1011 at Abstract; [0020]. “The frames exposed to light are created by having the sensor face a calibration device called an integrating sphere, which produces a uniform light source of know intensity.” EX. 1011 at [0020].

323. Then, Turner receives a plurality of image frames from the digital sensor when exposed to dark conditions, e.g., placing a lens cover over the sensor to generate a dark condition. EX. 1011 at Abstract, [0020].

324. Then, Turner enhances the image frame as shown in FIG. 5.EX. 1011 at [0022].

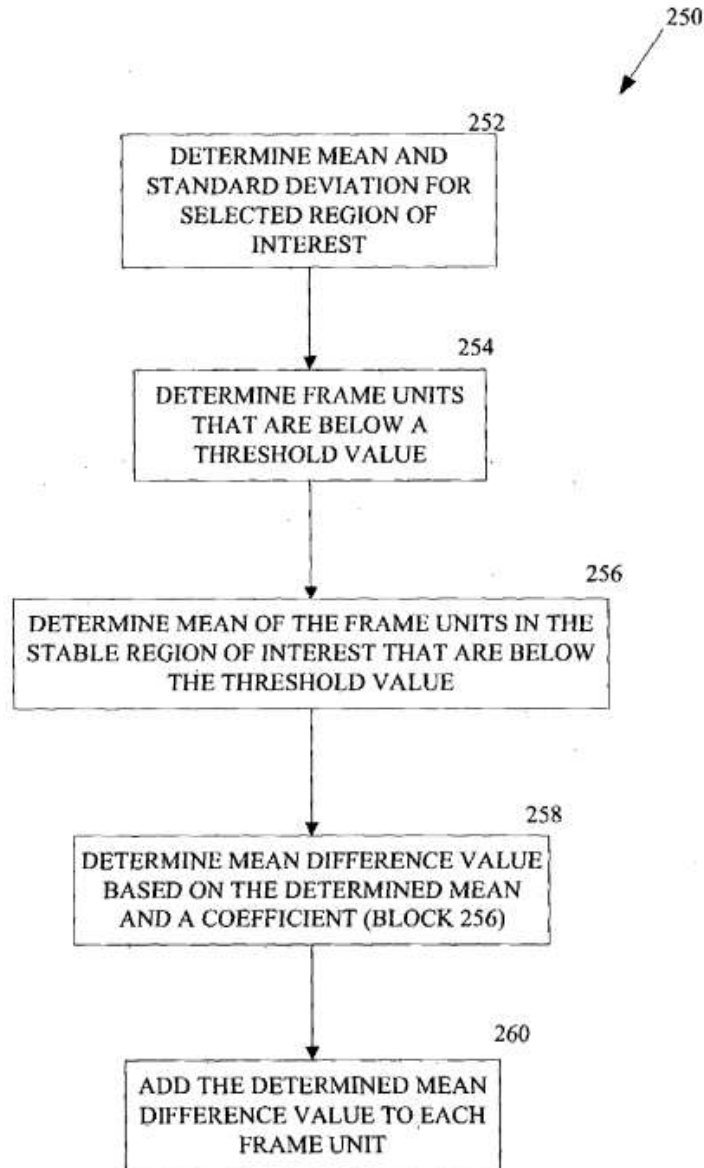


FIG. 5.

B. THE PROPOSED COMBINATION OF WATANABE + TURNER

325. Turner explains “[l]ight scattering effects are removed from the corrected image frame based upon characteristics of the digital sensor.” EX. 1011 at Abstract. In Watanabe, Petitioner alleges that the CCD 53 corresponds to the

claimed digital sensor. Petition at 14. Watanabe does not discuss correction values based on the characteristics of CCD 53. Instead, Watanabe discloses tables based on lens type, for example, lens 51. Petitioner fails to explain how a POSA would incorporate the teachings of Turner into Watanabe's system.

326. Petitioner alleges that "POSA's would have had reasons to use Turner's teachings in Watanabe's image processing program to extend Watanabe's functionality and improve its system to include other known imaging defects." Petition at 51. Petitioner does not explain how Turner corrects light scattering aberrations. Petitioner is using hindsight bias.

327. Because Petitioner does not explain how Turner operates, Petitioner fails to establish that Turner's teachings could have or would have been incorporated into Watanabe's system. Petitioner fails to explain how or why a POSA would have used Turner's teachings regarding exposure to light conditions, including having the sensor face a calibration device. Petitioner fails to explain how or why a POSA would have used Turner's teachings regarding exposure to light conditions, including placing a lens cover over the sensor. In my opinion, a POSA would not have been motivated to do so.

328. Petitioner alleges that "the programming to implement Turner's corrections in Watanabe's digital image processing was within the POSA's ordinary skill" (Petition at 52), but at no point does Petitioner identify Turner's

corrections or explain how Turner performs corrections. Petitioner fails to establish that a POSA would have been motivated to incorporate Turner's teachings in Watanabe's system. Petitioner fails to establish that it would have been within the ordinary skill of a POSA to combine the teachings of the references or that a POSA would have a reasonable expectation of success in doing so. Petitioner and its expert fail to establish that the proposed combination would have yielded predictable results. Petitioner and its expert are using hindsight bias.

329. Because Petitioner does not identify Turner's corrections or explain how they are performed, Petitioner has no basis to allege that Turner's corrections would work with digital video in Watanabe's modified system.

C. CLAIM 24 OF THE '685 PATENT

1. Claim 24: "The system of claim 1, wherein the system includes machine readable instructions for the system to correct for scattered light aberrations."

330. Petitioner alleges that "Watanabe+Turner includes 'machine readable instructions for the system to correct scatter light aberrations.'" Petition at 52. Petitioner fails to establish that Turner discloses machine readable instructions or that Turner's techniques are implemented using software. Petitioner fails to explain how a POSA would have incorporate Turner's teachings into Watanabe's system. Petitioner is using hindsight bias. Petitioner fails to establish that Watanabe + Turner meets claim 24.

XV. GROUND 7 BASED ON WATANABE + LIEGE

Ground	Claims	35 U.S.C. §	References
7	26	103	Watanabe + Liege (EX. 1012)

A. OVERVIEW OF LIEGE (EX. 1012)

331. Liege discusses an “appliance chain” where the system corrects/modifies defects introduced by each appliance in the chain. EX. 1012 at 30:18-20. There is formatted information 15 representing the defects of each appliance. EX. 1012 at 31:41-45. For example, formatted information for APP.1 through APP.n is represented as 15.1 through 15.n. EX. 1012 at 31:49-54.

332. Liege discloses that the observer (e.g., the photographer) is an appliance. EX. 1012 at 8:19-36 (“Within the meaning of the invention, an appliance can be in particular... a human being having vision defects, such as astigmatism.”); see also EX. 1012 at 9:49-52 (explaining appliance chain P3 includes at least one observer). **Liege refers to astigmatism of an observer, not astigmatism aberration in an image.**

333. Liege discloses that preferably: “the method is more particularly designed to modify the visual quality of the image for an observer” where the formatted information is “related to the vision characteristics of the observer, especially functional anomalies of the eyes and/or of the brain of the observer.”

EX. 1012 at 4:13-19; see also EX. 1012 at 36:21-25 (“to correct vision defects (such as astigmatism) of an observer 701”).

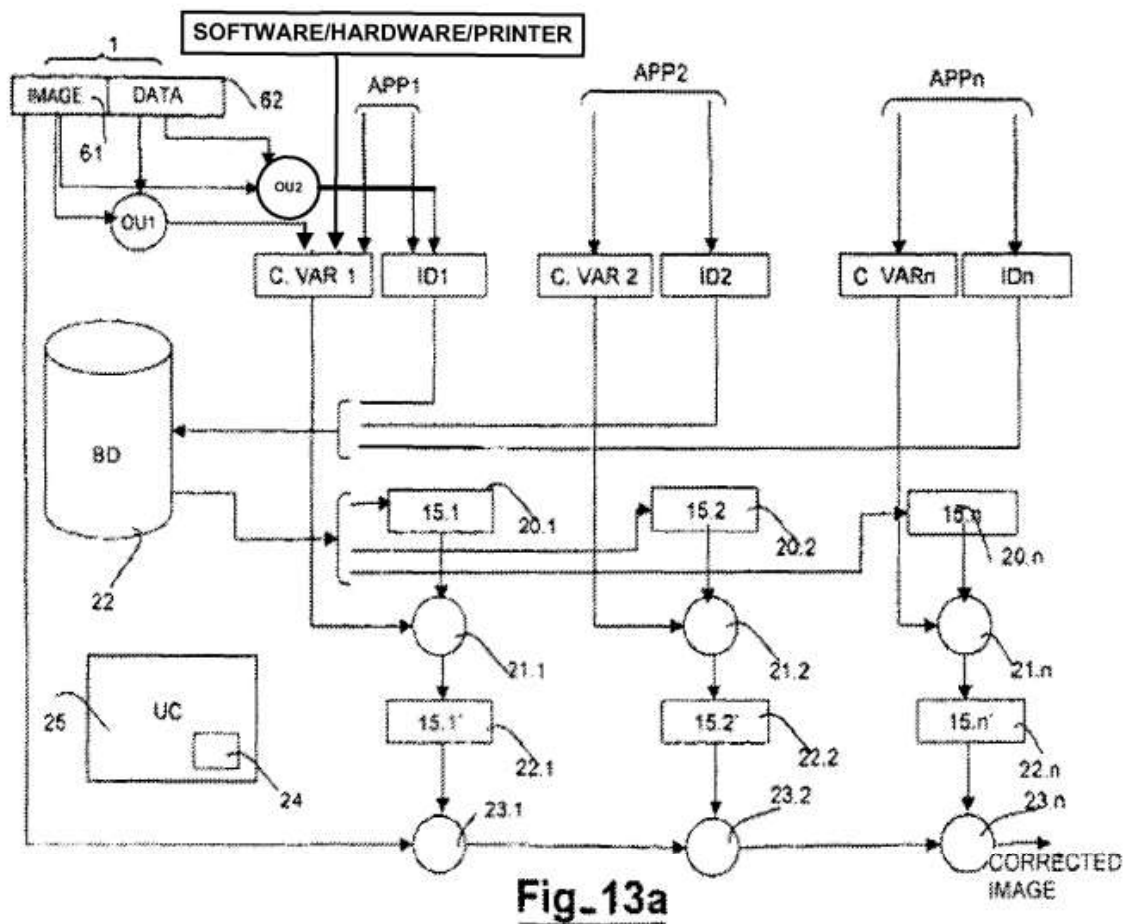
B. THE PROPOSED COMBINATION OF WATANABE + LIEGE

334. Petitioner alleges that “Liege describes correcting images from digital video frames for “defect[s] related to the characteristics of the optical system” (e.g., the lens) including astigmatism.” Petition at 52. I disagree for at least the reasons discussed above. Liege refers to astigmatism of an observer, not astigmatism aberration in an image.

335. Petitioner alleges that “POSAs would have had reasons to use Liege’s astigmatism correction in Watanabe’s system because this would improve Watanabe’s functionality by adding an additional distortion correction.” Petition at 53. I disagree. Petitioner does not explain how Liege operates and Petitioner fails to explain how a POSA could have or would have incorporated Liege’s teachings into Watanabe’s system. Petitioner also fails to establish that Watanabe’s system is capable of performing corrections as taught by Liege.

336. A POSA would not be motivated to incorporate the teachings of Liege because it would require high processing power for multiple processes. As shown and described in FIG. 13A of Liege, image-processing operators 23.1 through 23.n process the images based on modified formatted information 15.1’ through 15.n’ respectively. EX. 1012 at 32:15-23; *see also* EX. 1012 at 34:47-56. Image-

processing operator 23.1 processes the image based on modified formatted information 15.1' and provides a modified image, which is then processed by each operator 23.2 through 23.n in a similar fashion. *Id.* Thus, there are “n” number of operators 23 that each produce a modified image based on the defects of each appliance.



337. Petitioner alleges that “Watanabe describes image processing components supporting Liege’s astigmatism correction.” Petition at 53. I disagree. There are multiple operators involved in Liege. As described with respect to FIG. 13A of Liege, there are operators 20.1-20.n, operators 21.1-21.n, operators 22.1-

22.n, and operators 23.1-23.n which each play an important role in the correction process. Petitioner does not explain how the functionality of operators 20.1-20.n, or operators 21.2-21.n, or operators 22.1-22.n, or operators 23.1-23.n of Liege would be incorporated into Watanabe's system. Petitioner fails to explain how Watanabe's existing components support Liege's teachings.

338. In fact, Watanabe expressly teaches away from prior art where “process data need[s] to be transmitted between apparatuses and consequently the process becomes complicated.” EX. 1005 at [0008]. As such, a POSA would not be motivated to combine Watanabe and Liege.

339. Liege expressly states that operators 23.1-23.n do not modify the image based on formatted information 15.1-15.n, but rather based on modified formatted information 15.1'-15.n' provided by the operators 21.1-21.n and 22.1-22.n.

340. Petitioner alleges that Liege's astigmatism corrections “would simply add additional tables” to Watanabe's tables. Petition at 53. Petitioner does not identify Liege's alleged “astigmatism corrections” and Petitioner does not explain how Watanabe's system would include Liege's corrections. Petitioner alleges that Watanabe's table 70 would be modified to include formatted information 15.1-15.n (Petition at 52), but this information is not sufficient to perform image processing

based on the teachings of Liege, because the operators 23.1-23.n require **modified formatted information 15.1'-15.n'**.

341. Petitioner fails to explain these implementation details of Liege's teachings. Petitioner fails to establish a POSA would be motivated to combine Watanabe and Liege as proposed or that doing so would be within the ordinary skill of a POSA.

C. CLAIM 26 OF THE '685 PATENT

1. Claim 26: "The system of claim 1, wherein the system includes machine readable instructions for the system to correct for astigmatism aberrations."

342. Petitioner fails to establish that Liege discloses correcting "astigmatism aberrations". Liege refers to astigmatism of an observer, not astigmatism aberration in an image.

343. Petitioner alleges that "Watanabe+Liege meets claim 26 because it includes software implementing Liege's astigmatism correction in images from digital video." Petition at 53-54. Petitioner fails to identify any software in Liege that could or would be incorporated in Watanabe's system. Petitioner fails to establish that Liege discloses machine readable instructions or that Liege's techniques are implemented using software.

344. Additionally, for at least the reasons discussed above, a POSA would not be motivated to incorporate Liege’s teachings into Watanabe. Petitioner is using hindsight.

XVI. GROUND 8 BASED ON TAKANE + WATANABE

Ground	Claims	35 U.S.C. §	References
8	1, 2, 6, 7, 10, 12, 14, 15, 17, 18, 27, 28, 30	103	Takane + Watanabe

A. THE PROPOSED COMBINATION OF TAKANE + WATANABE

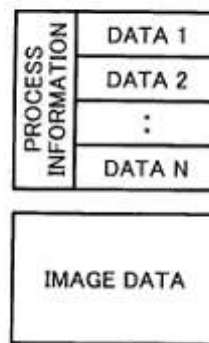
345. Petitioner relies on Takane’s digital camera shown in FIGS. 1 and 2, including for example lens 12, CCD 14, A/D converter 30, CPU 48, and image processing circuit 46. In my opinion, a POSA would understand these are hardware components of Takane’s digital camera 10.

346. Petitioner’s expert opined that “Takane does not describe how distortion correction circuits 56 or 58 are implemented.” EX. 1003 at ¶474; IPR2024-00924, EX. 1003 at ¶312. I disagree. Takane discloses complete hardware diagrams in FIG. 1 and FIG. 2. A POSA would be familiar with the hardware components disclosed in Takane and a POSA reading Takane would

understand the hardware capabilities and required resources. A POSA would have understood that modifying these hardware components would affect at least the size, weight, and power-requirements of the modified camera and a POSA cannot ignore the impact of these modifications.

347. As discussed above, Watanabe explains that “various data (data 1-data N) are added to image data as process information”. EX. 1005 at [0046]. For example, information of a lens type, a focusing point, and a zoom position may correspond to data 1, data 2, and data 3, respectively. EX. 1005 at [0047]; FIG. 3.

FIG. 2



348. Watanabe discloses tables 70 with correction values, prepared in advance, for each lens type. EX. 1005 at [0047]. The CPU 57 determines a table according to lens type (data 1) and then, determines the correction values according to the focusing point (data 2) and zoom position (data 3). EX. 1005 at [0047].

349. Petitioner’s expert opined that “Takane does not explain how it stores correction parameters in ROM 22 or distortion circuits 56 and 58, how the system loads correction parameters into circuits 56 and 58, or how the system changes the correction parameters in the distortion correction circuits to match the aberration(s) for different optical system components (lenses) and their settings or parameters (focal length or zoom position).” EX. 1003 at ¶440. Petitioner argues that POSAs would have had several reasons to use Watanabe’s database [tables 70] and DBMS teachings in order to implement Takane’s system by organizing distortion correction parameters in tables comprising a database, then identifying and retrieving parameters, and providing them to Takane’s distortion correction circuits to correct distortion. Petition at 56. For at least the reasons discussed above regarding claim 1 in Ground 1, I disagree that Watanabe’s database and DBMS teachings meet the claim limitations. I also disagree with Petitioner’s characterization of Takane as discussed herein. I also disagree that a POSA would have been motivated to modify Takane based on the teachings of Watanabe as discussed herein.

350. Petitioner expressly states that Takane + Watanabe “**modifies Takane’s teachings**” with the table teachings of Watanabe (database) “to organize and store parameters for optical distortion correction for each image size, lens, focal length, and zoom position in Takane’s ROM 22 for simplified and

streamlined access.” Petition at 57 (emphasis added). Petitioner argues that in Takane + Watanabe, Takane’s software “retrieve[s] parameters from the database and loads them into the distortion correction circuits ... **at the time of image capture.**” Petition at 57 (emphasis added). Petitioner further argues that argues that Takane’s IC executes software that accesses a database comprising tables with correction parameters that it provides to distortion correction circuit 56. Petition at 60.

351. Petitioner agrees that Takane discloses polynomial coefficients (correction parameters). Petition at 54. Thus, I understand in the proposed combination of Takane + Watanabe, Petitioner alleges that Takane would store the correction parameters in a table in Takane’s ROM 22 and that Takane’s software would retrieve the correction parameters and load them into the distortion correction circuits at the time of image capture.

352. As discussed herein, Takane expressly discloses that the correction parameters are “stored in advance” in the correction circuits 56/58 themselves. *See, e.g.*, EX. 1009 at [0054], [0059]. A POSA would understand that because the correction parameters are stored in the circuits 56/58 “in advance”, the correction parameters are stored in the circuits 56/58 before the time of image capture.²⁵ For

²⁵ Petitioner’s expert testified that Takane discloses that the correction parameters are stored in Takane’s circuits 56/58 “at the point of actually performing the corrections. Laub Depo Tr. at 112:19-113:1.

example, a POSA reading Takane would understand that the image size and/or focal length is designated by the user in advance, before the time of image capture, and the correction parameters are stored in the correction circuits 56/58 in advance, before the time of image capture. The correction parameters are selected based on the designated image size and/or focal length. In my opinion, Petitioner is conflating or confusing the image capture parameters (e.g., image size, focal length) and the correction parameters (polynomial coefficients) disclosed in Takane. For example, Takane discloses:

- “Parameters expressing a polynomial which approximates the amount of displacement of the optical distortion (i.e., the coefficients of a polynomial) are **stored in advance in each of the first distortion correction circuit 56 and the second distortion correction circuit 58**. By using these parameters, the first distortion correction circuit 56 and the second distortion correction circuit 58 correct the optical distortion included in the inputted digital image data.” EX. 1009 at [0054](emphasis added)
- “Here, the parameters, which express the polynomial approximating the amount of displacement of the optical distortion and which are stored in the first distortion correcting circuit 56 (i.e., the set of coefficients of the multidimensional function $F(d)$), are **set in advance** so as to be peculiar to the predetermined size obtained at the time of photographing standby or at the time of dynamic image photographing (in the present embodiment, the VGA size).” EX. 1009 at [0059](emphasis added)
- “As described above, the digital camera 10 of the present embodiment has an optical zoom function. Thus, **parameters ... can be stored for each of a plurality of predetermined focal distances**. The group of optimal parameters can be selected in accordance with the focal length at the time of obtaining the digital image data which is the object of correction, and processing for correcting the optical distortion can be carried out.” EX. 1009

at [0060](emphasis added)

353. Petitioner’s expert opined that “Takane leaves the camera’s data storage and retrieval techniques to the implementer.” EX. 1003 at ¶442. I disagree. Takane expressly discloses that the correction parameters are set in advance and stored in the correction circuits 56/58 themselves. *See, e.g.*, EX. 1009 at [0054],[0059].

354. The proposed modification would change Takane’s principle of operation. Takane teaches storing correction parameters in circuits 56 and 58 and does not use a separate table as disclosed in Watanabe.

355. A POSA would not be motivated to modify Takane based on Watanabe as proposed. Storing the parameters in tables in Takane’s ROM 22 would be inefficient and change Takane’s principle of operation.

356. Takane expressly teaches away from prior art that uses a table of correction amounts that require a large storage capacity, which reduces the work region and increases costs. EX. 1009 at [0007]. Takane also distinguishes prior art that stores the correction parameters (the coefficients of the polynomial) in a separate table. EX. 1009 at [0008]. Takane instead teaches storing the correction parameters in the correction circuits 56/58 in advance.²⁶

²⁶ In IPR2024-00925, Petitioner argues that “Takane’s criticism of tables storing corrections for each pixel or “coordinate” (Takane, [0007]) does not apply since

357. Petitioner fails to address that modifying Takane’s system to function as proposed would require more processing power, more memory space, increase costs, and be highly inefficient. A POSA would not be motivated to make the proposed modifications. Petitioner is applying hindsight bias using the claims of the ‘339 Patent as a roadmap.

358. Petitioner’s expert testified that, for example, computation time would be considered by a POSA as a factor when designing a camera, “if there is a consideration for how quickly a finished result can be delivered.” Laub Depo Tr. at 24:5-8. Storing the correction parameters in the circuits 56/58 speeds up computation time. A POSA reading Takane would not be motivated to slow down computation time. Takane repeatedly refers to speed as a consideration. *See, e.g.*, EX. 1009 at [0012] (“processing requires more time” in prior art); [0014] (“processing time... can be shortened” in present invention); [0015] (“processing speeds”), [0016] (“processing speeds”), [0017] (“distortion can be corrected in a short time”); [0021] (“shorten the overall processing time”); [0022]

this combination [Takane + Watanabe] uses tables to store correction parameters rather than correction values for each pixel.” IPR2024-00925, Petition at 43. I disagree. Takane also criticizes storing the correction parameters (the coefficients of the polynomial) in a separate table. EX. 1009 at [0008]. Takane explains that by using only parameters (the coefficients of the polynomial) “there is no need to hold the correction amounts of the respective coordinates in a table.” EX. 1009 at [0008].

(“processing speed will be fast”), [0061] (“processing time can be shortened”); [0062] (“processing speed”).

359. In my opinion, a POSA would understand that Takane’s correction parameters are polynomial coefficients that can be used in a correction algorithm. Takane’s correction parameters are selected based on, for example, image size and focal length. However, unlike Watanabe, Takane teaches storing the correction parameters in the circuits 56/58 and not in a separate table. Takane teaches away from storing the correction parameters in a separate table and modifying Takane to store the correction parameters in a separate table would change Takane’s principle of operation.

360. Takane discloses that the user can designate/set various image capture parameters such as image size or focal length before the time of image capture:

- “The operation section 18 includes a release button 18A operated at the time of instructing execution of photographing of a still image or dynamic images; a mode switching switch 18B serving as a photographing mode selecting section which is operated in order to select one of a still image photographing mode, a dynamic image photographing mode, and a playback mode; **a cursor button 18C operated in order to set various parameters** or to designate an image which is to be played back when the playback mode is selected; a power switch 18D operated to turn the power source of the digital camera 10 on and off; and the like.” EX. 1009 at [0034] (emphasis added)
- “The dynamic image signal processing circuit 52... converts the gradation such that image size becomes a **predetermined image size set in advance**. Note that the predetermined image size used in this case is generally VGA size (640×480 pixels) or QVGA size (320×240 pixels).” EX. 1009 at [0047]

(emphasis added)

- “When the release button 18A is depressed halfway, the still image signal processing circuit 54 gradation-converts the inputted digital image data of the actually photographed size, into a **predetermined image size which is set in advance** and which is smaller than the actually photographed size.” EX. 1009 at [0048] (emphasis added)
- “[W]hen the release button 18A is depressed fully, the gradation is converted to as to become **an image size designated by the photographer in advance.**” EX. 1009 at [0049] (emphasis added)

361. A POSA would understand that a user may specify image capture parameters such as focal length or image size before the image is captured. These image capture parameters are different from the correction parameters (polynomial coefficients) used by distortion correction circuits 56/58.

362. Takane further discloses correction parameters stored in advance in the distortion correction circuits 56/58:

- “Parameters expressing a polynomial which approximates the amount of displacement of the optical distortion (i.e., the coefficients of a polynomial) are stored in advance in each of the first distortion correction circuit 56 and the second distortion correction circuit 58. By using these parameters, the first distortion correction circuit 56 and the second distortion correction circuit 58 correct the optical distortion included in the inputted digital image data.” EX. 1009 at [0054]
- “Here, the parameters, which express the polynomial approximating the amount of displacement of the optical distortion and which are stored in the first distortion correcting circuit 56 (i.e., the set of coefficients of the multidimensional function $F(d)$), are set in advance so as to be peculiar to the predetermined size obtained at the time of photographing standby or at the time of dynamic image photographing (in the present embodiment, the VGA size).” EX. 1009 at [0059]

363. Petitioner's expert testified that Takane + Watanabe does NOT store the parameters Takane's ROM 22 **in addition to** storing those parameters in Takane's circuits 56/58. Laub Depo Tr. at 114:4-9. Therefore, in my opinion, Petitioner's proposed combination of Takane + Watanabe changes Takane's principle of operation.

364. A POSA would not be motivated to store correction parameters in the external ROM 22 as opposed to in the correction circuits 56/58. Takane's ROM 22 is described as an external ROM. EX. 1009 at FIG. 1, [0052]. Takane discloses "an external ROM 22 in which various programs, parameters, conversion tables and the like are stored in advance." EX. 1009 at [0033].²⁷ However, the parameters stored in Takane's ROM 22 are not the correction parameters stored in the correction circuits 56/58. The parameters stored in ROM 22 relate to image capture parameters. For example, Takane explains the ROM 22 stores bitmap data "in advance" to be "superposed" on the subject and displayed on the LCD 16. EX. 1009 at [0071] ("Note that the bitmap data is stored in advance in the external ROM 22, and the necessary bitmap data is selected and read out from the external

²⁷ Takane's conversion tables may relate to for example the image signal processing circuits 52/54. "The digital image data which has been processed by the signal processing circuit 50 is gradation-converted into VGA size by the dynamic image signal processing circuit 52." EX. 1009 at [0079]. "[T]he data is inputted to the still image signal processing circuit 54, and is gradation-converted to VGA size by the still image signal processing circuit 54." EX. 1009 at [0086].

ROM 22.”).²⁸ These image capture parameters do relate to image processing, but the image capture parameters are not the same as the correction parameters stored in circuits 56/58. For example, focal length is an image capture parameter and the focal length may be “superposed” on the image. *See* EX. 1009 at [0090]. Further, focal length is an image capture parameter and the correction parameters are selected based on the focal length. *See* EX. 1009 at [0060].

365. Instead of using the external ROM 22 to store correction parameters, Takane explains that correction parameters are set in advance and stored in the correction circuits themselves. EX. 1009 at [0054] (“Parameters expressing a polynomial... are stored in advance in each of the first distortion correction circuit 56 and the second distortion circuit 58....”). Petitioner admits that Takane discloses storing correction parameters in the first distortion correction circuit 56 and second distortion correction circuit 58. Petition at 54 (citing Takane at [0054]); *see also* EX. 1003 at ¶544.

366. Petitioner argues a POSA would be motivated to use external ROM 22 for “simplified and streamlined access.” Petition at 57. However, Takane’s

²⁸ “[T]he LCD 16 and as needed, displays various types of bitmap data expressing various types of menus, a still image/dynamic image photographing mode mark, the date, a frame showing the A/F frame, parameters relating to the image processing, a message or the like, such that they are superposed on the subject obtained by photographing.” EX. 1009 at [0070]. Using the OSD circuit 62 and the LCD driving circuit 34, “an image, in which bitmap data is superposed on the subject, can be displayed on the LCD 16.” EX. 1009 at [0071].

correction parameters are already stored in circuits 56 and 58 and moving the correction parameters to an external ROM would not provide simplified and streamlined access for circuits 56 and 58.

367. To the extent Petitioner is suggesting to add additional correction parameters or additional correction algorithms to Takane based on the teachings of Watanabe, that is not clearly set forth in the petition. Even so, a POSA reading Takane would not be motivated to add additional correction parameters or additional correction algorithms for processing by the first distortion correction circuit 56, the alleged digital signal processor. *E.g.*, Petition at 60. Takane's first distortion correction circuit 56 purposefully uses fewer parameters and provides lower accuracy. Takane explains that "at the first distortion correction circuit 56, the image size which is the object of correction is fixed, and the number of parameters which must be held is lower than in a case in which a plurality of image sizes are objects of processing." EX. 1009 at [0059]. Therefore, a POSA would not be motivated to increase corrections at Takane's first distortion correction circuit 56.

368. A POSA looking to use a polynomial for correction as described in Takane would understand that the polynomial would cover a limited set of

aberrations.²⁹ A POSA would understand that using different or multiple polynomials would require different sets of correction parameters that are set in advance based on the types of lenses used with the system. In *Takane + Watanabe*, Petitioner fails to acknowledge that polynomials (plural) would require different tables with different correction parameters for different lenses, and that is not discussed in either *Takane* or *Watanabe*, or in the petition. None of the cited references discloses the claimed DBMS/database that would allow a POSA to manage/organize the necessary information. Even if a POSA were to redesign *Takane* to provide a common processing system that could utilize an array of polynomials for in-camera processing, which by itself is a difficult task with a number of unknown results, the data itself is set in advance based on the lens and polynomials considered at the time of the camera redesign. If a user chooses to use a new lens, there is no guarantee that the same set of corrections would work effectively – the corrections applied to the new lens would be limited to the pre-existing camera design. Also, if a user wishes to use improved polynomials, there is no disclosure in *Takane* or *Watanabe* that a POSA would be able to update the pre-existing polynomials and there is no disclosure that the improved polynomials

²⁹ Petitioner's expert identifies the $F(d)$ algorithm disclosed in *Takane* to correct optical distortion and alleges that *Takane* discloses correcting pin-cushion and barrel distortion as types of optical distortion. EX. 1003 at ¶544 (citing EX. 1009 at [0055]) and ¶377 (citing EX. 1009 at [0005]).

would be able to be performed by the pre-existing camera design. In view of these engineering challenges facing a POSA, the claimed technology is unconventional in its flexibility, updatability, and scalability using the claimed hardware and software.

369. To the extent Petitioner is relying on incorporating Watanabe's process information into Takane, that is not clearly set forth in the petition. Even so, Petitioner does not explain how Watanabe's process information would be used with respect to Takane's correction parameters. Watanabe teaches selecting correction values stored in tables 70 of Watanabe based on the process information. Watanabe makes clear that the process information (lens type, focusing point, zoom position) is used to determine a table and then a correction value. Petitioner does not explain the different functionality of the "imaging processing program" and the "photographing program" of Watanabe, where it is the "photographing program" that appends the process information to the image data and it is the "imaging processing program" that performs imaging processing. *See, e.g.*, EX. 1005 at FIG. 4. Petitioner does not explain if, in Takane + Watanabe, Takane's software would append process information to the image data and supply both the process information and image data to the distortion correction circuits 56/58. Doing so would be extremely inefficient in Takane's system.

370. Takane does not disclose separate imaging processing versus photographing programs, the transfer of process information, or the reference to tables for correction values. Instead, Takane simply stores correction parameters in Takane's correction circuits 56/58.

371. Even if a POSA were motivated to modify Takane to store the correction parameters in Takane's external ROM 22 instead of correction circuits 56/58, with which I disagree, neither Takane nor Watanabe disclosed the claimed DBMS/database.

372. In my opinion, Petitioner and its expert fail to establish that it would have been within the ordinary skill of a POSA to combine the references or that a POSA would have a reasonable expectation of success in doing so. Petitioner and its expert fail to establish that the proposed combination would have yielded predictable results. Petitioner and its expert are using hindsight bias.

1. Petitioner's expert's deposition testimony³⁰

373. During deposition, Petitioner's expert testified that he has "not proposed a modification" to Takane. Laub Depo Tr. at 109:9-12. When questioned if Petitioner's expert is relying on a modified system of Takane based on

³⁰ It is noted that Petitioner's expert's analysis regarding the proposed combination of Takane + Watanabe is the same in IPR2024-00924 of the '805 Patent and IPR2024-00923 of the '685 Patent. See IPR2024-00924, EX. 1003 at ¶¶283-295 and IPR2024-00925, EX. 1003 at ¶¶441-453.

Watanabe's teachings of a database, Petitioner's expert testified "that is wrong".

Laub Depo Tr. at 138:15-19. **This testimony directly contradicts the petition.**

Petition at 57 (Takane + Watanabe "modifies Takane's teachings").

374. Petitioner's expert appears to suggest that a POSA would use Watanabe's teachings to "implement" – "not modify" – storing parameters in tables comprising a database. Laub Depo Tr. at 111:4-12; *see also* Laub Depo Tr. at 117:8-9 ("It's not a modification; it is a – an implementation"). **However, Petitioner's expert could not explain the proposed "implementation."**

375. Petitioner's expert testified that Takane + Watanabe does NOT store the correction parameters in Takane's ROM 22. Laub Depo Tr. at 114:19-115:3. **This testimony directly contradicts the expert declaration.** EX. 1003 at ¶451 ("Thus in Takane in view of Watanabe, Takane's system uses Watanabe's tables (database) to organize and store parameters for optical distortion correction for each image size, lens, focal length, and zoom position in Takane's ROM 22."); IPR2024-00924, EX. 1003 at ¶293 (same). When asked if the parameters are NOT stored in Takane's ROM 22, Petitioner's expert acknowledged that was a contradiction of paragraph 293 of his expert declaration on the '805 Patent. Laub Depo Tr. at 115:13-18.³¹

³¹ I note that paragraph 293 of the expert's declaration on the '805 Patent is the same as paragraph 451 of the expert's declaration on the '685 Patent.

376. Petitioner's expert refused to answer whether in Takane + Watanabe, the parameters "would" be stored in Takane's ROM 22. Laub Depo Tr. at 115:19-22; 116:1-118:9. **Petitioner's expert fails to support that a POSA would be motivated to make the modification proposed in the petition.**

377. Petitioner's expert confirmed it is NOT his opinion that a POSA would modify Takane to store parameters Takane's ROM 22 **instead of** the circuits themselves. Laub Depo Tr. at 109:4-8; 110:6-112:3. Petitioner's expert testified that Takane + Watanabe does NOT store the parameters Takane's ROM 22 **in addition to** storing those parameters in Takane's circuits 56/58. Laub Depo Tr. at 114:4-9. Again, Petitioner's expert could not explain the proposed "implementation".

378. Petitioner's expert's inconsistent testimony fails to support Petitioner's reliance on Takane + Watanabe. Petitioner's expert could not explain the reliance on a proposed modification to Takane in Takane + Watanabe and Petitioner's expert could not explain what that proposed modification would be. Petitioner's expert could not confirm where the correction parameters are stored in Takane + Watanabe. Petitioner's expert could not explain why a POSA would be motivated to change the principle of operation of Takane, given that Takane expressly teaches storing the correction parameters in the circuits themselves.

379. The expert declaration itself acknowledge that Takane discloses storing parameters in the circuits themselves. EX. 1003 at ¶497 (“Takane stores correction parameters ‘in advance’ in first distortion correction circuit 56 based on the lens and focal length”).

380. Petitioner’s expert testified that a POSA would have known of Watanabe’s database and DBMS teachings, but “none of this compels the POSITA, and none of those, no specific one of those, is – would reach to the word ‘would’ that you have been continually using, which is why you have heard so many no’s from me”. Laub Depo Tr. at 117:1-118:9. Petitioner’s expert testified that “[i]t is something that **could** be used by a POSITA as a way to implement Takane”. Laub Depo Tr. at 118:5-7 (emphasis added). **Petitioner’s expert fails to support that a POSA would be motivated to make the modification proposed in the petition.**

381. In view of Petitioner’s expert’s deposition testimony, the proposed combination of Takane + Watanabe is not supported and not explained. Petitioner fails to show a rational basis for the proposed modification and Petitioner’s expert’s deposition testimony directly contradicts the allegations in the petition. Petitioner’s expert could not explain the proposed modification or the motivation for the proposed modification during deposition. Petitioner and its expert fail to show that a POSA would be motivated to make the combination as proposed.

B. CLAIM 1 OF THE '685 PATENT

1. *Claim 1[a]: “a digital video camera including in-camera software, an optical lens mechanism, at least one digital sensor for capturing the digital video, an integrated circuit including; a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and a memory storage sub-system”*

382. I incorporate my above discussion of Takane + Watanabe herein.

c. “integrated circuit”

383. Claim 1[a] recites “an integrated circuit.”

384. Petitioner does not clear identify the component(s) of Takane that alleged correspond to the claimed integrated circuit. Petition at 59. It is not clear if Petitioner is relying on Takane’s main controlling section 24 implemented as a one-chip LSI or Takane’s image processing circuit 46.

385. For claims 1[c] and 1[d], Petitioner refers to Takane’s main controlling section 24 as the “IC”. Petition at 61. However, Petitioner also relies on Takane’s image processing circuit 46. Petition at 62.

a. “digital signal processor” (DSP)

386. Claim 1[a] recites “a digital signal processor.” Throughout the analysis of claim 1, it is clear that Petitioner is relying on Takane’s first distortion correction circuit 56 as allegedly corresponding to the claimed DSP. Petition 60 (analyzing 1[a]), 61 (analyzing 1[c] and 1[d]), 63 (analyzing 1[f]). Petitioner’s

expert confirmed in deposition that he is relying on Takane's first distortion correction circuit 56 as corresponding to the claimed DSP. Laub Depo Tr. at 127:11-20.

387. In my opinion, a POSA would understand that Takane's circuit 56 is a hardware component. Interpreting a circuit to be a functional block contradicts the common understanding of a POSA of the word "circuit" which refers to hardware.³²

388. Petitioner's expert agreed that a digital signal processor "generally was well-known." Laub Depo Tr. at 27:7-15. Petitioner's expert admitted that "the specification of the patent presumes that a person reading that patent would understand what is referred to when the phrase 'digital signal processor' is used." Laub Depo Tr. at 28:17-29:10. However, Petitioner's expert opined that any of Takane's circuits that process digital signals could be regarded as DSPs. EX. 1003 at ¶473.³³ I disagree. A digital signal processor is a term of art and refers to a specific type of hardware. The claims recite DSP hardware with specific functionality.

³² Petitioner's expert agreed that the word "circuit" refers to an electrical or electronic circuit. Laub Depo Tr. at 31:8-18.

³³ Petitioner's expert repeatedly confirmed during deposition that Petitioner's analysis of a digital signal processor was "anything that processes a signal in a digital manner." Laub Depo Tr. at 27:16-28:12; *see also* Laub Depo Tr. at 56:14-15.

389. In my opinion, Petitioner fails to establish that Takane's circuit 56 corresponds to a DSP as claimed. For example, Petitioner fails to show that Takane's circuit 56 has flexible programming or uses software as opposed to fixed functionality hard-coded into the circuit itself. Petitioner's expert admits that a POSA would understand differences between a DSP and an ASIC based on flexible programming using software. IPR2024-00924, EX. 1003 at ¶¶157, 319. Petitioner's expert testified that a "DSP is capable of being programmed in any of a variety of ways. So the DSP is flexible in terms of programs provided to it." Laub Depo Tr. at 52:15-53:11.

390. Petitioner stated in IPR2024-00924 that: "a DSP provides known advantages where a programmable upgrade in processing function (such as image optimization) may be desirable" and that "DSPs provide upgrade benefits as compared to ASICs based on software programming" IPR2024-00924, Petition at 12. Petitioner also states that "a POSITA would recognize that while lens aberrations were known, optimization schemes may require the flexible programming of a DSP." *Id.*

391. In IPR2024-00924, Petitioner relies on EX. 1081 ("Ralston") which explains that:

- "Codec functions running on RISC [Reduced Instructions Set] processors or DSPs are typically software routines, with the advantage that they can be

modified in order to correct programming errors or upgrade functionality.”

IPR2024-00924, EX. 1081 at 7:65-8:1.

- “The disadvantage of implementing certain complex, repetitive codec functions as software is that the resulting overall processor resource and power consumption requirements typically exceeds those available in mobile communications devices.” IPR2024-00924, EX. 1081 at 8:1-5.
- “Codec functions running on ASICs and multimedia processors are typically fixed hardware implementations of complex, repetitive computational steps, with, typically, the advantage that specially tailored hardware acceleration can substantially reduce the overall power consumption of the codec.” IPR2024-00924, EX. 1081 at 8:5-10.
- “The disadvantages of implementing certain codec functions in fixed hardware include longer and more expensive design cycles, the risk of expensive product recalls in the case where errors are found in the fixed silicon implementation, and the inability to upgrade fixed silicon functions in deployed products in the case where newly developed features are to be added to the imaging application.” IPR2024-00924, EX. 1081 at 8:10-16.

392. Neither Petitioner nor Petitioner’s expert addressed whether Takane’s circuit 56 is capable of being flexible programmed. In view of a POSA’s

knowledge of a DSP, Petitioner fails to show that Takane's circuit 56 corresponds to the claimed DSP.

393. Indeed, Takane expressly discloses that for the circuit 56, "[t]he correction accuracy is intentionally lowered, and the processing time can be shortened and the **circuit structure** of the first distortion correction circuit 56 can be made **simple**." EX. 1009 at [0061] (emphasis added).

394. To the extent Petitioner proposes to modify Takane's circuit 56 by implementing DSP hardware, that explanation is not clearly set forth in the petition. Also, Takane expressly teaches a simple circuit structure. EX. 1009 at [0061].

395. In IPR2024-00925, Petitioner states that "using a DSP for distortion correction in circuits 56 and 58 would at least advantageously provide greater flexibility for functions that are not repetitive and labor intensive (suggesting an ASIC)." IPR2024-00925, Petition at 47.³⁴ However, Petitioner fails to establish that the functionality of Takane's circuit 56 as disclosed is not repetitive and labor intensive. Petitioner also fails to establish that the functionality of Takane's circuit 56 in Takane + Watanabe is not repetitive and labor intensive.

³⁴ Here Petitioner states that "POSAs would have understood that using a DSP for distortion correction in circuits 56 and 58 would advantageously provide greater flexibility for such functions as Takane expressly suggested." Petition at 60 (citing EX. 1009 at [0133]). There is nothing in paragraph 133 of Takane that suggests flexible programming of Takane's circuits 56/58.

b. “database management system” (DBMS)

396. Petitioner relies on Watanabe’s DBMS teachings in Takane + Watanabe. Petition at 60-61.

397. I incorporate my discussion of claim 1[a] and the alleged DBMS in Watanabe discussed above in Ground 1 herein.

398. Petitioner argues that “Takane’s IC executes software that accesses a database comprising tables with correction parameters that it provides to distortion correction circuit 56.” Petition at 60. I disagree for at least the reasons discussed above regarding the proposed combination of Takane + Watanabe. Takane expressly discloses that the correction parameters are stored in advance in Takane’s circuit 56. EX. 1009 at [0054].

2. Claim 1[d]: “to correct the at least one optical image aberration in at least one frame of the digital video using at least one of the plurality of optical image aberration corrections in the database”

399. Petitioner relies on Watanabe’s database teachings in Takane + Watanabe. I incorporate my discussion of claim 1[d] above in Ground 1 herein.

400. Petitioner argues that Takane’s IC executes software that identifies correction parameters. Petition at 61. I disagree for at least the reasons discussed above regarding the proposed combination of Takane + Watanabe. Takane expressly discloses that the correction parameters are stored in advance in Takane’s circuit 56. EX. 1009 at [0054].

401. Petitioner's expert also opined that "[a] POSA would have understood that there were two known alternatives: (1) storing the algorithm(s) implementing the function F(d) for a particular lens as executable code in the DSP if the DSP is capable of and has capacity for that non-volatile storage, or (2) storing them in some other memory or computer-readable medium and loading them into the DSP as needed." EX. 1003 at ¶545. Petitioner's expert further opined that "Takane's SoC would "obtain" the correction algorithm by accessing the database for information identifying the algorithm (or the algorithm itself), then "forward" the algorithm to the DSP so it could apply the filter and correct the aberration." EX. 1003 at ¶548.³⁵

402. I disagree that there are only two alternatives for at least the reasons discussed above in Ground 1. I also disagree with Petitioner's analysis of Takane + Watanabe for at least the reasons discussed above.

403. The first proposed "alternative" is a modification to Takane. Takane's circuit 56 would be understood by a POSA to be a hard-coded circuit. There is no suggestion in Takane that circuit 56 includes software comprising executable code.

³⁵ It appears that Petitioner's expert's reference to Takane's SoC refers to Takane's main controlling section 24. EX. 1003 at ¶534. However, during deposition, Petitioner's expert could not confirm whether he was relying on Takane's main controlling section 24 implemented as a one-chip LSI or whether he was relying on Takane's image processing circuit 46. Laub Depo Tr. at 121:7-126:4.

A POSA would have understood that using a hard-coded circuit, such as circuit 56, provides for fast computation.

404. The second proposed “alternative” is a modification to Takane. Takane’s circuit 56 would be understood by a POSA to be a hard-coded circuit. Takane expressly discloses that the correction parameters are stored in advance in the circuit 56.

405. Contrary to Petitioner’s arguments, there are not only “two” alternatives. A POSA would have understood that Takane’s circuit 56 is a hard-coded circuit. Takane’s correction parameters (the coefficients of the polynomial) are used in a hard-coded algorithm in the circuit.

406. As discussed above, Takane teaches away from storing corrections in a separate table (EX. 1009 at [0007]-[0008]) and instead discloses storing the correction parameters in the correction circuit 56.

C. CLAIM 6 OF THE ‘685 PATENT

407. I incorporate my discussion of claim 1 above in Ground 8 herein.

D. CLAIM 10 OF THE ‘685 PATENT

1. Claim 10: “The system of claim 6: wherein the digital signal processor applies color filtration to at least two frames of the digital video image.”

408. For claim 6, Petitioner relies on Takane’s first distortion correction circuit 56 as corresponding to the claimed “digital signal processor.” Petition at 64.

Petitioner fails to establish that Takane's circuit 56 performs white balance adjustment as alleged.

409. Petitioner cites to paragraph 44 of Takane which describes the signal processing circuit 50 performs white balance adjustment. EX. 1009 at [0044].

410. For claim 10, Petitioner's expert relies on Takane's signal processing circuit 50 as corresponding to the claimed "digital signal processor." EX. 1003 at ¶528. Petitioner's expert's analysis is inconsistent.

E. CLAIM 14 OF THE '685 PATENT

411. I incorporate my discussion of claim 1 above in Ground 8 herein.

412. Moreover, Petitioner fails to establish that a POSA would be motivated to modify Takane for the alleged IC to "forward" a filtration algorithm to the circuit 56 as required by claim 14[f]. For at least the reasons discussed above, because the correction parameters are stored in circuits 56/58 of Takane, the main controlling section 24 is not configured to forward the at least one filtration algorithm to the circuits 56/58. A POSA would not be motivated to modify Takane to do so.

F. CLAIM 18 OF THE '685 PATENT

413. Petitioner relies on its analysis of claim 10 for claim 18. Petition at 71.

414. I incorporate my discussion of claim 10 above in Ground 8 herein. In claim 14, from which claim 18 depends, Petitioner relies on Takane's first distortion correction circuit 56 as corresponding to the claimed DSP. Petition at 67.

G. CLAIM 27 OF THE '685 PATENT

- 1. Claim 27: "The system of claim 1, wherein the system includes machine readable instructions for the system to correct for lens distortion aberrations."***

415. Petitioner fails to establish that Takane's distortion correction is implemented using software.

H. CLAIM 28 OF THE '685 PATENT

- 1. Claim 28: "The system of claim 1, wherein the system includes machine readable instructions for the system to correct for pin cushion aberrations."***

416. Petitioner fails to establish that Takane's distortion correction is implemented using software.

I. CLAIM 30 OF THE '685 PATENT

- 1. Claim 30: "The system of claim 1, wherein the system includes machine readable instructions for the system to correct for barrel distortion aberrations."***

417. Petitioner fails to establish that Takane's distortion correction is implemented using software.

XVII. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS**A. LONG-FELT NEED**

418. Petitioner's expert admits that:

- “[A]ll 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.” EX. 1003 at ¶75.
- A POSA would consider “cost and manufacturing efficiencies” in designing a camera. *See* EX. 1003 at ¶113.
- “The challenged claims address topics related to digital aberration correction and/or modification of captured image data.” EX. 1003 at ¶78.
- “The successful implementation of software defined processing into cameras was vital to the rise in popularity of digital cameras. Software allows a POSITA to program the various internal workings of the camera to carry out the tasks desired by the user.” EX. 1003 at ¶116.

419. Historically, aberration correction was done on an external computer as discussed above regarding Adobe Photoshop and/or Russ in IPR2024-00924. However, this requires significant time, cost, and expertise as discussed above and in IPR2024-00924. Additionally, conventional cameras stored and transferred

compressed images (JPEG) which are inherently degraded in terms of image quality when compared to RAW images, which means the post-production editing was performed on an already degraded compressed image.

420. Conventional wisdom taught against adding significant hardware needed to perform the processing as described in the claims due to limitations of size, weight, power, cost, and mobility and a POSA would not think to arrive at the claimed technology because aberration correction was conventionally done on an external computer.

421. A POSA would have understood the long-felt need for improved image quality by way of aberration correction, but there were significant engineering challenges in achieving in-camera aberration correction as claimed in the '685 Patent. The claimed technology solves this long-felt need and does so by efficiently balancing competing considerations of size, weight, power, cost, and mobility in the camera itself. The claimed technology recites hardware and software that provides in-camera aberration correction capabilities and uniquely balances limited space, power consumption, and expense of a desirable digital camera. By efficiently performing in-camera aberration correction within the image processing pipeline within the camera, the result is far improved image quality, even when compared to post-production editing. The claimed technology enables in-camera aberration correction with the use of multiple different lenses

with multiple different camera systems. This is extremely beneficial in solving the known problems facing many photographers, engineers, and camera manufacturers.

422. Further, in my opinion, using a DBMS/database as claimed in a compact self-contained device, such as a digital camera, is by itself unconventional because without the express teachings of the '685 Patent, the POSA would not look to implement the features of a DBMS in such a device. Furthermore, the ability to organize/manage/update a database allows continued efficient organization/management of data as new data is introduced.

423. In my opinion, it is unconventional for a POSA to consider access to a DBMS within the image processing pipeline of a compact self-contained device. A POSA would conventionally take all efforts to make this processing portion of the device as efficient as possible and adding a DBMS would initially be thought of as unnecessary overhead. The teachings of the '685 Patent enable a POSA to understand that the correction data can be retrieved from and updated within an organized database and processed efficiently within the image processing pipeline.

424. In my opinion, the long-felt need for the claimed technology is evidence of non-obviousness.

B. CANON LITIGATION

425. I understand that Canon Inc. (“Canon”) was accused of infringing Patent Nos. 7,612,805 and 8,451,339 in Case No. 2:19-cv-246 (“Canon Litigation”). The complaint in the Canon Litigation was filed July 8, 2019.

426. I understand that Canon filed IPRs against the ‘805 and ‘339 Patents in IPR2020-01321 and IPR2020-01322 (“Canon IPRs”), respectively, on July 20, 2020. The IPRs were denied institution on discretionary grounds. Canon filed requests for rehearing, which were later withdrawn.

427. I understand that Canon also filed a declaratory judgment action against Patent Nos. 10,873,685 and 10,877,266 in Case No. 1:20-cv-1238 (W.D. Tex.)(“Canon DJ Action”).³⁶ The complaint in the Canon DJ Action was filed December 22, 2020.

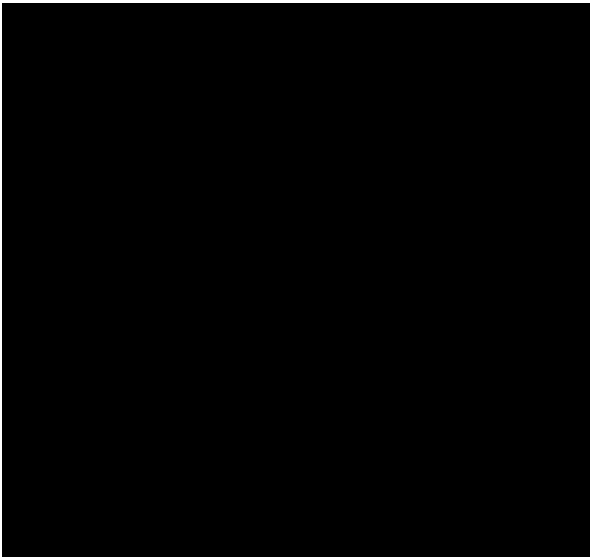
428. Canon previously allowed photographers to make post-production corrections using its proprietary Digital Photo Professional (DPP) software on an external computer. Canon explains that:

- “Digital Photo Professional (DPP) is a high-performance RAW image processing, viewing and editing software for EOS digital cameras and PowerShot models with RAW capability. Using DPP you can easily perform basic and advanced editing and printing of RAW images. An example of the available editing functions are image rotation, white balance adjustment, dynamic-range adjustment, colour adjustment and fine-tuning of tone curve

³⁶ The Canon DJ Action also involved Patent No. 10,877,267.

characteristics.”³⁷

429. I have been informed by counsel for OIT that at least the following Canon products were accused of infringing the ‘805 and ‘339 Patents in the Canon Litigation for their use of the claimed in-camera aberration correction technology:



430. While I do not have access to Canon’s confidential and highly-confidential documents produced in the Canon Litigation, due to a destruction order, I have reviewed public information related to Canon products.

431. I understand that the Canon EOS Rebel T6s was a very popular Canon product. The Canon EOS Rebel T6s was introduced in 2015.³⁸ Reviews of this product stated, for example:

³⁷ https://en.canon-cna.com/support/consumer_products/software/digital-photo-professional.html?softwareid=tcm:257-1328049&os=all (EX. 2021).

³⁸ <https://www.reviewed.com/cameras/content/canon-eos-rebel-t6s-first-impressions-review> (EX. 2022)

- “[I]t’s that this camera has everything you’d want from an advanced camera, at the price point of a mid-range model”³⁹
- “Pushing data around the camera is a Digic 6 processor, which enables a few key features here. First off, while you can’t record video at 1080/60p, you will be able to get 1080/30p from it. Continuous shooting gets a nice boost from the faster chip, which can push 5fps max to its buffer.”⁴⁰
- “Considering the mediocre refresh treatment that the Rebel lineup usually gets from Canon, the T6s feels like a breath of fresh air.”⁴¹
- “The Canon T6s takes the Rebel series up a notch.”⁴²
- “Its straightforward functionality is great for an entry-level DSLR shooter, but it also brings over more advanced features and performance from higher-end cameras to satisfy the more experienced photographer as well.”⁴³
- “The new EOS Rebel T6s (\$849.99) ... offers the best balance of features and performance for consumers, making it our new Editors' Choice for sub-\$1,000 SLRs.”⁴⁴
- “What really impresses is how I get great-looking photos right out of the T6s with no editing or processing required. This is the greatest thing I can say about any camera; its color, exposure, focus and auto white balances are always right-on, so pictures look much better than I get from other brands of camera like Fuji or Sony. With the T6s, I can point and shoot and get great

³⁹ <https://www.reviewed.com/cameras/content/canon-eos-rebel-t6s-first-impressions-review> (EX. 2022)

⁴⁰ <https://www.reviewed.com/cameras/content/canon-eos-rebel-t6s-first-impressions-review> (EX. 2022)

⁴¹ <https://www.reviewed.com/cameras/content/canon-eos-rebel-t6s-first-impressions-review> (EX. 2022)

⁴² <https://www.imaging-resource.com/PRODS/canon-t6s/canon-t6sA.HTM> (EX. 2023)

⁴³ <https://www.imaging-resource.com/PRODS/canon-t6s/canon-t6sA.HTM> (EX. 2023)

⁴⁴ <https://www.pcmag.com/reviews/canon-eos-rebel-t6s> (EX. 2024)

results.”⁴⁵

- “It's easy to shoot, shoots well, and the pictures look much better than many other brands of cameras.”⁴⁶
- “The 6Ti can be set so JPGs are recorded with lens distortion automatically corrected. Even the 5DS R can't do this! Ha!”⁴⁷
- “All Canon EOS EF and EF-S lenses made since the 1980s work perfectly.”⁴⁸
- “The T6s is a great little camera. It's easy to use, very lightweight, handles well, and the pictures look great.”⁴⁹
- “If you think you'll like the T6s, you'll love it when you actually get yours. It's small, light, easy to use and the pictures look much better than anything I can get with even the most expensive mirrorless cameras like the \$3,200 Sony A7R II. The T6s also weighs less than the Sony, so go T6s!”⁵⁰

432. The Canon EOS Rebel T6s included Canon's DIGIC 6 image processing engine. As shown below, I performed an analysis of exemplary claim 1 of the '685 Patent and the Canon EOS Rebel T6s:

Claim 1 of Patent No. 10,873,685	Canon EOS Rebel T6s
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⁴⁵ <https://www.kenrockwell.com/canon/t6s.htm> (EX. 2025)

⁴⁶ <https://www.kenrockwell.com/canon/t6s.htm> (EX. 2025)

⁴⁷ <https://www.kenrockwell.com/canon/t6s.htm> (EX. 2025)

⁴⁸ <https://www.kenrockwell.com/canon/t6s.htm> (EX. 2025)

⁴⁹ <https://www.kenrockwell.com/canon/t6s.htm> (EX. 2025)

⁵⁰ <https://www.kenrockwell.com/canon/t6s.htm> (EX. 2025)

1[pre]	A digital imaging system for correcting optical image aberrations in a digital video, comprising:	 51 Overview Advanced EOS Features, Rebel Simplicity Designed to make high quality imaging simple and fun, the EOS Rebel T6s camera is the most sophisticated Rebel ever. It has powerful features like a 24.2 Megapixel CMOS Sensor, a DIGIC 6 Image Processor and compatibility with Canon's entire line of EF and EF-S lenses. Plus, the EOS Rebel T6s is the first Rebel to include advanced options like a top LCD display panel and a Quick Control dial (with locking mechanism), even a built-in level display, all in an elegant, compact and portable package. For stills, the EOS Rebel T6s can shoot incredibly quickly in Live View mode with Servo Burst Shooting, plus it has a number of advanced HD movie shooting features that include HDR video recording and Movie Digital Zoom. And, a Rebel first, the EOS Rebel T6s comes equipped with built-in Wi-Fi® and NFC, making it possible to transfer and share photos easily and conveniently to compatible devices without having to rely on using cables. Near Field Communication* (NFC) allows the camera to pair with compatible Android™ devices** and even Canon's new Connect Station CS100. With the simple versatility of the Rebel line, plus features rarely found in this camera class, the sky's the limit with the EOS Rebel T6s. 52
1[a-1]	a digital video camera including in-camera software,	 53

51

https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s# (EX. 2026)

52

https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s# (EX. 2026)

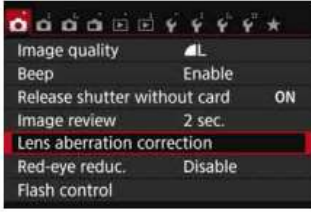
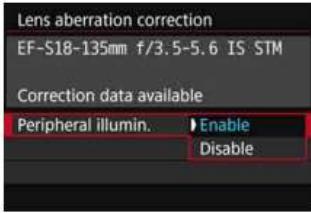
53

https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s# (EX. 2026)

		MENU Correction of Lens Peripheral Illumination and Aberrations Peripheral light fall-off is a phenomenon that makes the image corners look darker due to the lens characteristics. Color fringing along subject outlines is called chromatic aberration. And image distortion due to lens characteristics is called distortion. These lens aberrations and light fall-off can be corrected. By default, Peripheral illumination and Chromatic aberration correction are set to [Enable], and Distortion correction is set to [Disable]. 54
		• Image Processing During Shooting Picture Style: Auto, Standard, Portrait, Landscape, Neutral, Faithful, Monochrome, User Def. 1 - 3 Basic+: Ambience-based shots, Light/scene-based shots Extra Effect Shot: Possible (in <CA> mode) White balance: Auto, Preset (Daylight, Shade, Cloudy, Tungsten light, White fluorescent light, Flash), Custom White Balance correction and White balance bracketing possible * Flash color temperature information transmission enabled ... Noise reduction: Applicable to long exposures and high ISO speed shots Automatic image Auto Lighting Optimizer brightness correction: Highlight tone priority: Provided Lens aberration Peripheral illumination correction, Chromatic aberration correction: correction, Distortion correction 55

⁵⁴ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebelt6s-760d-im4-en.pdf>
(page 150) (EX. 2028)

⁵⁵ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebelt6s-760d-im4-en.pdf>
(pages 401-402) (EX. 2028)

		Peripheral Illumination Correction   Select [Lens aberration correction]. - Under the [1] tab, select [Lens aberration correction], then press <SET>. Select the setting. - Check that [Correction data available] is displayed for the attached lens. - Select [Peripheral illumin.], then press <SET>. - Select [Enable], then press <SET>. Take the picture. - The image will be recorded with the peripheral illumination corrected.
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⁵⁶ <https://gdip01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf>
(page 150) (EX. 2028)

		Chromatic Aberration Correction The screenshot shows the camera's menu with 'Lens aberration correction' at the top, followed by 'EF-S18-135mm f/3.5-5.6 IS STM'. Below that, 'Correction data available' is shown. The 'Chromatic aberration' option is highlighted, with 'Enable' selected and 'Disable' as an alternative. 1 Select the setting. • Check that [Correction data available] is displayed for the attached lens. • Select [Chromatic aberration], then press <SET>. • Select [Enable], then press <SET>. 2 Take the picture. • The image will be recorded with the chromatic aberration corrected. Distortion Correction The screenshot shows the camera's menu with 'Distortion' at the top. Below it, 'Disable' and 'Enable' are listed, with 'Enable' selected. A note below states: 'The effect of distortion correction is not displayed during Live View shooting'. At the bottom, there are 'SET' and 'OK' buttons. 1 Select the setting. • Check that [Correction data available] is displayed for the attached lens. • Select [Distortion], then press <SET>. • Select [Enable], then press <SET>. 2 Take the picture. • The image will be recorded with the distortion corrected. 57 Lens Correction Data The camera already contains data for lens peripheral illumination correction, chromatic aberration correction, and distortion correction for approx. 30 lenses. If you select [Enable], the peripheral illumination correction, chromatic aberration correction, and distortion correction will be applied automatically for any lens whose correction data is registered in the camera. With EOS Utility (EOS software), you can check which lenses have their correction data registered in the camera. You can also register the correction data for unregistered lenses. For details, refer to the EOS Utility Instruction Manual (p.422). For lenses incorporating the correction data, it is not necessary to register the correction data to the camera. 58
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⁵⁷ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf>
(page 151) (EX. 2028)

⁵⁸ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf>
(page 152) (EX. 2028)

		 EOS DIGITAL Solution Disk Various software for EOS DIGITAL cameras are contained on the EOS DIGITAL Solution Disk. EOS Utility With the camera connected to a computer, EOS Utility enables you to transfer still photos and movies shot with the camera to the computer. You can use this software to set various camera settings and shoot remotely from the computer connected to the camera. Also, you can copy background music tracks, such as EOS Sample Music*, to the card. * You can use the background music as the soundtrack for a video snapshot album, movie, or slide show played back with your camera. 59 Configurable functions ● Firmware update Check and update the camera firmware version. For details on firmware updates, visit the Canon website. ● Date/Time/Zone Setting Configure these settings as needed. • Set the camera date/time and the time zone where images were captured • Sync the camera date/time to the computer time • Set or cancel daylight saving time ● Register lens aberration correction data (🔗) ● Register Picture Style File (🔗) ● Owner's name/Author/Copyright Owner's name: Enter the name of the camera owner. Author: Enter the photographer's name. Copyright (copyright information): Enter information about image copyright holders. ● Personal white balance settings (🔗) ● WFT Captions (🔗) ● Register Background Music (🔗) ● Register IP I C information (🔗) ● Web Service Settings (🔗) ● Network settings (🔗) 60
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⁵⁹ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf>
(page 420) (EX. 2028)

⁶⁰ https://cam.start.canon/en/S003/manual/html/UG-02_CameraSetting_0020.html
(EX. 2036)

1[a-2]	an optical lens mechanism,	Specifications Type Digital AF/AE single-lens reflex camera with built-in flash Recording Media SD card, SDHC card, SDXC memory card * Compatible with Ultra High Speed (UHS-I) memory cards and Eye-Fi cards. Image Format Approx. 22.3mm x 14.9mm (APS-C) Compatible Lenses Canon EF lenses (including EF-S lenses) Lens Mount Canon EF mount	61
1[a-3]	at least one digital sensor for capturing the digital video,	Image Sensor Type CMOS Sensor Pixels Effective pixels: Approx. 24.20 megapixels Total pixels: Approx. 24.70 megapixels Pixel Unit 3.72µm square Aspect Ratio 3:2 (Horizontal : Vertical) Color Filter System RGB primary color filters Low Pass Filter Fixed position in front of the image sensor 62 • Image Sensor Type: CMOS sensor Effective pixels: Approx. 24.2 megapixels * Rounded off to the nearest 10,000th. Aspect ratio: 3:2 Dust delete feature: Auto/Manual, Appending Dust Delete Data	63

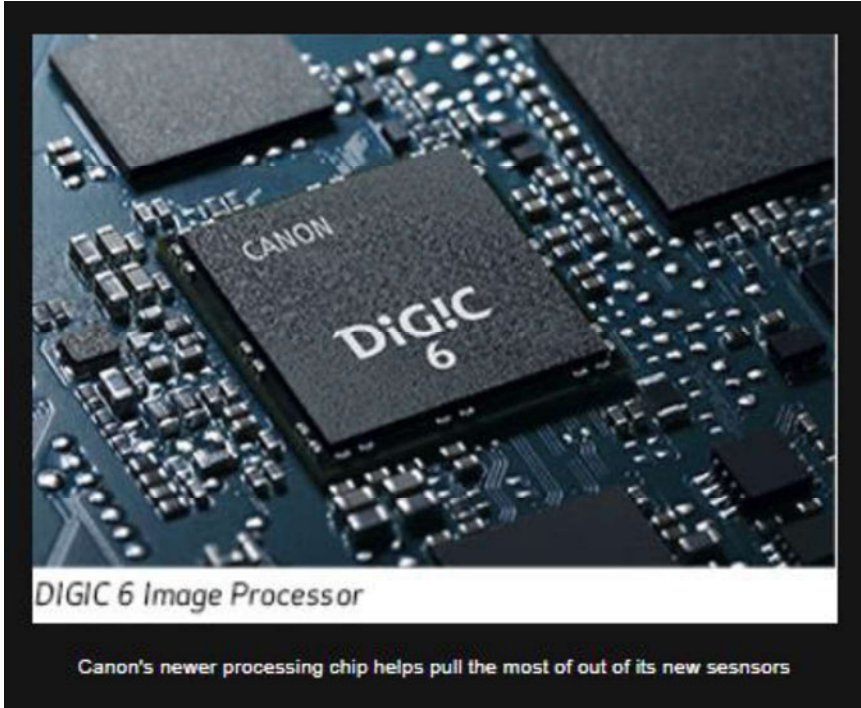
61

https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s#specificationsTab (EX. 2027)

62

https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s#specificationsTab (EX. 2027)

⁶³ https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel_t6s-760d-im4-en.pdf (page 401) (EX. 2028)

1[a-4]	an integrated circuit including; a digital signal processor configured to access a database management system including a plurality of optical image aberration corrections, and	The DIGIC 6 includes one or more digital signal processors, microprocessors, and application specific integrated circuits.  64  65
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⁶⁴ <https://thenewcamera.com/canon-digic-6-processor-and-new-18mp-aps-c-cmos-sensor-arrives/> (EX. 2029)

⁶⁵ https://photographic-central.blogspot.com/2017/10/canon-eos-80d-review.html#google_vignette (EX. 2030)

		Q: How has introduction of DIGIC 6 enhanced the functions of the camera?  A: "The main enhancements include the new noise reduction processing system which enables ISO 16000 to be used as a standard setting, Creative filters for movie shooting, as well as support for Full HD 60p, 50p and HDR movies". While all these items increase the load on the image processor, this issue is resolved by the high-speed processing system. The DIGIC 6 processor is much more powerful than expected. 66 Canon Japan says it's a BSI CMOS design, which should mean improved low-light performance. The DIGIC 6 processor delivers what Canon claims is a ~50% increase in speed where it counts - shutter lag and AF acquisition, and the convenience of built-in Wi-Fi has the potential to appeal to a lot of people. 67
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⁶⁶ <https://snapshot.canon-asia.com/article/eng/more-about-the-eos-80d-part-2-technology> (EX. 2031)

⁶⁷ <https://www.dpreview.com/reviews/first-impressions-review-using-the-canon-powershot-g16#:~:text=The%20DIGIC%206%20processor%20delivers,to%20a%20lot%20of%20people.> (EX. 2032)

		■ 24.2 Megapixel CMOS (APS-C) sensor, ISO 100-12800 (expandable to H: 25600) for shooting from bright to dim light and high performance DIGIC 6 Image Processor for outstanding image quality and speed. 68 When light enters the camera via the lens, it is converted to an electrical signal by the image sensor. Canon's DIGIC image processor¹ is then used to generate image data based on the signal. This data reproduces natural colors with rich gradations and little noise. DIGIC uses proprietary algorithms to perform processing optimized for still images and videos, which makes it possible to reduce noise while maintaining high resolution, even when shooting in low-light scenarios. Additionally, Canon's DIGIC image processor is a high-performance system LSI² that uses a proprietary architecture to make high-speed processing possible, including the creation and processing of beautiful still images and videos, autofocus, image-stabilization evaluation operations, continuous shooting processing and Live View display. 1 A microcomputer in which a CPU core, memory for storing programs, timer function, and I/O unit connected to an external source are incorporated into one integrated circuit. 2 A large-scale integrated circuit on which functions achieved using such parts as CPUs, memory and special-purpose LSIs are integrated on one chip. System LSIs speed up operations by making it unnecessary to connect the complicated wires required when using multiple chips. In addition, because little board space is required for one chip, it is possible to make both the board and product more compact. 69 “As cameras increase in functionality, pixel counts and sophistication, the burden shouldered by DIGIC has increased as well. ... It is not an overstatement to say that the development of new features and future camera models hinges on the capabilities of the DIGIC image processor. Features such as Panning mode, Time Lapse Movies and in-camera lens correction by Digital Lens Optimizer require extensive data processing power, and were successfully implemented with the aid of upgrades to the DIGIC image processor. ... Each version of DIGIC features faster, higher-level data processing capabilities than the previous version. ... When shooting, DIGIC processes all this information
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68

https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s#featuresTab (EX. 2033)

69

<https://global.canon/en/technology/support14.html#:~:text=When%20light%20enters%20the%20camera,data%20based%20on%20the%20signal>. (EX. 2034)

		rapidly, instantly evaluating the subject's brightness and colour and detecting faces. It transmits this information to the lens and adjusts the focusing lenses to establish focus on the subject. ... Ultimately, DIGIC is more than just a simple image processor. Its capabilities play a crucial role in determining what comes next, and it is therefore most likely one of the core considerations in any future imaging innovations by Canon.”⁷⁰
1[a-5]	a memory storage sub-system;	See above See also: Compatible Cards The camera can use the following cards regardless of capacity: If the card is new or was previously formatted by another camera or computer, format the card with this camera (p.65). • SD memory cards • SDHC memory cards* • SDXC memory cards* * UHS-I cards supported. 71 Specifications • Type Type: Digital, single-lens reflex, AF/AE camera with built-in flash Recording media: SD/SDHC*/SDXC* memory cards * Compatible with UHS-I cards 72

⁷⁰ <https://snapshot.canon-asia.com/article/eng/5-things-made-possible-with-digic-image-processor> (EX. 2035)

⁷¹ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf> (page 5) (EX. 2028)

⁷² <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf> (page 401) (EX. 2028)

		• Recording System Recording format: Design rule for Camera File System (DCF) 2.0 Image type: JPEG, RAW (14-bit Canon original) RAW+JPEG Large simultaneous recording possible Recorded pixels: L (Large) : 24 megapixels (6000 x 4000) M (Medium) : Approx. 10.6 megapixels (3984 x 2656) S1 (Small 1) : Approx. 5.9 megapixels (2976 x 1984) S2 (Small 2) : Approx. 2.5 megapixels (1920 x 1280) S3 (Small 3) : Approx. 350,000 pixels (720 x 480) RAW : 24 megapixels (6000 x 4000) Aspect ratio: 3:2, 4:3, 16:9, 1:1 Create/select a folder: Possible File numbering: Continuous, Auto reset, Manual reset 73 Recording System BACK TO TOP ^ Recording Format Complies with Design rule for Camera File system 2.0 and Exif 2.30 File Size 3:2 1. Large: Approx. 24.00 Megapixels (6000 x 4000) 2. Medium: Approx. 10.60 Megapixels (3984 x 2656) 3. Small 1: Approx. 5.90 Megapixels (2976 x 1984) 4. Small 2: Approx. 2.50 Megapixels (1920 x 1280) 5. Small 3: Approx. 0.35 Megapixels (720 x 480) 6. RAW: Approx. 24.00 Megapixels (6000 x 4000) 4:3 1. Large: Approx. 21.30 Megapixels (5328 x 4000) 2. Medium: Approx. 9.50 Megapixels (3552 x 2664) 3. Small 1: Approx. 5.30 Megapixels (2656 x 1992) 4. Small 2: Approx. 2.20 Megapixels (1696 x 1280) 5. Small 3: Approx. 0.31 Megapixels (640 x 480) 6. RAW: Approx. 24.00 Megapixels (6000 x 4000) 16:9 1. Large: Approx. 20.20 Megapixels (6000 x 3368) 2. Medium: Approx. 8.90 Megapixels (3984 x 2240) 3. Small 1: Approx. 5.00 Megapixels (2976 x 1680) 4. Small 2: Approx. 2.10 Megapixels (1920 x 1080) 5. Small 3: Approx. 0.29 Megapixels (720 x 408) 6. RAW: Approx. 24.00 Megapixels (6000 x 4000) 1:1 1. Large: Approx. 16.00 Megapixels (4000 x 4000) 2. Medium: Approx. 7.10 Megapixels (2656 x 2656) 3. Small 1: Approx. 3.90 Megapixels (1984 x 1984) 4. Small 2: Approx. 1.60 Megapixels (1280 x 1280) 5. Small 3: Approx. 0.23 Megapixels (480 x 480) 6. RAW: Approx. 24.00 Megapixels (6000 x 4000) 74
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⁷³ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebelt6s-760d-im4-en.pdf>
(page 401) (EX. 2028)

⁷⁴

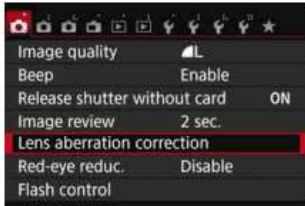
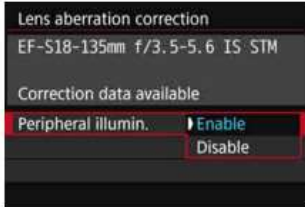
https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s#specificationsTab (EX. 2027)

1[b]	wherein the optical lens mechanism is a zoom lens or a fixed focal length lens;	Specifications Type Digital AF/AE single-lens reflex camera with built-in flash Recording Media SD card, SDHC card, SDXC memory card * Compatible with Ultra High Speed (UHS-I) memory cards and Eye-Fi cards. Image Format Approx. 22.3mm x 14.9mm (APS-C) Compatible Lenses Canon EF lenses (including EF-S lenses) Lens Mount Canon EF mount 75
1[c]	wherein the integrated circuit uses the in-camera software to identify at least one optical image aberration and	See above MENU Correction of Lens Peripheral Illumination and Aberrations Peripheral light fall-off is a phenomenon that makes the image corners look darker due to the lens characteristics. Color fringing along subject outlines is called chromatic aberration. And image distortion due to lens characteristics is called distortion. These lens aberrations and light fall-off can be corrected. By default, Peripheral illumination and Chromatic aberration correction are set to [Enable], and Distortion correction is set to [Disable]. • Image Processing During Shooting Picture Style: Auto, Standard, Portrait, Landscape, Neutral, Faithful, Monochrome, User Def. 1 - 3 Basic+: Ambience-based shots, Light/scene-based shots Extra Effect Shot: Possible (in <CA> mode) White balance: Auto, Preset (Daylight, Shade, Cloudy, Tungsten light, White fluorescent light, Flash), Custom White Balance correction and White balance bracketing possible * Flash color temperature information transmission enabled ... 76

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https://www.cla.canon.com/cla/en/support/consumer/cameras/eos_cameras/eos_rebel_t6s#specificationsTab (EX. 2027)

⁷⁶ https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel_t6s-760d-im4-en.pdf (page 150) (EX. 2028)

		Noise reduction: Applicable to long exposures and high ISO speed shots Automatic image brightness correction: Auto Lighting Optimizer Highlight tone priority: Provided Lens aberration correction: Peripheral illumination correction, Chromatic aberration correction, Distortion correction 77
		Peripheral Illumination Correction   Select [Lens aberration correction]. - Under the [1] tab, select [Lens aberration correction], then press <SET>. Select the setting. - Check that [Correction data available] is displayed for the attached lens. - Select [Peripheral illumin.], then press <SET>. - Select [Enable], then press <SET>. Take the picture. - The image will be recorded with the peripheral illumination corrected. 78

⁷⁷ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf>
(pages 401-402) (EX. 2028)

⁷⁸ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebel6s-760d-im4-en.pdf>
(page 150) (EX. 2028)

		Chromatic Aberration Correction The screenshot shows the camera's menu with 'Lens aberration correction' at the top. Below it, 'EF-S18-135mm f/3.5-5.6 IS STM' is listed. Under 'Correction data available', 'Chromatic aberration' is highlighted, and 'Enable' is selected over 'Disable'. 1 Select the setting. • Check that [Correction data available] is displayed for the attached lens. • Select [Chromatic aberration], then press <SET>. • Select [Enable], then press <SET>. 2 Take the picture. • The image will be recorded with the chromatic aberration corrected. Distortion Correction The screenshot shows the camera's menu with 'Distortion' at the top. Below it, 'Disable' and 'Enable' are listed, with 'Enable' selected. A note below says 'The effect of distortion correction is not displayed during Live View shooting'. At the bottom, there are 'SET' and 'OK' buttons. 1 Select the setting. • Check that [Correction data available] is displayed for the attached lens. • Select [Distortion], then press <SET>. • Select [Enable], then press <SET>. 2 Take the picture. • The image will be recorded with the distortion corrected. 79 Lens Correction Data The camera already contains data for lens peripheral illumination correction, chromatic aberration correction, and distortion correction for approx. 30 lenses. If you select [Enable], the peripheral illumination correction, chromatic aberration correction, and distortion correction will be applied automatically for any lens whose correction data is registered in the camera. With EOS Utility (EOS software), you can check which lenses have their correction data registered in the camera. You can also register the correction data for unregistered lenses. For details, refer to the EOS Utility Instruction Manual (p.422). For lenses incorporating the correction data, it is not necessary to register the correction data to the camera. 80
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⁷⁹ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebelt6s-760d-im4-en.pdf>
(page 151) (EX. 2028)

⁸⁰ <https://gdlp01.c-wss.com/gds/4/0300018244/04/eos-rebelt6s-760d-im4-en.pdf>
(page 152) (EX. 2028)

		See also: When light enters the camera via the lens, it is converted to an electrical signal by the image sensor. Canon's DIGIC image processor¹ is then used to generate image data based on the signal. This data reproduces natural colors with rich gradations and little noise. DIGIC uses proprietary algorithms to perform processing optimized for still images and videos, which makes it possible to reduce noise while maintaining high resolution, even when shooting in low-light scenarios. Additionally, Canon's DIGIC image processor is a high-performance system LSI² that uses a proprietary architecture to make high-speed processing possible, including the creation and processing of beautiful still images and videos, autofocus, image-stabilization evaluation operations, continuous shooting processing and Live View display. 1 A microcomputer in which a CPU core, memory for storing programs, timer function, and I/O unit connected to an external source are incorporated into one integrated circuit. 2 A large-scale integrated circuit on which functions achieved using such parts as CPUs, memory and special-purpose LSIs are integrated on one chip. System LSIs speed up operations by making it unnecessary to connect the complicated wires required when using multiple chips. In addition, because little board space is required for one chip, it is possible to make both the board and product more compact. 81
1[d]	to correct the at least one optical image aberration in at least one frame of the digital video using at least one of the plurality of optical image aberration	See above

	corrections in the database;	
1[e]	wherein the video is captured by the at least one digital sensor and is forwarded to the digital signal processor;	See above
1[f]	wherein the video image file with the at least one optical image aberration is corrected by applying digital filtration using the digital signal processor; and	See above
1[g]	wherein the corrected	See above

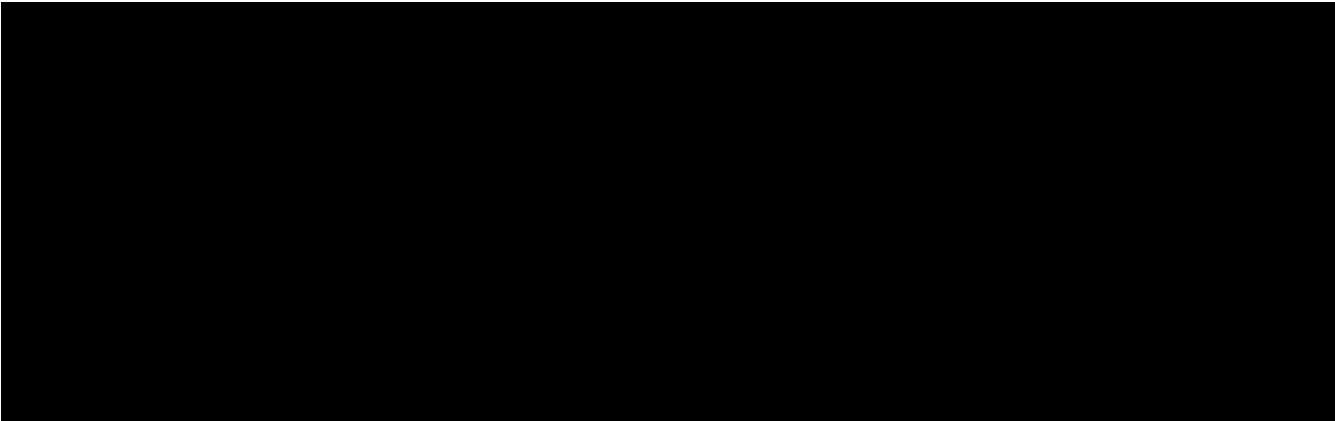
	video consisting of the digital data optimized from the at least one optical image aberration that are corrected from the original video image is stored in the memory storage sub-system.	
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433. In my opinion, this evidence shows that the Canon EOS Rebel T6s incorporated the claimed technology.

434. I understand that Canon has consistently held significant market share in the digital camera industry. For example:

- In 2019, Canon's market share was approx. 45.4%⁸²

⁸² <https://nikonrumors.com/2020/08/14/2019-camera-market-share-canon-45-4-sony-20-2-nikon-18-6-fuji-4-7-panasonic-4-7.aspx/> (EX. 2037)

- In 2020, Canon's market share was approx. 47.9%⁸³
 - In 2021, Canon's market share was approx. 45.8%⁸⁴
 - In 2022, Canon's market share was approx. 46.5%⁸⁵
 - In 2023, Canon's market share was approx. 46.5%⁸⁶
 - In 2024: Canon's market share was approx. 46.5%⁸⁷
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⁸³ <https://www.fujirumors.com/digital-camera-market-share-2020-only-canon-sony-and-fujifilm-grow/> (EX. 2038)

⁸⁴ <https://nikonrumors.com/2022/11/22/the-latest-digital-camera-global-market-share-2021.aspx/> (EX. 2039)

⁸⁵ <https://www.fujirumors.com/digital-camera-market-share-2022-canon-dominates-ahead-of-sony-and-nikon-fujifilm-4th/> (EX. 2040)

⁸⁶ <https://www.thephoblographer.com/2024/09/23/canon-and-sony-market-shares-display-a-troubling-trend/> (EX. 2041)

⁸⁷ <https://www.starkinsider.com/2024/09/trendspotting-canon-followed-by-the-rest-digital-camera-market-share-2024.html> (EX. 2042)

I declare that the foregoing is true and correct under penalty of perjury of the laws of the United States.

Signed in Potomac, MD on 2/26/2025

Omid Khia