

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOTOROLA MOBILITY LLC
Petitioner,

v.

LARGAN PRECISION CO., LTD.
Patent Owner.

Case IPR2024-00689
U.S. Patent No. 9,366,845

PATENT OWNER PRELIMINARY RESPONSE

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EXHIBIT LIST

Exhibit No.	Description
2001	Bibliographic data page from https://worldwide.espacenet.com/ (accessed Oct. 24, 2024) showing Cai (EX1005) correspondence with “US8599495B1”
2002	Bibliographic data page from https://worldwide.espacenet.com/ (accessed Oct. 24, 2024) showing Ishizaka (EX1008) correspondence with “CN203673137U”
2003	Bibliographic data page from https://worldwide.espacenet.com/ (accessed Oct. 24, 2024) showing Hashimoto (EX1025) correspondence with “CN203965708U” and “US2015070783A1”
2004	Bibliographic data page from https://worldwide.espacenet.com/ (accessed Oct. 24, 2024) showing Shinohara-553 (EX1026) correspondence with “TWM490015U,” “CN203941337U,” and “US2015009578A1”
2005	Bibliographic data page from https://worldwide.espacenet.com/ (accessed Oct. 24, 2024) showing Kubota-386 (EX1027) correspondence with “US2015198791A1”
2006	Bibliographic data page from https://worldwide.espacenet.com/ (accessed Oct. 24, 2024) showing Kubota-380 (EX1029) correspondence with “US2015198787A1”
2007	US 2023/0228981
2008	US 11,719,913

Patent Owner Largan Precision Co., Ltd. (“Largan”) submits the following preliminary response (“POPR”) to the petition for *inter partes* review (“Petition”) of claims 1–34 of U.S. Patent No. 9,366,845 (the “’845 patent”), filed by Motorola Mobility LLC (“Motorola”).

I. INTRODUCTION

The seven-lens assembly claimed by the ’845 patent uses particular arrangements of lens element features to achieve a more compact lens assembly with better image quality, suitable for use with very high-megapixel image sensors found in small electronic devices such as smart phones. *See* EX1001, 1:20–48. The claimed lens element features include, among others, refractive power (defined by focal length) and surface curvature (defined by the curvature radius and aspheric equation, constant, and coefficients associated with each lens surface). *See id.*, 58:43–63:20. Notably, the claims issued after an examination that considered essentially the same prior art that Motorola now presents.

Motorola asserts two grounds for alleged unpatentability, each based on single-reference obviousness. But Fukaya¹ and Cai both disclose a seven-lens

¹ Largan adopts and uses herein the shorthand exhibit identifiers Motorola defines in its table of exhibits, including “Fukaya” and “Cai” for Motorola’s main asserted references, EX1004 and EX1005, respectively. *See* Pet., vii–ix, 3.

assembly having a different structure than the '845 patent. Both also teach lens systems that are well corrected against aberrations, with reasonable chief ray angles and short track lengths, so a person of ordinary skill in the art ("POSA") would have had no reason to target these aspects for improvement, despite Motorola's argument to the contrary.

As admitted in the Petition, Fukaya and Cai both fail to disclose [1.7] "a sixth lens element having an image-side surface being concave in a paraxial region thereof" and [1.10] " $0.5 < Y_{c62}/Y_{c72} < 1.5$ " and [20.7] "a sixth lens element ... having an image-side surface being concave in a paraxial region thereof." Pet., 20, 64, 77, 113. While Motorola argues that it would have been obvious to modify Fukaya and Cai to include these missing elements to correct aberrations, control chief ray angle, and shorten track length, the Petition's arguments and evidence still fail to show a reasonable likelihood that Motorola would prevail if the Board were to institute trial. 35 U.S.C. § 314(a).

Most notably, the Petition cites no evidence that a POSA in August 2014² would have considered the so-called "double gullwing design form" something so desirable and universally effective that its absence from *any* given seven-lens

² The '845 patent claims priority to Taiwanese App. No. 103126480 A, filed August 1, 2014. EX1001, face page, item no. (30).

system would have served as the sole motivation for modifying that system to include it. This fallacious premise holds, according to the Petition, even for designs like Fukaya and Cai that have none of the aberration, size, or chief ray angle problems that the “double gullwing design form” was allegedly known to fix. Indeed, both Fukaya and Cai intentionally avoid the “double gullwing design form” in favor of certain specific benefits achieved by using a bi-convex sixth lens element and a bi-concave seventh lens element, as detailed in their specifications.³

³ The Petition deploys a range of labels to describe what it calls the “double gullwing design form.” These include “gullwing lens pair,” Pet., 2, “double-gullwing lens pair,” *id.*, 21, 22, 26, 45, 69, 80, 119, 120, “meniscus-gullwing lens pair,” *id.*, 12, 23, 26, 70, 79, 81, 120, “double meniscus-gullwing arrangement,” *id.*, 45, 100, “double-gullwing pair,” *id.*, 51, and “double meniscus-gullwing lens configuration,” *id.*, 70. But the term “gullwing” is a slang term, EX1018, 71:18, with no fixed or formal meaning, and it is used to refer to the shape of a lens **surface**, not to the shape of an entire lens, *id.*, 72:15–17. It is in fact found nowhere in any of Petition’s cited exhibits, beyond Dr. Bentley’s deposition in a different matter (EX1018, 66–77) and a statement in her *Field Guide to Lens Design* (EX1016, 61) that “gull wing” is among “[m]any qualitative terms ... that help

II. ARGUMENT

A. The Board should exercise its discretion to reject the Petition under 35 U.S.C. § 325(d).

The Board should reject the Petition under 35 U.S.C. § 325(d) because it relies on “the same or substantially the same prior art or arguments previously [] presented to the Office.” 35 U.S.C. § 325(d).

[U]nder § 325(d), the Board uses the following two-part framework:

(1) whether the same or substantially the same art previously was

describe an aspheric shape.” The label “gullwing” is thus not meaningfully informative, and “gullwing lens” is even less so, since there is no such thing (without specifying which surface or surfaces feature a “gullwing” shape). Arguing obviousness based on alterations to implement a double “gullwing” design therefore amounts to a failure to identify the grounds for alleged unpatentability “with particularity,” as required by 35 U.S.C. § 312(a)(3). Largan should not be left to guess what all these labels are supposed to describe, but given the clear hindsight bias evident throughout the Petition, Largan assumes it is the arrangement shown in the presently challenged ’845 patent at, e.g., FIG. 1, reference nos. 160 and 170. Since the Petition starts by calling it a “double gullwing design form,” Pet., 2, 3, Largan uses that label throughout except where quoting the Petition’s use of a different label.

presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and (2) if either condition of first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. ***If a condition in the first part of the framework is satisfied and the petitioner fails to make a showing of material error, the Director generally will exercise discretion not to institute inter partes review.***⁴

Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GmbH, IPR 2019-01469, Paper 6 at 8–9 (PTAB Feb. 13, 2020) (precedential) (emphasis added). In the present case, Motorola admits that the same art was previously presented to the Office, so it bears the burden of showing “that the Office erred in a manner material to the patentability of challenged claims.” *Id.*

Motorola admits that Fukaya (EX1004), the sole Ground 1 reference, was “referenced during prosecution,” Pet., 5, and that “Tsai (EX1032), a U.S. family member of [lone Ground 2] reference Cai (EX1005), was discussed during prosecution,” *id.*, 3. In fact, both Tsai (EX1032) and Cai (EX1005) share an identical specification and claim priority to the same Taiwanese application 101124430, filed on July 6, 2012. See EX1032, face page, item no. (30); EX1005,

⁴ All instances of emphasis are supplied by Largan unless otherwise indicated.

face page, item no. (30). The only difference is that Motorola's translation somehow gave inventor Tsai the alternative translation of "Cai."

Motorola also admits that Baik (EX1007) was "the primary reference cited by the Examiner during prosecution," *id.*, 4, while elsewhere in the Petition citing Baik as alleged evidence of the "knowledge and skills possessed by POS[er]s," *id.*, 10 (section IV.B.2), 18 (pointing to section IV). Motorola contends that the Examiner "materially erred" in finding that Baik did not disclose the condition " $0.5 < Yc62/Yc72 < 1.5$." Pet., 3–4. But Motorola concedes that "Baik did not list specific values for Yc62 and Yc72," *id.*, 4, so there is no error, material or otherwise. This point alone precludes Motorola from meeting its burden and avoiding discretionary denial.

Despite its concession that "Baik did not list specific values for Yc62 and Yc72," Pet., 4, the Petition dedicates about a half page of text to argue that Baik nonetheless "actually disclosed lens arrangements satisfying this Yc62/Yc72 condition," *id.* As its only support for this contention, Motorola points to Baik paragraphs [0090] and [0091] as "discussing the shapes of the image-side surfaces of the sixth and seventh lenses." *Id.* Even if true, that does not teach anything about the claimed Yc62/Yc72 relationship. Paragraph [0090] describes an image-side surface shape for the sixth lens element that is consistent with what is shown in many of the figures, and paragraph [0091] does the same for the seventh lens

element, but there is no explanation—in Baik or from Motorola—as to how that discussion teaches the claimed Yc62/Yc72 relationship. There is no discussion of scale or dimensions, nor is there any evidence on which to base a reasonable inference that a POSA would have read this discussion in 2014 in the way Motorola now claims, ten years later.

Motorola next argues that FIG. 13 of Baik “depict[s] sixth and seventh lenses with non-axial critical points **visually** satisfying the condition.” Pet., 4. Again, there is no explanation of how this is so. There is no evidence, for example, that a POSA in 2014 would have had reason to regard FIG. 13 as a drawing to scale or would have otherwise considered its appearance as a faithful portrayal of actual dimensions. Quite the contrary, in fact. Baik explains that, “[i]n the drawings, the shapes and dimensions of elements may be exaggerated for clarity.” EX1007, [0051]. Baik thus expressly cautions readers not to base any conclusion about lens shape on a **visual** inspection of a drawing—which is exactly what Motorola did.

The last few lines of Motorola’s short argument posit that “a lens designer would have readily determined these [Yc62 and Yc72] values from the lens data disclosed by Baik” at paragraphs [0119] and [0120]. Pet., 4. Paragraph [0119] refers to the Example 5 “MTF characteristics and aberration characteristics as shown in FIGS. 14 and 15, respectively.” EX1007, [0119]. Paragraph [0120] reads

“[t]he lens module according to the sixth exemplary embodiment (Example 6) of the present disclosure will be described with reference to FIGS. 16 through 18.”

EX1007, [0120]. Motorola does not explain how these passages or the figures are relevant to Yc62/Yc72, let alone to explain how they would have allowed a POSA in 2014 to “readily determine[] these [Yc62 and Yc72] values.”

If the citation is intended to point to the lens data in Table 9 and Table 10, which tables are sandwiched between paragraphs [0119] and [0120], the argument is even less supportive. It is premised on what a *particularly driven* POSA *could* have learned from Baik, not on what a *hypothetical* POSA *would* have learned. This presumed motivation is inconsistent with the law, and the assertion about what the data would have conveyed is wholly unsupported.

As to what a POSA *could* have done with the underlying data, assuming drive for the sake of argument only, the Petition provides only a very high-level description of “inputting the lens data into the aspheric surface equation disclosed by Baik (EX1007, [0056]), via Excel or another spreadsheet software, using lens design software, or even by hand.” Pet., 4. But there is no explanation of how a POSA could have identified specific Yc62 and Yc72 values using any of these methods, nor citation to any reference recognizing the significance of their relationship in the way that the ’845 patent does. Indeed, while the Petition cites Dr. Milster’s declaration, his testimony is just a verbatim reproduction of the

Petition, also with no external support. Pet., 4; EX1003, ¶ 68. If the premise were indeed true, it would have been simple for Dr. Milster—according to Motorola—to show the calculations and graphical renderings that would prove it. But neither Motorola nor Dr. Milster presents any such analysis. Proving “material error” requires more than bare attorney argument and conclusory expert testimony. It requires evidence, and the fact that Motorola presents nothing but attorney arguments means it has not carried its burden.

The “material error” argument further assumes the Examiner should have considered the perspective of a *particularly driven* POSA, not that of the hypothetical POSA. The Petition assumes, without evidence, that the POSA would have been particularly curious about Yc62, Yc72, and their relationship, and therefore would not have been deterred by Baik’s failure to expressly state any values for Yc62 or Yc72. The POSA would not have put Baik to the side, so goes the argument, but would have commenced “inputting the lens data into the aspheric surface equation.” Pet., 4. To be clear, as shown below, this would have been an extremely tedious undertaking. Baik’s “aspheric surface equation” is:

$$Z = \frac{cY^2}{1 + \sqrt{1 - (1 + K)c^2Y^2}} + AY^4 + BY^6 + CY^8 + DY^{10} + EY^{12} + FY^{14} + \dots$$

EX1007, [0056] where “Z indicates the height of a point on the aspheric surface at a distance Y from the optical axis relative to the tangential plane at the aspheric surface vertex, c indicates curvature (1/r), k indicates a conic constant, and Y indicates a distance from the point on the curve of the aspheric surface to the optical axis,” *id.*, [0057]. “Constants A to J sequentially indicate 4th-order to 20th-order aspheric coefficients.” *Id.* Using the data for FIG. 13 as an example, which represents Baik’s “Example 5,” the values for each surface’s conic constant k, aspheric coefficients A through J, and radius (which determines the value for the curvature, c) are found in Table 10, reproduced below:

TABLE 10

Example 5	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y Radius	2.004	9.413	5.035	2.520	4.272	-18.245	-2.964	-2.883	-2.348	-1.975	5.085	2.965	2.794	1.494
Conic Constant (K)	0.000	0.000	0.000	-10.034	0.000	0.000	-2.420	-0.992	0.398	-0.449	0.000	0.000	-21.513	-6.544
4th-order Coefficient (A)	-0.016	-0.141	-0.255	-0.120	-0.103	-0.068	-0.021	-0.018	0.067	0.041	-0.103	-0.118	-0.141	-0.087
6th-order Coefficient (B)	0.007	0.245	0.526	0.324	0.006	-0.026	0.032	0.029	0.007	0.024	0.004	0.028	0.025	0.026
8th-order Coefficient (C)	-0.063	-0.369	-0.643	-0.354	-0.028	0.011	-0.016	-0.011	-0.002	0.005	0.016	-0.003	0.004	-0.005
10th-order Coefficient (D)	0.073	0.286	0.474	0.220	0.022	-0.018	0.011	-0.001	0.001	-0.005	-0.011	0.000	-0.001	0.000
12th-order Coefficient (E)	-0.063	-0.125	-0.171	-0.049	-0.020	0.023	0.001	0.002	-0.001	0.000	0.002	0.000	0.000	0.000
14th-order Coefficient (F)	0.012	0.018	0.021	0.000	0.015	-0.009	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16th-order Coefficient (G)														
18th-order Coefficient (H)														
20th-order Coefficient (J)														

Significantly, Motorola fails to explain why a POSA would have been inspired to dig into Baik’s data with a singular focus on finding the values for Yc62 and Yc72 from the data alone. To present the argument with no such

explanation is to admit the forbidden influence of hindsight, which pervades the Petition. The fact that the **inventor** of the '845 patent in August 2014 turned his focus to Yc62, Yc72, and the relationship between them, cannot supply evidence that a **hypothetical POSA** at that time would have done the same. *Standard Oil Co. v. Am. Cyanamid Co.*, 774 F.2d 448, 454 (Fed. Cir. 1985) (“The issue of obviousness is determined entirely with reference to a **hypothetical** ‘person having ordinary skill in the art.’”) (emphasis in original) (*quoting* 35 U.S.C. § 103 (1984)⁵). A hypothetical POSA must not be assigned the extraordinary attributes reserved to inventors:

The statutory emphasis is on a person of **ordinary** skill. Inventors, as a class, according to the concepts underlying the Constitution and the statutes that have created the patent system, possess something—call it what you will—which sets them apart from the workers of **ordinary** skill, and one should not go about determining obviousness under § 103 by inquiring into what **patentees** (i.e., inventors) would have known or would likely have done, faced with the revelations of references.

Id. (emphasis in original). The hypothetical POSA “is also presumed to be one who thinks along the line of **conventional** wisdom in the art and is **not one who undertakes to innovate, whether by patient, and often expensive, systematic**

⁵ The quoted language remains the same in the present-day version.

research or by extraordinary insights, it makes no difference which.” *Id.* With no effort to confront the limitations of the hypothetical POSA, and nothing to distinguish its arguments from a hindsight drive to find claim elements, Motorola cannot prove the Examiner materially erred in not taking such extraordinary measures himself or in not assuming that a POSA would have done so.

Ultimately, Motorola’s half-page Petition argument is just that—bare attorney argument with no evidence to support a conclusion that a material error occurred. “Attorney argument is no substitute for evidence,” *Enzo Biochem, Inc. v. Gen-Probe, Inc.*, 424 F.3d 1276, 1284 (Fed. Cir. 2005), and unsupported expert testimony is entitled to little or no weight, 37 C.F.R. § 42.65(a). Also, the argument makes no sense. Motorola contends that the lens design world in 2014 was enamored of the “double gullwing design form,” so much so that POSAs at the time would have sought to change or modify every single seven-element lens assembly like Fukaya (EX1004) and Cai (EX1005) to have one, irrespective of whether the change would or would not make sense or yield improvement. But the Examiner ultimately allowed the claims over Baik (EX1007), despite combining it with Tsai (EX1032), a U.S. counterpart of Cai (EX1005), in initially rejecting all of them. Beyond the unsupported argument about the existence of Baik’s Yc62 and Yc72 values, Motorola makes no effort to explain how that allowance was the product of material error.

Motorola has failed to make the required showing of material error, so the Board, acting for the Director, should exercise discretion not to institute *inter partes* review.

B. The Petition is grounded on a false premise regarding the POSA's alleged knowledge of the “double gullwing design form.”

Section IV of the Petition attempts to paint a picture that lens design was easy, use of aspheric surfaces was simple, and, by 2014, the lens design world was awash in seven-element lens assemblies featuring the “double gullwing design form” for their sixth and seventh lens elements. Pet., 5–12. A POSA armed with such knowledge, according to the Petition, would thus have modified Fukaya and Cai to supply the missing elements needed to match their respective disclosures to the challenged claims.

To argue the point that lens design was not complicated, the Petition at Section IV.A mostly states or implies the premise, then cites an exhibit but without providing the allegedly supportive material. Pet., 6–7. The fact is lens design has always been and continues to be extraordinarily complicated, requiring protracted trial-and-error experimentation to discover new and improved lens arrangements. A review of the first three chapters of the 2005 second edition of Smith, EX1010, confirms the complexity, starting with a list of over 50 different potential specification types that could be involved, *id.*, 3–4. Smith also notes that “[w]hat is

referred to as automatic lens design is, of course, nothing of the sort.” *Id.*, 11.

Fischer’s 2008 second edition, EX1011, explains that “[a] lens system consists of a nearly infinite number of possible solutions in a highly multidimensional space, and it is the job of the designer to determine the optimum solution,” *id.*, 169.

Fischer also notes that “[y]ou will often reach a solution that simply does not meet your performance requirements[, which] is very common during the design evolution,” *id.*, 174 (step 7), even after having used a patent as a starting point prescription, *id.*, 172 (step 2), and “[i]f you still cannot reach a viable design, then at this point you will need to return to step 2 and select a new starting point,” *id.*, 175 (step 9). In other words, success is far from expected, regardless of a POSA’s use of lens design software.

Section IV.B, including subparts 1, 2, and 3, tries to establish that using the “double gullwing design form” was part of the POSA’s “knowledge” as of the August 2014 effective filing date. Pet., 8–12. The apparent reason for this effort is that each of the Petition’s two stated grounds argues single-reference obviousness, i.e., that the challenged claims would have been obvious to a POSA in August 2014 over a single stand-alone reference—Fukaya or Cai—when combined with the POSA’s “knowledge” at that time. Pet., 18, 20, 75, 77. Arguing obviousness based on a single reference plus the “knowledge” of a POSA, however, carries certain implications.

The Federal Circuit held in *Arendi S.A.R.L. v. Apple Inc.* that, “common sense and common knowledge have their proper place in the obviousness inquiry,” and that the court therefore “do[es] consider common sense, common wisdom, and common knowledge in analyzing obviousness.” 832 F.3d 1355, 1361 (Fed. Cir. 2016). But the court added “there are at least three caveats to note in applying ‘common sense’ in an obviousness analysis.” *Id.* “First, common sense is typically invoked to provide a known **motivation to combine**, not to supply a missing claim limitation.” *Id.* (emphasis in original). “Second, in *Perfect Web*, the only case Appellee identifies in which common sense was invoked to supply a limitation that was admittedly **missing** from the prior art, the limitation in question was unusually simple and the technology particularly straightforward.” *Id.* at 1362 (emphasis in original) (citing *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1326 (Fed. Cir. 2009)). “Third, our cases repeatedly warn that references to ‘common sense’—whether to supply a motivation to combine or a missing limitation—cannot be used as a wholesale substitute for reasoned analysis and evidentiary support, especially when **dealing with a limitation missing from the prior art references specified.**” *Id.* The court added an additional point particularly relevant to this case: “In cases in which ‘common sense’ is used to supply a missing limitation, as distinct from a motivation to combine, moreover, **our search for a reasoned basis for resort to common sense must be searching.**” *Id.* at 1363.

In the present case, Motorola contends that the POSA's knowledge of the "double gullwing design form" supplies the missing shapes for the surfaces of the sixth and seventh lens elements of both Fukaya and Cai. The Board, however, cannot "accept[] 'a conclusory assertion from a third party about general knowledge in the art ***without evidence on the record***, particularly where it is an important [] limitation that is ***not evidently and indisputably*** within the common knowledge of those skilled in the art." *Id.* at 1363–64 (quoting *Perfect Web*, 751 F.3d at 1365) (emphases added by *Arendi* court).

The main issue here is that there is no evidence that the "double gullwing design form" in a seven-lens system was "evidently and indisputably within the common knowledge of those skilled in the art." The Petition describes the POSA's "knowledge" as including "fundamentals of optical aberration theory," as understood in August 2014, along with "[then-]standard techniques for improving lenses," and "how to use [the 2014 versions of] lens design software such as Code V, Oslo, and Zemax," Pet., 17, all of which, the Petition contends, are "reflect[ed]" in lens design books available in 2014 from Schaub (EX1009), Smith (EX1010), Fischer (EX1011), and Bentley (EX1016), *id.*, 18. But other than these conclusory statements, the Petition says nothing about how these references show the "double gullwing design form" was "evidently and indisputably within the common knowledge of those skilled in the art."

In describing the POSA's skill level, the Petition also refers to certain of the 2014 POSA's "specific knowledge and skills" as being allegedly described in Section IV of the Petition, Pet., 18. That section includes reliance on several patents and applications that publicized use of the "double-gullwing design form" in seven-lens systems *after* the '845 patent's effective filing date. Specifically, the Petition contends at Section IV.B.3 that "Sekine expressly recognized the benefits of implementing the last two lenses of a seven-lens system with gullwing shapes, where 'the sixth lens plays a very important role in reducing the burden on the seventh lens, located nearest to the image plane, for correction of aberrations and control of the chief ray angle.'" Pet., 10–11 (*quoting* EX1006, [0036]). But Sekine published on December 25, 2014, five months after the '845 patent's effective filing date of August 1, 2014. EX1006, face page, item no. (43). The Petition also cites Kubota-386 for the same proposition, but it was published even later, on September 20, 2016. EX1027, face page, item no. (45). The Petition further cites Sekine and Kubota-386, along with Shinohara-298, Hashimoto, and Shinohara-553, as allegedly proving that "POSITAs understood the specific advantages of using a meniscus-gullwing lens pair (i.e., two gullwing lenses with meniscus shapes on the optical axis, having convex curvature on the object side and concave curvature on the image side): shorter track lengths, better off- and on-axis aberration correction and suppression, constrained incident angles and chief ray

angle.” Pet., 11. But Shinohara-298, Hashimoto, and Shinohara-553 all published after the ’845 patent’s effective filing date, just like Sekine and Kubota-386.

EX1024, face page, item no. (43) (“Jul. 30, 2015”); EX1025, face page, item no. (45) (“Nov. 29, 2016”); EX1026, face page, item no. (45) (“Jul. 5, 2016”).

These are patents and printed publications that published from applications filed before the effective filing date. They may technically qualify as “prior art” under 35 U.S.C. § 102(a)(2), essentially the same as former § 102(e) (pre-AIA), although known more accurately as “secret prior art.” However, ***art that was not publicly available when Largan filed the application for the ’845 patent “does not show what [was] known generally to ‘any person skilled in the art,’ to quote from § 112.” In re Glass, 492 F.2d 1228, 1232 (C.C.P.A. 1974); Eli Lilly & Co. v. Sicor Pharms., Inc., 705 F. Supp. 2d 971, 996 n. 30 (S.D. Ind. 2010) (explaining that while secret prior art under pre-AIA 35 U.S.C. § 102(e) “is available for assessing obviousness under 35 U.S.C. § 103 ... [,] it is not evidence of what was generally known in the art”), aff’d, 426 F. App’x 892 (Fed. Cir. 2011) (unpublished) (“the trial court’s decision is ‘so clearly correct as a matter of law that no substantial question regarding the outcome of the appeal exists’”) (citation omitted). As the Federal Circuit’s predecessor court explained in *Glass*, “as a matter of common sense, it is clear that the contents of a patent application which may be available as ‘prior art’ under [pre-AIA] § 102(e) [now § 102(a)(2)] to show***

that another was the first inventor ***may not have been known to anyone other than the inventor, his attorney, and the Patent Office examiner, and perhaps the assignee.***” 492 F.2d at 1231–32.

The evidence thus does not support the Petition’s foundational premise that the “double gullwing design form” was “evidently and indisputably within the common knowledge of those skilled in the art.” *See Arendi*, 832 F.3d at 1363–1364. Compounding the Petition’s inefficacy is the fact that nearly every single patent and published patent application reference that it cites was also considered by the examiner during prosecution, either directly or in the form of a corresponding reference having an identical specification. These are identified in the tables below, and some were already discussed in the § 325(d) argument presented above. They are identified here simply to underscore the point that this Petition is almost entirely reliant on prior art that the Office has already considered—including the two primary references.

Motorola Reference	Motorola Reference Listed on '845 Pat. Face Page and Considered by Examiner
Fukaya (EX1004) US 2014/0139719	EX1001, page 2: 2014/0139719 A1 5/2014 Fukaya EX1002, 828 (IDS initialed by Examiner)
Tsai (EX1032) US 8,599,495	EX1001, face page: 8,599,495 B1 * 12/2013 Tsai EX1002, 828 (IDS initialed by Examiner)
Baik (EX1007) US 2015/103414	EX1001, page 2: 2015/0103414 A1* 4/2015 Baik EX1002, 830 (IDS initialed by Examiner)
Sekine (EX1006) US 2014/376105	EX1001, page 2: 2014/0376105 A1 12/2014 Sekine EX1002, 830 (IDS initialed by Examiner)
Shinohara-298 (EX1024) US 2015/212298	EX1001, page 2: 2015/0212298 A1 7/2015 Shinohara et al. EX1002, 831 (IDS initialed by Examiner)

Motorola Reference	Reference Corresponding to Motorola Reference	Reference Corresponding to Motorola Reference — Listed on '845 Pat. Face Page and Considered by Examiner
Cai (EX1005) CN 202886720	US 8,599,495 ^{6,7}	EX1001: 8,599,495 B1 * 12/2013 Tsai EX1002, 828 (IDS initialed by Examiner)
Ishizaka (EX1008) US 2014/0211324	CN 203673137 U ⁸	EX1001: CN 203673137 U 6/2014 EX1002, 828 (IDS initialed by Examiner)
Hashimoto (EX1025) US 9,507,125	CN 203965708 U ⁹ US 2015/0070783 A1 ¹⁰	EX1001: CN 203965708 U 11/2014 EX1002, 834 (IDS initialed by Examiner) EX1001: 2015/0070783 A1 3/2015 Hashimoto EX1002, 830 (IDS initialed by Examiner)

⁶ Filed by Motorola as Tsai EX1032.

⁷ EX2001 (showing Cai correspondence with “US8599495B1”).

⁸ EX2002 (showing Ishizaka correspondence with “CN203673137U”).

⁹ EX2003 (showing Hashimoto correspondence with “CN203965708U”).

¹⁰ EX2003 (showing Hashimoto correspondence with “US2015070783A1”).

Motorola Reference	Reference Corresponding to Motorola Reference	Reference Corresponding to Motorola Reference — Listed on '845 Pat. Face Page and Considered by Examiner				
Shinohara-553 (EX1026) US 9,383,553	TW M490015 U ¹¹	EX1001: <table><tr><td>CN</td><td>203965708</td><td>U</td><td>11/2014</td></tr></table> EX1002, 834 (IDS initialed by Examiner)	CN	203965708	U	11/2014
	CN	203965708	U	11/2014		
	CN 203941337 U ¹²	EX1001: <table><tr><td>CN</td><td>203941337</td><td>U</td><td>11/2014</td></tr></table> EX1002, 834 (IDS initialed by Examiner)	CN	203941337	U	11/2014
CN	203941337	U	11/2014			
US 2015/0009578 A1 ¹³	EX1001: <table><tr><td>2015/0009578</td><td>A1</td><td>1/2015</td><td>Shinohara et al.</td></tr></table> EX1002, 830 (IDS initialed by Examiner)	2015/0009578	A1	1/2015	Shinohara et al.	
2015/0009578	A1	1/2015	Shinohara et al.			
Kubota-386 (EX1027) US 9,448,386	US 2015/0198791 A1 ¹⁴	EX1001: <table><tr><td>2015/0198791</td><td>A1</td><td>7/2015</td><td>Kubota et al.</td></tr></table> EX1002, 831 (IDS initialed by Examiner)	2015/0198791	A1	7/2015	Kubota et al.
2015/0198791	A1	7/2015	Kubota et al.			
Kubota-380 (EX1029) US 9,146,380	US 2015/0198787 A1 ¹⁵	EX1001: <table><tr><td>2015/0198787</td><td>A1</td><td>7/2015</td><td>Kubota et al.</td></tr></table> EX1002, 830 (IDS initialed by Examiner)	2015/0198787	A1	7/2015	Kubota et al.
2015/0198787	A1	7/2015	Kubota et al.			

The Petition's premise is completely without support. It is simply not true that a POSA would have abandoned designs like Fukaya and Cai in favor of the "double gullwing design form," once it became public (which was after the '845 patent's effective filing date, as explained above). If it were, then there would be no seven-lens systems like Cai and Fukaya invented after 2014, to hear Motorola

¹¹ EX2004 (showing Shinohara-553 correspondence with "TWM490015U").

¹² EX2004 (showing Shinohara-553 correspondence with "CN203941337U").

¹³ EX2004 (showing Shinohara-553 correspondence with "US2015009578A1").

¹⁴ EX2005 (showing Kubota-386 correspondence with "US2015198791A1").

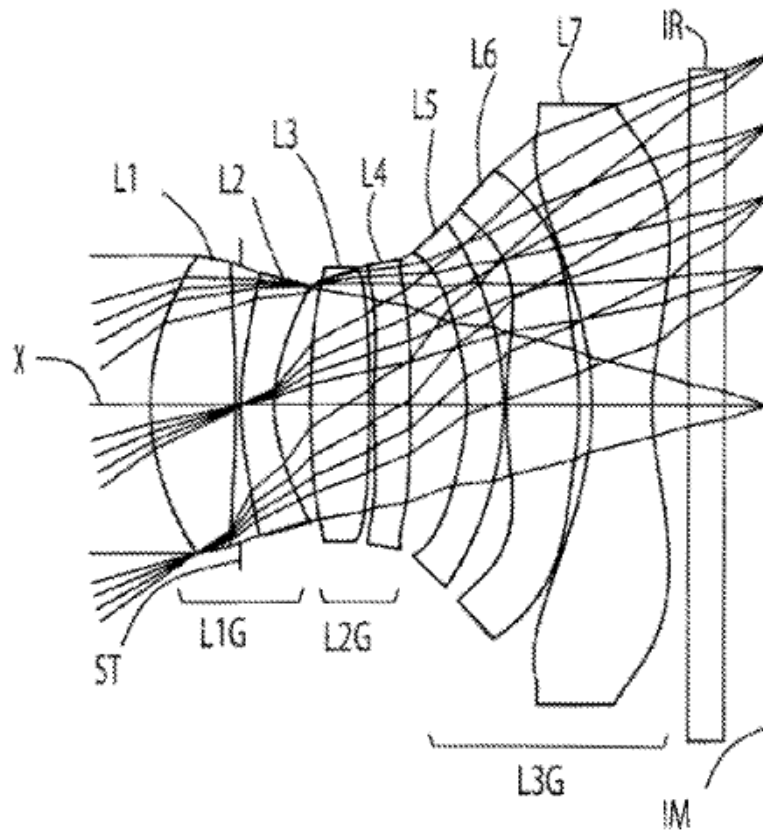
¹⁵ EX2006 (showing Kubota-380 correspondence with "US2015198787A1").

tell it, or certainly after the application for the '845 patent published on February 4, 2016. EX1001, face page, item no. (65). But later patent filings from, e.g., 2018 and 2019 still include lens designs without the “double gullwing design form,” just like Fukaya and Cai. *See* EX2007, US 2023/0228981 (priority filing date May 29, 2018; having bi-convex sixth lens element and bi-concave seventh lens element); EX2008, US 11,719,913 (priority filing date August 28, 2019; having bi-convex sixth lens element and bi-concave seventh lens element). So even the alleged popularity of the “double gullwing design form” after the '845 patent did not render all other forms obsolete, as Motorola now argues.

C. The Petition fails to show a reasonable likelihood of prevailing on Ground 1, if trial were instituted, because there is insufficient evidence to support an inference that a POSA would have been motivated to modify Fukaya.

Fukaya teaches a seven-element lens assembly in which the sixth and seventh lens elements are bi-convex and bi-concave, respectively, in their paraxial regions. *See, e.g.,* EX1004, FIG. 1. The image-side surface of Fukaya's sixth lens element is aspheric, but not to a degree that creates an inflection point where the curvature changes from convex on-axis to concave off-axis, toward the lens

periphery.¹⁶ *Id.*, FIG. 1, [0123]. Figure 1 from Fukaya is reproduced below, depicting Fukaya's "Embodiment 1." *Id.*, [0072]. The image-side is on the right, the object-side on the left, and the sixth and seventh lens elements are indicated by the labels L6 and L7, respectively:



¹⁶ Motorola agrees that the point on a lens surface at which it changes from convex on-axis to concave off-axis, or vice-versa, is an "inflection point." Pet., 9 (annotated figure); EX1003, ¶ 51 (same), ¶ 98 (describing what "a POSITA would understand describes an inflection point").

Motorola recognizes that this configuration fails to satisfy at least elements [1.7], [1.10], and [20.7] of the challenged independent claims, Pet., 20, 38, 42, 64, and is also missing several of the additional elements required by the dependent claims, including claims 3, 6, 8, 11, 17, 26, and 27, *id.*, 44–45, 48–49, 54–55, 59–61, 69–71. Motorola contends, however, that all these shortcomings would have been overcome by using the “double gullwing design form” to replace the sixth and seventh lens elements, i.e., “to implement Fukaya with a double-gullwing lens pair that is meniscus on-axis, with convex surfaces towards the object side and concave surfaces towards the image side.” Pet., 22.

However, “implementing Fukaya with a double-gullwing lens pair” would have required, among other things,

- (i) changing Fukaya’s sixth lens element from bi-convex to meniscus (to meet elements [1.7] and [20.7]);
- (ii) adding “at least one inflection point” to the image-side surface of the sixth lens element (also to meet elements [1.7] and [20.7]), so as to create a “non-axial critical point” and the required Yc62 condition (to meet element [1.10]); and
- (iii) changing the seventh lens element from bi-concave to meniscus (to meet the requirements of dependent claim 3).

The Petition contends that a POSA would have been motivated to make these changes “to achieve the many known advantages of this configuration, such as aberration correction, improved control over chief ray angle and thus improved illumination, and ease of achieving a compact size.” Pet., 22. This is the only identified alleged motivation for making this overly complicated set of changes. It is deficient for a number of reasons.

First, the evidence for the alleged “ubiquity” of the “double gullwing design form,” Pet., 2, even if true, teaches at most that the change **could** have been made, not that a POSA **would** have been motivated to make that change. For that, there would need to be some evidence to show that the change would have in fact improved Fukaya’s performance in terms of the “many known advantages,” i.e., aberration correction, chief ray angle control, and compact size. *See Samsung Elecs. Co. v. Dynamics Inc.*, No. 2021-2352, 2022 WL 3041158, at *4 (Fed. Cir. Aug. 2, 2022) (nonprecedential) (affirming Board nonobviousness decision and finding “reasoning was not legal error” where reliant on petitioner “fail[ure] to explain why altering **either** of [the asserted references] would improve the functionality over what is disclosed in each reference”) (emphasis in original; brackets added; quotation marks and citation to Board decision omitted); *see also Shenzhen Jimuyida Tech. Co., Ltd. v. Artec Eur. S.A.R.L.*, No. IPR2023-01148, Paper 6 at 22–23 (PTAB Jan. 16, 2024) (assertion of “‘improv[ed] efficiency of a

3D scanning system’ lacks substantive explanation of **how** efficiency would have been improved over what was taught ... or **why** the [POSA] would have found the efficiency of [the prior system] lacking”) (emphasis in original; brackets added). Otherwise, improper hindsight cannot be ruled out as the primary motivation.

Indeed, “simply identifying all of the elements in a claim in the prior art does not render a claim obvious.” *Plantronics, Inc. v. Aliph, Inc.*, 724 F.3d 1343, 1354–55 (Fed. Cir. 2013). Rather, “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.” *Belden Inc. v. Berk–Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (emphases in original). This means more than simply describing a possible rationale, with the benefit of hindsight. *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1367 (Fed. Cir. 2017) (“we cannot allow hindsight bias to be the thread that stitches together prior art patches into something that is the claimed invention”). It means presenting evidence that POSAs **at the time of invention** would have seen and understood a reason for combining the references or, as in this case, modifying a single reference. *Personal Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993–994 (Fed. Cir. 2017). Motorola’s Petition must therefore provide evidence showing that a POSA in August 2014 would have seen a reason for not only giving up Fukaya’s specifically designed and emphasized bi-convex sixth lens element and

bi-concave seventh lens element but also modifying Fukaya in several ways, all in a manner that just happens to coincide with the challenged claims (e.g., convex object side plus concave image side). It fails to do so.

The alleged improvements that accompany a “double gullwing design form” for the sixth and seventh lens elements are smaller size, reduction in off-axis aberrations, and more control over the chief ray angle with related illumination improvement. Pet., 11, 20, 22. Motorola cherry-picks language from a number of reference guides, patents, and published patent applications, and springs from there to the implied assertion that these alleged benefits were inextricably attached to the “double gullwing design form” and readily understood as being freely transferrable from one seven-lens system to another, regardless of prescription. None of the Petition’s cited reference guides, patents, or published applications makes any such sweeping claim. More importantly, there is no evidence that Fukaya was in need of *any* improvements to its compactness, aberrations, or chief ray angle.

Regarding the compactness of the Fukaya system, Table 12 indicates total track lengths (identified as “TLA,” *see* [0119]) ranging across all 11 disclosed embodiments from 5.033mm to 5.160mm. EX1004, [0159]. The Petition provides neither evidence nor argument that this size is too large or somehow warrants attention to reduce it. The Petition mentions that Dr. Milster employed Zemax lens design software to simulate Fukaya with the “double gullwing design form”

modifications, Pet., 23–26, but provides no evidence that the modification resulted in a shorter track length.¹⁷ In fact, Motorola’s proposed modification results in a track length of 5.283mm, EX1003, ¶ 85, which Motorola does **not** say is shorter

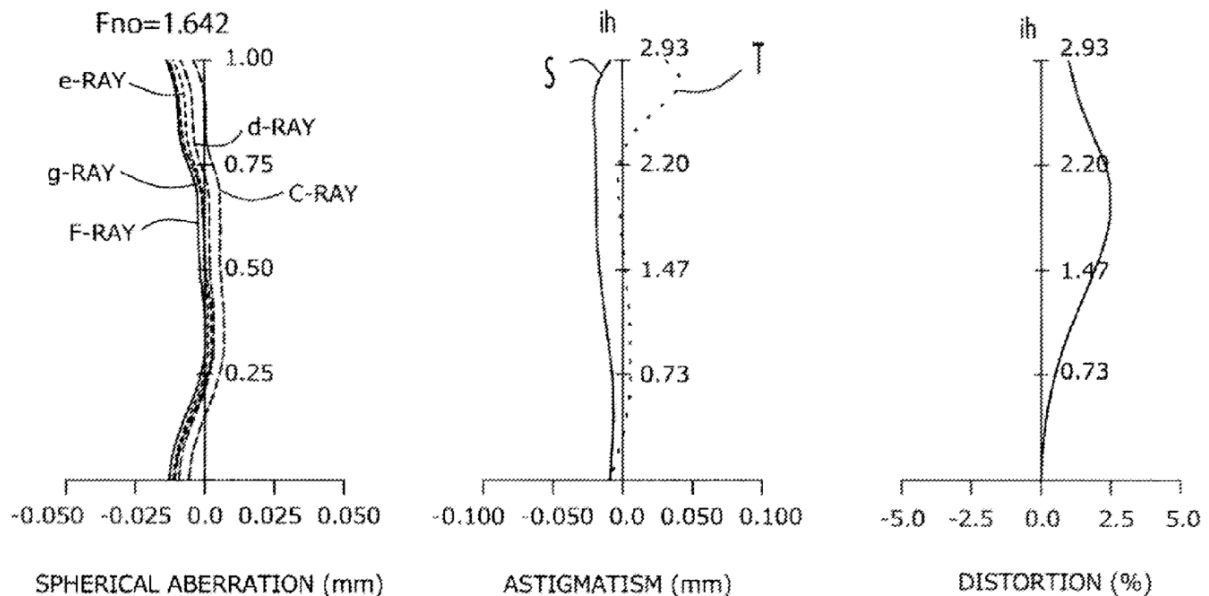
¹⁷ Dr. Milster’s Zemax modification exercise is described superficially in the Petition in one short paragraph accompanied by an image of the alleged result. Pet., 23–24. The Petition cites four paragraphs from Dr. Milster’s declaration as support, but those four paragraphs span nine pages of declaration text and illustration. EX1003, ¶¶ 82–85. However, “[t]his practice of citing the Declaration to support conclusory statements that are not otherwise supported in the Petition amounts to incorporation by reference,” *Cisco Sys., Inc. v. C-CationTechs., LLC*, Case IPR2014-00454, Paper 12 at 10 (PTAB Aug. 29, 2014) (informative), which is prohibited under 37 C.F.R. § 42.6(a)(3) so as to “minimize[] the chance that an argument would be overlooked and [to] eliminate[] abuses that arise from incorporation and combination,” 77 Fed. Reg. 48,612, 48,617 (Dep’t of Commerce Aug. 14, 2012) (commentary accompanying announcement of final rule). The Board should not consider Dr. Milster’s testimony in evaluating whether “the information presented **in the petition** ... shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a).

and which, in fact, is **longer** than any track length originally disclosed in Fukaya's 11 embodiments. This comes as no surprise given Fukaya's express teachings on the importance of its **bi-convex** sixth lens element (as opposed to a concave image-side of the '845 patent's element [1.7] and [20.7]) and **bi-concave** seventh lens element (as opposed to a convex object-side of the '845 patent's claim 3) to maintaining short track length: "The sixth lens L6 has a biconvex shape near the optical axis X and its positive refractive power is relatively strong and the seventh lens L7, which has a biconcave shape near the optical axis and has relatively strong negative refractive power, is located on the image side of the sixth lens L6, ***so that the total track length is shortened.***" EX1004, [0104]; *see also id.* at [0022] ("If the sixth lens has a biconvex shape near the optical axis, strong positive refractive power is obtained, offering ***an advantage in shortening the total track length.***"). It stands to reason that altering these shapes to accommodate Motorola's "double gullwing" would negatively affect track length. Indeed, the result of the proposed modification confirms such negative impact and shows that the modified Fukaya cannot boast a reduction in total track length. EX1003, ¶ 85. Even a slight enlargement of track length (such as a track length of 5.283mm resulting from Motorola's proposed modification) would run counter to Fukaya's own objectives.

Regarding aberrations, Fukaya states that "FIG. 2 shows spherical aberration (mm), astigmatism (mm), and distortion (%) of the imaging lens in Embodiment 1"

and concludes that, “[a]s FIG. 2 indicates, aberrations are ***properly corrected.***”

EX1007, [0127]. The three aberration diagrams of FIG. 2 are reproduced below:



EX1007, FIG. 2. For each of the remaining ten embodiments, Fukaya provides the same description that the aberration diagrams alone “indicate[] [that] aberrations are ***properly corrected.***” EX1007, [0130], [0133], [0136], [0139], [0142], [0145], [0148], [0151], [0154], [0157].

The Petition makes no claim to the contrary and thus fails to identify any kind of aberration-related rationale to suggest a POSA would have perceived a need to improve Fukaya with the “double gullwing design form.”¹⁸ The proposition

¹⁸ Dr. Milster suggests the aberration profile for Fukaya’s first embodiment needed improvement, EX1003, ¶¶ 82–83, but the Petition does not cite, refer to, or repeat

that a POSA would nonetheless have forced a “double gullwing design form” on Fukaya simply goes against the specifically designed and emphasized bi-convex sixth lens element and bi-concave seventh lens element that already consistently deliver “properly corrected” aberrations.

Notably, Fukaya teaches that its “non-gullwing design” (i.e., bi-convex sixth lens element and bi-concave seventh lens element) already works well to deliver the same three “known advantages” that would have allegedly inspired the POSA “to implement Fukaya with a double-gullwing lens pair”—shorten track length, properly correct aberrations, and control chief ray angle, which Fukaya calls “the angle of principal light rays incident on the image sensor”:

The sixth lens L6 has a **biconvex** shape near the optical axis X and its positive refractive power is relatively strong and the seventh lens L7,

that assertion, so the Board may exclude it or give it no weight. 37 C.F.R.

§ 42.104(b)(5) (“The Board may exclude or give no weight to the evidence where a party has failed to state its relevance or to identify specific portions of the evidence that support the challenge.”). Also, even if true, there is nothing in the way of evidence or explanation to suggest that a POSA would have labored to fix the aberrations of just one embodiment instead of moving on to or relying on any of the other ten embodiments that are well-corrected.

which has a **biconcave** shape near the optical axis and has relatively strong negative refractive power, is located on the image side of the sixth lens L6, so that the **total track length is shortened** and off-axial **aberration is corrected** by the aspheric image-side surface of the seventh lens L7 and **the angle of principal light rays incident on the image sensor is controlled** not to be larger than necessary.

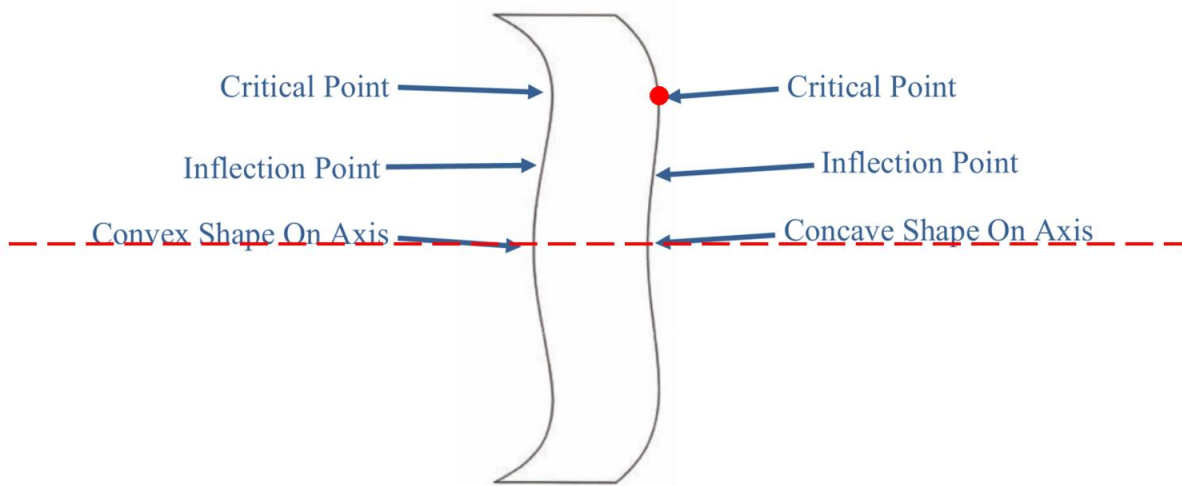
EX1004, [0104]. The Petition does not confront this fact or otherwise explain why a POSA would have seen a need to further improve Fukaya's total track length, aberration correction, or chief ray angle, especially through use of a technique that would alter an already successful collaboration of Fukaya's original sixth and seventh lens elements that has produced these very same benefits.

The Petition purports to challenge the quality of Fukaya's chief ray angle, but the argument is completely unsupported. The Petition first argues that Fukaya's native prescription results in a chief ray angle that translates to a relative illumination below 50% at the edge of the image. Pet., 24. The Petition presents graphs allegedly illustrating the peripheral relative illumination before modification, where it appears to be around 48%, Pet., 25, and after, where it looks to be about 53%, *id.*, 26. The Petition provides no explanation for the source of the data used for the graphs or for how they were generated. The Board should disregard them for this reason alone, but there is a larger problem with the argument. It is premised on a fallacy—that POSAs “would have known that lens

specifications **require** a relative illumination ‘greater than 50% at the edge of the field.’” Pet., 25. The Petition cites Bareau for this proposition, *id.*, but Bareau actually states that “[l]ens specifications **usually** require a value greater than 50% at the edge of the field,” EX1013, 7. Bareau provides nothing more than a general statement about what lens specifications, as submitted to lens designers by their customers or employers, “usually require,” not the sweeping declaration the Petition implies it to be: that **all** lens specifications **absolutely require** a relative illumination value above 50%. The Petition implies a threshold requirement for functionality whereas Bareau simply states the author’s own observation about customer preference. Even if it were true that Fukaya’s relative illumination were about 48%, there is simply no evidence that the promise of achieving around 53% would have motivated a POSA in 2014 to disregard Fukaya’s short track length and properly corrected aberrations to pursue changing the sixth and seventh lens elements to the “double gullwing design form.”

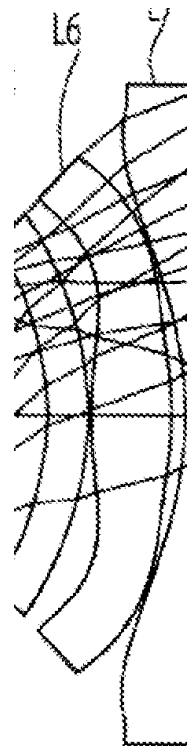
An additional deterrent to making the “double gullwing design form” change would have been the need to change Fukaya by adding “at least one inflection point” to “the image-side surface of the sixth lens element,” as required by elements [1.7] and [20.7], to form “a non-axial critical point on the image-side surface of the sixth lens element,” as required by element [1.10], which is located at “Yc62,” i.e., the vertical distance between the optical axis and the critical point.

The Petition uses this image from Schaub to illustrate inflection and critical points generally, with the blue annotations added by Motorola. Largan has added a dashed red line to illustrate the optical axis and a red dot to signify the location of an image-side “non-axial critical point” at Yc62:



Pet., 9 (red annotations added by Largan).

No such inflection or critical points are evident in the FIG. 1 schematic of Fukaya’s “Embodiment 1,” the only embodiment Motorola argues would have been modified by a POSA to implement the “double-gullwing design form.” A detail from Fukaya’s FIG. 1 is shown at right, highlighting the sixth lens element, labeled “L6.” The right-most surface of L6 is the image-side surface. It appears aspheric, in that it is not spherical, but it lacks any clear inflection points or any critical points, especially when compared to the image above. Nor



does Fukaya otherwise disclose or specify the location of an inflection point, a critical point, or Yc62 on the image-side of the sixth lens element.

In connection with the element [1.7] inflection point, the Petition argues that “Fukaya discloses the aspheric equation providing ‘the aspheric shapes of these lens surfaces,’ as well as the radius of curvature, conic constant, and aspheric surface coefficients of the image-side surface of the sixth lens L6.” Pet., 36. The very next sentence concludes from this, with no analysis whatsoever, that “[t]hese values confirm at least one inflection point on the image-side surface of the sixth lens L6.” *Id.*, 37. While the Petition cites Dr. Milster’s declaration, he provides no analysis either, nor any rationale or calculation to prove the assertion. EX1003, ¶ 96. So there is no evidence showing that the image-side surface of Fukaya’s sixth lens element has at least one inflection point as claimed.

For the sake of argument, Motorola is likely to assume that changing the paraxial region of the image-side surface of the sixth lens element to make it concave “would naturally provide a gullwing shape,” Pet. 38, and thus provide a Yc62 critical point, but there is no explanation of why or how that would happen, *id.*, 42–43 (admitting that “Fukaya does not disclose non-axial critical points on the image-side surface of the sixth lens L6”). A conclusory assertion that a claim element would “naturally” have occurred fails to provide a rationale free from hindsight, and the Board is free to reject it. *Apple Inc. v. MPH Techs. Oy*, 28 F.4th

254, 262–263 (Fed. Cir. 2022) (affirming Board conclusion that expert testimony of what a combination “naturally would have included” “amounted to an argument about ‘what could be combined’ and a conclusory statement that the combination would have been obvious”).

Ultimately, nothing in Fukaya’s track length, aberration profile, or chief ray angle would have caused a POSA to try to improve the design, and there is no persuasive evidence in the Petition that imposing the “double gullwing design form” would have resulted in any such improvement or in the first-time appearance of a Yc62 critical point. The Board should thus deny the Petition as to Ground 1.

D. The Petition fails to show a reasonable likelihood of prevailing on Ground 2, if trial were instituted, because there is insufficient evidence to support an inference that a POSA would have been motivated to modify Cai.

The Petition’s argument about Cai is very nearly identical to its argument about Fukaya. The two references are indeed quite similar, in that Cai also teaches a seven-element lens assembly in which the sixth and seventh lens elements are bi-convex and bi-concave, respectively, in their paraxial regions. *See, e.g.*, EX1005, FIG. 1. Motorola recognizes that this configuration fails to satisfy at least elements [1.7] (“a sixth lens element having an image-side surface being concave in a paraxial region thereof”), [1.10] (“ $0.5 < Yc62/Yc72 < 1.5$ ”), and [20.7] (“a sixth lens element ... having an image-side surface being concave in a paraxial region

thereof”) of the challenged claims. Pet., 77, 92–93, 97, 113. As with Fukaya, Motorola again argues that a POSA in 2014 would have “recognized that using gullwing shapes for both image-side surfaces of the sixth and seventh lenses would further achieve these same goals of off-axis aberration correction, compact length, and improved control of the chief ray angle,” Pet., 79, and therefore “would have been motivated to implement Cai with a sixth lens with a gullwing image-side surface in order to achieve a meniscus-gullwing lens pair that enables improved off-axis aberration correction, compact length, and improved control of chief ray angle,” *id.*

Motorola admits that altering Cai in this way would have required “varying the image-side curvature radius of the sixth lens from convex to concave, and similarly varying the object-side curvature of the seventh lens from concave to convex to balance the change to the image-side surface of the sixth lens, so that both the sixth and seventh lenses would be meniscus on axis.” Pet., 80. Not admitted but no less true is that Cai lacks “at least one inflection point” on the image-side surface of the sixth lens element as required by elements [1.7] and [20.7], or the related Yc62 critical point required by element [1.10], so the admittedly necessary “varying” of that surface would have to give rise to these features. The only alleged motivation for any of this is, again, just like Fukaya, “off-axis aberration correction, compact length, and improved control of the chief

ray angle.” *Id.*, 79. This rationale remains deficient for Cai for the same reasons it is deficient for Fukaya—there is no evidence that a POSA would have noted Cai’s aberration correction as wanting, its track length as too large, or its chief ray angle as unacceptable.

Indeed, Cai notes the specific benefits that accompany, and attributes those benefits to, its “non-gullwing design” (i.e., the bi-convex shape of the sixth lens element and the bi-concave shape of the seventh lens element). EX1005, [0128], [0129]. The bi-convexity in the paraxial region of the sixth lens element is used “so that a high order **aberration** of the optical image capturing system set can be **corrected** so as to enhance the resolution of the optical image capturing system set for better image quality.” *Id.*, [0128]. Cai’s bi-convex sixth lens element thus accomplishes aberration correction which results in improved image quality. The bi-concave paraxial region of the seventh lens element is used “so that a principal point of the optical image capturing system set can be positioned away from the image plane for reducing a back focal length thereof so as to further **reduce the total length** of the optical image capturing system set, achieving the goal of a compact size.” *Id.*, [0129]. The bi-concavity of the seventh lens element is thus important for reducing track length and achieving compact size. The seventh lens element’s aspheric image-side surface “has inflection points” and “[t]herefore, an **incident angle** of an off-axis field of view onto the image sensing element can be

effectively **minimized**, and preferably, **aberrations** of the off-axis field of view can be **corrected**.” *Id.* Thus, Cai’s seventh lens element, in its native state and design (i.e., bi-concave), already helps minimize the chief ray angle and further aids with off-axis aberration correction.

Regarding the compactness of the Cai system, the eighth embodiment has a track length of 6.245mm, based on adding the values from the “Thickness” column of Table 15. EX1005, [0292]. Cai’s eighth embodiment is one of only three, along with the first and the fifth, that happen to meet the lens refractive power ordering that the challenged claims collectively require, i.e., PNPPNPN. *Id.*, [0176], [0242]. The Petition ignores that the fifth embodiment has a track length of 5.001mm—the shortest of all the Cai embodiments—and argues instead that the POSA would have selected the eighth embodiment for modification “because the sixth lens has a weaker refractive power (longer focal length) compared to other Cai embodiments with the same refractive power configuration, and thus the modification to the image-side surface would have been easiest to implement.” Pet., 79. There is no explanation provided nor evidence cited to support the contention that changing the shapes of the sixth and seventh lens elements to achieve a shorter track length of the **eighth** embodiment would have been attractive to a POSA despite the 20%-shorter track length of the **fifth** embodiment. The Petition cryptically asserts that a POSA would have “incrementally, iteratively optimized the Cai design while

varying the image-side curvature radius of the sixth lens from convex to concave, and similarly varying the object-side curvature of the seventh lens from concave to convex to balance the change to the image-side surface of the sixth lens, so that both the sixth and seventh lenses would be meniscus on axis.” Pet., 79–80. But no more detail than that is provided, in the Petition or in the cited declaration testimony from Dr. Milster. *See* EX1003, ¶¶ 152–153. There is thus no evidence to support an assumption that this open-ended and ill-defined process is anything other than tedious and time-consuming, with no assurance of success. Clearly, a POSA interested in shortening track length within Cai’s framework would have looked to the shortest track length and would have had no reason to work with the other embodiments and the considerable modifications they would have required.

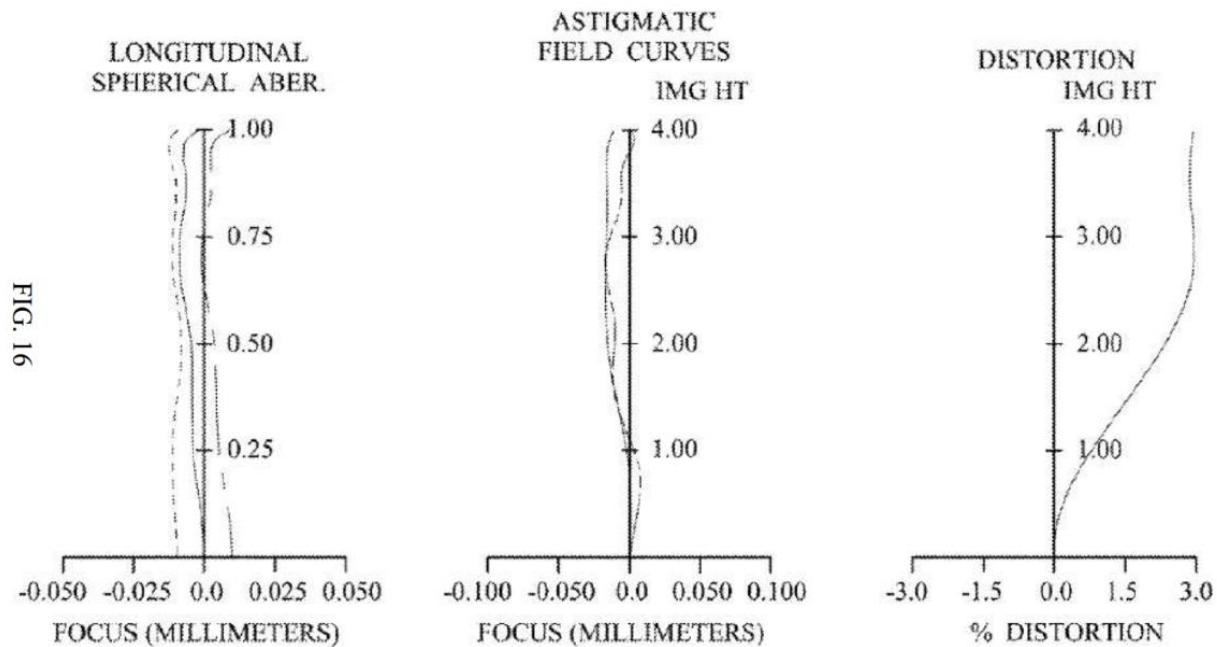
Regardless, whether looking at Cai’s fifth embodiment or the eighth, the Petition cites no evidence that a POSA would have found either embodiment’s track length to be too large or in need of attention to reduce it. The Petition mentions that Dr. Milster employed Zemax lens design software to simulate Cai with the “double gullwing design form” modifications, Pet., 80–81, but provides

no evidence that the modification resulted in a shorter track length.¹⁹ Again, Cai itself proves that its original design can have a short track length as small as 5.001mm without resort to changing the sixth and seventh lens elements to the “double gullwing design form,” as proposed by Motorola and motivated by hindsight.

Regarding aberrations, Cai includes the same three field curve diagrams that Fukaya provided: spherical aberration, astigmatism, and distortion. *See* EX1005 at, *e.g.*, FIG. 2. Cai states that the aberrations “can be corrected” by his invention. *Id.* at [0126], [0128], [0129]. Moreover, it is one of Cai’s stated objectives to “facilitate correcting the high order aberration and the off-axis aberrations.” EX1005, [0005]. Presumably, the field curve diagrams Cai’s embodiments show aberrations that Cai would consider to be corrected by the disclosed arrangement of lens powers and shapes. For example, the diagrams for Cai’s eighth embodiment

¹⁹ As it was with Fukaya, the Petition describes Dr. Milster’s Zemax modification of Cai in one short paragraph accompanied by an image of the alleged result. Pet., 81–81. The Petition cites three paragraphs from Dr. Milster’s declaration as support, but those three paragraphs span over nine pages of declaration text and illustration. EX1003, ¶¶ 155–157. This is improper incorporation by reference, for the same reasons stated in footnote 17. The Board should disregard it accordingly.

are reproduced below and, indeed, they appear quite similar with those “properly corrected” aberrations of Fukaya:



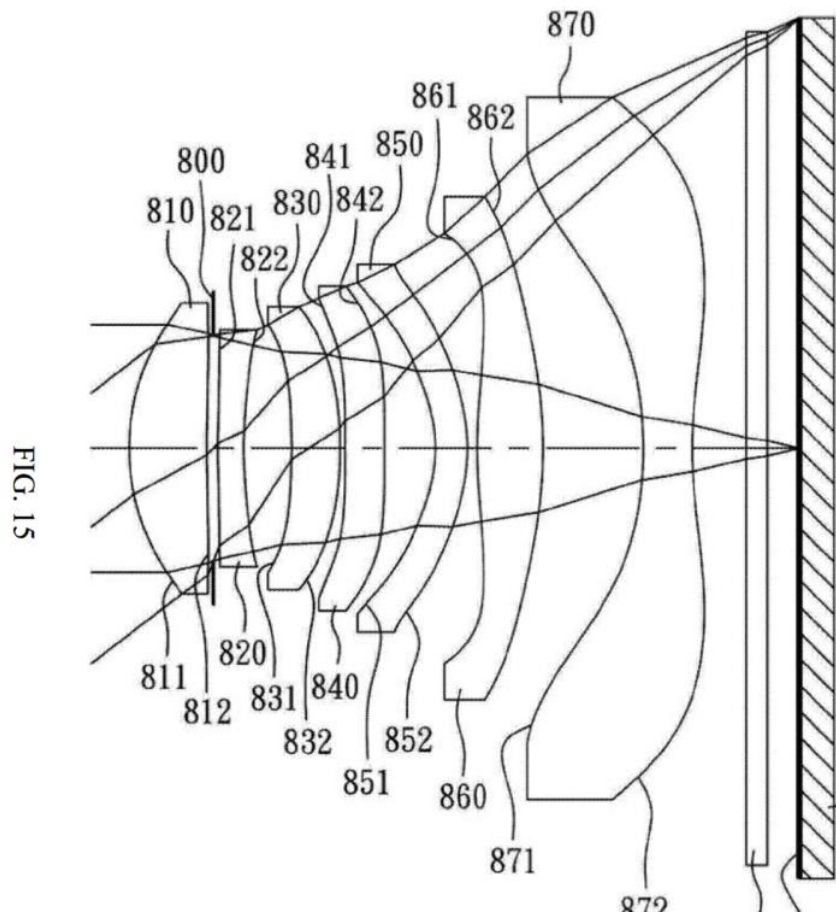
The Petition makes no claim that the aberrations are not well-corrected and thus fails to identify any kind of aberration-related rationale to suggest a POSA would have perceived a need to improve Cai with the “double gullwing design form.”²⁰ The proposition that a POSA would nonetheless have forced a “double

²⁰ Dr. Milster suggests the on-axis aberration profile for Cai’s eighth embodiment needed improvement, EX1003, ¶¶ 155, but the Petition does not cite, refer to, or repeat that assertion, so the Board may exclude it or give it no weight. 37 C.F.R. § 42.104(b)(5). Also, even if true, there is no evidence or argument to suggest that

gullwing design form” on Cai simply goes against the specifically designed and emphasized bi-convex sixth lens element and bi-concave seventh lens element that are designed to, and help, consistently deliver “properly corrected” aberrations.

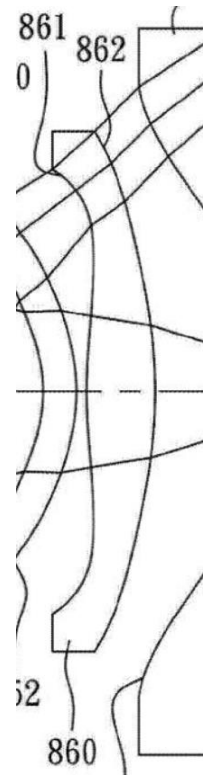
Further, as noted above, Cai teaches that the inflection points on the aspheric image-side surface of the seventh lens element help to “minimize” an “incident angle of an off-axis field of view onto the image sensing element.” EX1005, [0129]. The Petition simply ignores that Cai has taught how to control the chief ray angle and pretends that Cai fails to do so. There is neither evidence nor argument, for example, to explain why the ray trace for the eighth embodiment, shown in FIG. 15, demonstrates an unacceptable chief ray angle, or is somehow inaccurate. *See* EX1005, [0282].

a POSA would have labored to fix the aberrations of one embodiment instead of moving on to any of the other nine.



Finally, as was the case with Fukaya, an additional deterrent to making the “double gullwing design form” change would have been the need to change Cai by adding “at least one inflection point” to “the image-side surface of the sixth lens element,” as required by elements [1.7] and [20.7], to form “a non-axial critical point on the image-side surface of the sixth lens element,” as required by element [1.10], located at “Yc62.”

Like Fukaya, Cai does not disclose Yc62 or speak to its significance, nor does it otherwise disclose or specify the location of an inflection point or a critical point on the image-side of the sixth lens element. While mentioning “inflection points” and “tangent points” in the context of lens elements other than the sixth, Cai makes no such demands of the sixth lens element. And no such features are evident in the FIG. 15 schematic of Cai’s eighth embodiment, a detail of which is shown at right, highlighting the sixth lens element, labeled “860.” See EX1005, [0096]. The right-most surface of 860 is the image-side surface. It appears aspheric, in that it is not spherical, but it lacks any clear inflection points or any critical points. The Petition indeed admits that “Cai does not disclose non-axial critical points on the image-side surface of the sixth lens 860, and thus no vertical distance Yc62.” Pet., 97.



Accordingly, in connection with element [1.7] inflection point, the Petition has to rely on a proposed modification of Cai “to implement the sixth lens 860 with an image-side surface that is concave in the paraxial region thereof and [thereafter] includes at least one inflection point.” Pet., 92. This concession is not unexpected, considering the shape of the image-side surface of Cai’s eighth embodiment’s sixth lens element, discussed above. However, the Petition cites to ¶¶ 166–167 of Dr.

Milster's sworn declaration testimony, Pet., 93, where he claims that both Cai's image and the aspheric surface data reveal the presence of inflection points on the image-side of the sixth lens element, which is contrary to the Petition. The Board should assign no weight to this testimony because Motorola does not repeat or rely on it in the Petition and it is not consistent with the Petition arguments, 37 C.F.R., § 42.104(b)(5), and also because it severely undermines Dr. Milster's credibility.

The Petition also argues, as it does with Fukaya, that changing the paraxial region of the image-side surface of Cai's sixth lens element to make it concave "would naturally provide a gullwing shape," Pet. 92–93, and thus provide a Yc62 critical point, but there is no explanation of why or how that would happen, *id.* The Board should reject this conclusory and hindsight-driven rationale. *MPH Techs.*, 28 F.4th at 262–263.

Ultimately, nothing in Cai's track length, aberration profile, or chief ray angle would have caused a POSA to try to improve the design, and there is no persuasive evidence in the Petition that imposing the "double gullwing design form" would have resulted in any such improvement or in the first-time appearance of a Yc62 critical point. The Board should thus deny the Petition as to Ground 2.

III. CONCLUSION

In light of the foregoing, Largan respectfully submits that the Petition does not show a reasonable likelihood that Motorola would prevail if trial were instituted. The Board should therefore deny the Petition.

DATED: October 30, 2024

Respectfully submitted,

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WORD COUNT CERTIFICATION

The undersigned hereby certifies pursuant to 37 C.F.R. § 42.24(d) that the foregoing **PATENT OWNER PRELIMINARY RESPONSE** contains 9,915 words according to the word count of the word-processing software used to prepare the document, excluding table of contents, table of authorities, this certificate, the certificate of service, mandatory notices under § 42.8, appendix of exhibits or claim listing, or the signature block of counsel.

Dated: October 30, 2024

By: /R. Parrish Freeman/
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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing **PATENT OWNER PRELIMINARY RESPONSE** was served on October 30, 2024, via electronic mail on the following counsel of record for Petitioner:

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