

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SONY CORPORATION,
Petitioner,

v.

COLLABO INNOVATIONS, INC.,
Patent Owner.

Case IPR2016-00941
Patent 5,952,714

Before DAVID C. McKONE, GREGG I. ANDERSON, and
JENNIFER MEYER CHAGNON, *Administrative Patent Judges*.

ANDERSON, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Sony Corporation (“Petitioner”)¹ filed a Petition (Paper 2, “Pet.”) pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–13, 15, and 16 (“the challenged claims”) of US Patent No. 5,952,714 (“the ’714 patent,” Ex. 1001), filed July 30, 1996.² The Petition is supported by the Declaration of Michael Guidash (“Guidash Declaration,” Ex. 1002). Collabo Innovations, Inc. (“Patent Owner”) elected not to file a Preliminary Response.

We have jurisdiction under 35 U.S.C. § 314, which requires demonstration of a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim. We institute an *inter partes* review of claims 1–13, 15, and 16. The Board has not made a final determination of the patentability of any claim.

A. *Related Proceedings*

The ’714 patent has been asserted by Patent Owner against Petitioner in *Collabo Innovations, Inc. v. Sony Corp.*, Case No. 1-15-cv-01094 (D. Del.), which was filed on November 25, 2015, and first served (on Sony Electronics Inc.) on February 22, 2016. Pet. 1; Paper 5.

¹ Sony Corporation of America and Sony Electronics Inc. are identified as real-parties-in-interest. Pet. 1.

² The ’714 patent was filed July 30, 1996, under the Patent Cooperation Treaty (PCT). Ex. 1001, [22], [86]. Thus, Petitioner alleges the ’714 patent expired on July 30, 2016. Pet. 11. *See* II.A. *infra*.

B. Technology Overview

A discussion of the field of technology in general and the '714 patent specifically follows.

1. Background of the Field of Technology

The '714 patent relates to a package for a semiconductor “image sensing apparatus using a solid-state image sensing device” (also referred to as a “CCD chip” or “chip”). Ex. 1001, 1:6–8. The image sensing apparatus is mounted on a video camera which reproduces pictures. *Id.* at 1:19–29. The chip is mounted in a package made of plastic glass or ceramic material. *Id.* at 1:8–10.

The process of aligning and securing the chip in a package is called “mount[ing].” *Id.* at 1:42–61. One prior art method of mounting an image sensor is “die bonding.” *Id.* at 1:47–48. “‘Die bonding’ refers to affixing the back side of a chip (a ‘die’) to substrate, for example, the base of a package.” Ex. 1002 ¶ 44. “This leaves the upper (or front side) surface of the chip exposed.” *Id.*

Figure 10 of the '714 patent is reproduced below.

FIG. 10
PRIOR ART

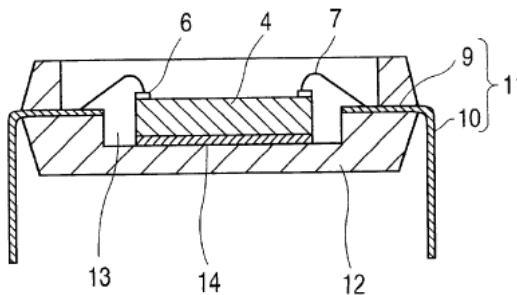


Figure 10 is a cross section of prior art chip 4 mounted in plastic package 12. Ex. 1001, 1:53–56. Lead frame 11 allows for electrical connections to external circuitry and includes inner lead 9 and outer lead 10 molded into

plastic package 12. *Id.*; *see also* Ex. 1002 ¶¶ 43–45 (describing die-bonding). CCD chip 4 is die-bonded by conductive paste 14 to concave portion 13. Ex. 1001, 1:57–58. Electrode pad 6 on the CCD chip is “wire-bonded to the inner lead 9 by the metal lead 7 as same as the case of the ceramic package.” *Id.* at 1:59–60. Upon mounting the image sensing apparatus to a “three-eye video camera and . . . accurately position[ing]” the apparatus, the “package 12 to which the CCD chip 4 is die-bonded” results in “high accuracy.” *Id.* at 1:66–2:5.

2. The '714 Patent (Ex. 1001)

The '714 patent is described in several different embodiments. Ex. 1001, 4:15–40 (Brief Description of the Drawings). Figure 2 of the '714 patent is reproduced below.

FIG. 2

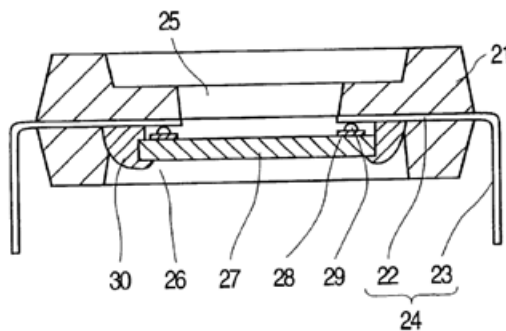


Figure 2 is a cross section of the “first exemplary embodiment” of the image sensing apparatus. Ex. 1001, 4:64–4:67. Epoxy resin is mixed with inorganic filler to form package 21, which includes lead frame 24. *Id.* at 4:67–5:3. Two openings 25 and 26 are formed respectively at the front side and back side of the package, opening 25 being of a smaller area than opening or inlet 26. *Id.* at 5:10–12; *see id.* at 4:53–58. “A frame body of the lead frame 24 is cut away, and the outer lead 23 is bent toward the inlet 26,

thereby forming the package 21.” *Id.* at 5:4–6. Bump 29 is formed on electrode pad 28 of CCD chip 27 and the bump is press-fitted to inner lead 22 through inlet 26. *Id.* at 5:7–11.

During the press-fit operation,

a position signal is feedbacked from a[n] optical position adjusting device (not shown) disposed in front of the CCD chip 27 to the mounting jig, thereby finely adjusting an orientation of the CCD chip 27 and disposing the CCD chip 27 on the back side of the step of the package 21.

Ex. 1001, 5:12–18. Simultaneously, ultra-violet hardening adhesive 30 is injected onto four sides of the CCD chip to glue the chip to package 21. *Id.* at 5:18–21. Thus, “the CCD chip 27 is accurately mounted to the package 21.” *Id.* at 5:21–22.

C. Illustrative Claims

Of the challenged claims, claims 1, 2, 6, 7, and 12 are independent apparatus claims and claims 13, 15, and 16 are independent method claims. Claims 3, 4, and 5 depend from claim 2. Claims 8–11 are multiple dependent claims that depend from claims 6 or 7. Claims 1 and 13 are reproduced below:

1. A solid-state image sensing apparatus comprising:
 - a package having a through hole therein, openings on both end faces thereof, and different opening areas of said openings,
 - a lead frame comprising inner leads and outer leads, said lead frame being sealed in said package, and
 - a solid-state image sensing device mounted in said package by being inserted from an inlet of said opening which has a wider area, and thereby sealing said through hole, said solid-

state image sensing device being secured to said package via an adhesive.

Ex. 1001, 9:20–30.

13. A manufacturing method of a solid-state image sensing apparatus comprising a package having a through hole therein, a lead frame comprising inner leads and outer leads, said lead frame being sealed in said package, and a solid state image sensing device mounted in said package, said manufacturing method comprising the steps of:

inserting said solid-state image sensing device into said through hole,

connecting an electrode pad of the solid-state image sensing device inserted in the through hole to the inner lead via a bump or an anisotropic conductor having only vertical conductivity, while simultaneously adjusting the optical positioning of said solid-state image sensing device, and

securing said solid-state image sensing device to the package with an adhesive.

Id. at 10:56–11:4.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 1–13, 15, and 16 patent as unpatentable on the following grounds. Pet. 2–3, 15–60.

Reference(s)	Basis	Claim(s) Challenged
Yoshino ³	§ 102(b)	1

³ Japan Pat. Application Pub. No. S61-131690, to T. Yoshino et al., Published June 19, 1986 (“Yoshino,” Ex. 1003 (English translation)/Ex.1006, (Japanese)). All citations to Yoshino and the other translated Japanese references are to the English translations thereof.

Reference(s)	Basis	Claim(s) Challenged
Yoshino and Izumi ⁴	§ 103(a)	6
Yoshino, Nagano, ⁵ and Wakabayashi ⁶	§ 103(a)	7
Izumi/Nagano, Hirosawa, ⁷ and Nita ⁸	§ 103(a)	8
Yoshino and Izumi/Nagano	§ 103(a)	9
Yoshino, Izumi/Nagano, and Wakabayashi	§ 103(a)	10
Yoshino, Izumi/Nagano, and Onishi ⁹	§ 103(a)	11
Yoshino and Tobase ¹⁰	§ 103(a)	12
Yoshino and Hikosaka ¹¹	§ 103(a)	13
Yoshino, Izumi, Nagano, and Hikosaka	§ 103(a)	15

⁴ Japan Pat. Application Pub. No. 63-221667, to A. Izumi et al., published Sept. 14, 1988 (“Izumi,” Ex. 1016 (English translation)/Ex. 1017 (Japanese)).

⁵ Japan Pat. Application Pub. No. H6-29507, to T. Nagano, published Feb. 4, 1994 (“Nagano,” Ex. 1018 (English translation)/Ex. 1019 (Japanese)).

⁶ Japan Pat. Application Pub. No. H07-45803, to T. Wakabayashi et al., published Feb. 4, 1995 (“Wakabayashi,” Ex. 1004 (English translation)/Ex. 1007 (Japanese)).

⁷ Japan Pat. Application Pub. No. S60-74880, to I. Hirosawa et al., published Apr. 27, 1985 (“Hirosawa,” Ex. 1020 (English translation)/Ex. 1021 (Japanese)).

⁸ Japan Pat. Application Pub. No. H07-78951, to S. Nita, published Mar. 20, 1995 (“Nita,” Ex. 1011 (English translation)/Ex. 1023 (Japanese)).

⁹ Japan Disc. No. H5-6989, to E. Onishi, disclosed Jan. 14, 1993 (“Onishi,” Ex. 1014 (English translation)/Ex. 1015 (Japanese)).

¹⁰ Japan Pat. Application Pub. No. H5-275611, to K. Tobase, published Oct. 22, 1993 (“Tobase,” Ex. 1022 (English translation)/Ex. 1013 (Japanese)).

¹¹ Japan Pat. Application Pub. No. S59-225560, to M. Hikosaka, published Dec. 18, 1984 (“Hikosaka,” Ex. 1005 (English translation)/Ex. 1008 (Japanese)).

Reference(s)	Basis	Claim(s) Challenged
Wakabayashi	§ 103(a)	12
Wakabayashi and Fujii ¹²	§ 103(a)	2–4
Wakabayashi, Fujii, and Onishi	§ 103(a)	5
Wakabayashi and Hikosaka	§ 103(a)	13

II. ANALYSIS

A. Claim Construction

Petitioner alleges the '714 patent expired on July 30, 2016. *See* Pet. 11. Based on the face of the published '714 patent, the application for the '714 patent was filed as a PCT application on July 30, 1996. Ex. 1001, at [22]. Thus, the July 30, 1996, filing date of the PCT application is the calculation date for the expiration of the '714 patent under 35 U.S.C. § 154(a)(2). *See Broad. Innovation, L.L.C. v. Charter Commc'ns, Inc.*, 420 F.3d 1364, 1368 (Fed. Cir. 2005). On this record, we agree that the '714 patent expired on July 30, 2016.

“[T]he Board’s review of the claims of an expired patent is similar to that of a district court’s review.” *In re Rambus Inc.*, 694 F.3d 42, 46 (Fed. Cir. 2012) (internal citations omitted). Thus, we construe the claims in accordance with their ordinary and customary meanings, as would be understood by a person of ordinary skill in the art, in the context of the specification. *See generally Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

¹² Japan Pat. Application Pub. No. H06-85221, to H. Fujii, published Mar. 25, 1994 (“Fujii,” Ex. 1024 (English translation)/Ex. 1025 (Japanese)).

Petitioner proposes six terms for construction. Pet. 11–14. Of the terms identified, at this stage of the proceeding, we determine preliminarily that the following terms of art require construction. For the remaining terms we proceed on the plain and ordinary meaning of the words in the context of the claim in which they appear or how the term would have been understood by the person of ordinary skill in the art.¹³

1. “*electrode pad*” (claims 2–7, 9–11, 13, 15, and 16)

Petitioner proposes that “electrode pad(s)” be interpreted as “an electrical connection point on a substrate or semiconductor device.” Pet. 12 (citing Ex. 1002 ¶¶ 81–84). The specification of the ’714 patent explains that “[t]he electrode pad disposed around the upper surface of the substrate is connected to the inner lead via the bump or anisotropic conductor so that the optical positioning as well as electrical connection is completed.” Ex. 1001, 3:23–26; *see also* Ex. 1002 ¶ 83 (citing this among other disclosures). We find this disclosure and the plain meaning of the term to be evidence regarding the construction of the term. The Guidash Declaration does not add to what is disclosed in the ’714 patent.

At this stage of the proceeding, relying on the specification’s description, we construe “electrode pad(s)” to mean “a pad disposed on the substrate which provides for an electrical connection point.”

¹³ Petitioner’s “constructions” for other terms are more correctly arguments about the scope of the term under consideration. For example, Petitioner asserts “‘plastic package’ in claim 7 should be construed to refer to the earlier use of the term ‘package’, which is a shorthand reference for ‘plastic package’.” Pet. 14.

2. “bump” (claims 3, 9, 13, 15, and 16)

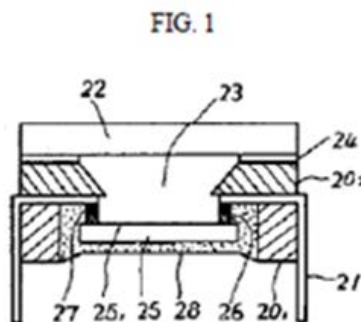
Petitioner proposes that “bump” be interpreted as “an amount of conductive material used for electrically connecting the device, using a number of different methods.” Pet. 12–13 (citing Ex. 1002 ¶ 85; CHARLES A. HARPER & MARTIN B. MILLER, *ELECTRONIC PACKAGING, MICROELECTRONICS, AND INTERCONNECTION DICTIONARY* (1993), 23, Bump: “A small metal mound or hump that is formed on the chip or the substrate bonding pad and is used as a contact in face-bonding. It is a means of providing connections to terminal areas of a device.” (“HARPER,” Ex. 1012)). The ’714 patent describes a “bump” in conjunction with the “electrode pad” as electrically connecting the electrode pad to the inner lead. Ex. 1001, 3:23–26.

Consistent with the specification and HARPER, we construe “bump” to mean “a mound or hump of conductive material.”

B. Anticipation Under § 102(b) by Yoshino (Claim 1)

1. Yoshino Overview (Ex.1003)

Yoshino discloses a packaging substrate for a solid-state image sensing device, where the device is mounted in a through hole and bonded to inner leads. Ex. 1003, 2. Yoshino, Figure 1 is reproduced below.



Yoshino’s Figure 1 is a cross section of the invention of Yoshino. *Id.* at 3.

Yoshino teaches packaging substrate 20 and opening 23. *Id.* “The solid-state image sensor (25) is placed so that the bonding pads (26) of the solid-state image sensor (25) are aligned with the electrode leads (21), and the bonding pads (26) and the electrode leads (21) aligned therewith are connected via a conductive bonding material (27).” *Id.* The solid-state image sensor is “supported” in the packaging substrate “via a molded resin (28).” *Id.*

2. Claim 1

Petitioner alleges that claim 1 is anticipated by Yoshino. Pet. 15–19. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 96–114.

The preamble of claim 1, limitation 1a in the Petition,¹⁴ recites “[a] solid-state image sensing apparatus.”¹⁵ Yoshino is directed to “[a] solid-state image pickup device characterized by comprising a solid-state image sensor, a packaging substrate supporting said solid-state image sensor.” Ex. 1003, 2 (claim 1). Petitioner relies on the preceding and the Guidash Declaration to show that Yoshino discloses the preamble. Pet. 15 (citing Ex. 1002 ¶ 100).

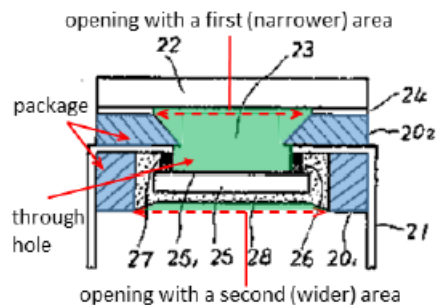
¹⁴ We adopt the Petition’s use of the claim number followed by alphabetical designations for each claim limitation, e.g., 1a for the preamble. *See* Pet. 15.

¹⁵ Petitioner proceeds on the basis that the preamble is limiting. In this instance the preamble is simply an introduction to the general field of the claim, i.e., “solid-state image sensing apparatus.” *See On Demand Machine Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1343 (Fed. Cir. 2006). Nonetheless, given that Yoshino and other prior art references are in the general field, for purposes of this Decision our analysis includes the preamble.

Limitation 1b recites “a package having a through hole therein, openings on both end faces thereof, and different opening areas of said openings.” Petitioner points to Figure 1 of Yoshino, showing packaging substrate and opening 23 and relies on the Guidash Declaration to show that limitation 1b is met. Pet. 15–16 (citing Ex. 1003, 3, Fig. 1 (annotated); Ex. 1002 ¶ 102).

Petitioner’s annotation of Yoshino’s Figure 1, described above in II.B.1., is reproduced below.

Petitioner’s Annotation of Yoshino Figure 1 (Pet. 16)



Annotated Figure 1 shows that “the package has openings on both end faces thereof, and different opening areas of said openings.” Ex. 1002 ¶ 102; *see* Pet. 16. Dr. Guidash further testifies:

The package (“packaging substrate (20)”) is highlighted in light blue and the through hole (“tapered opening (23)”) is highlighted in green. (Ex. 1003, p. 2). The openings on both end faces, having different opening areas, are indicated with red arrows.

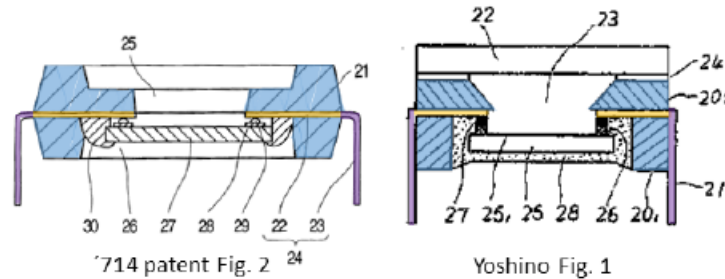
Ex. 1002 ¶ 102

Limitation 1c recites “a lead frame comprising inner leads and outer leads, said lead frame being sealed in said package.” Petitioner relies on Yoshino’s disclosures that the solid-state image sensor and bonding pads 26

of the solid-state image sensor are aligned with electrode leads. Pet. 16–17 (citing Ex. 1003, 3; Ex. 1002 ¶ 104).

A side-by-side comparison of annotated versions of Figure 2 of the '714 patent and Figure 1 of Yoshino are reproduced below.

Annotated Figure 2 of the '714 Patent and Figure 1 of Yoshino (Pet. 17)



As illustrated above, Petitioner makes a side-by-side comparison of the lead frame of the '714 patent and Yoshino's lead frame using annotated versions of Figure 2 of the '714 patent and Figure 1 of Yoshino. Pet. 17. Petitioner argues that "Yoshino teaches the same lead frame **comprising inner leads** (orange) **and outer leads** (purple), described in the '714 patent as 'inner lead 22' and 'outer lead 23' of 'lead frame 24.'" *Id.* (citing Ex. 1001, 4:52–53; Ex. 1002 ¶ 105). Petitioner also argues that "Yoshino's lead frame is **sealed in said package** (blue) in the same way as the '714 patent." *Id.* (citing Ex. 1002 ¶ 105).

Limitation 1d recites "a solid-state image sensing device mounted in said package by being inserted from an inlet of said opening which has a wider area, and thereby sealing said through hole, said solid-state image sensing device being secured to said package via an adhesive." Petitioner relies on the following disclosure from Yoshino to disclose limitation 1d:

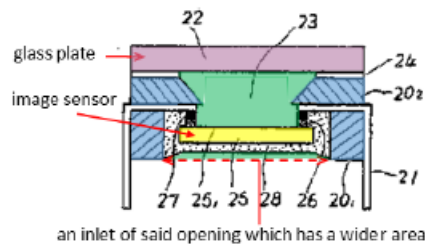
In this solid-state image pickup device, the packaging substrate (20) . . . is constructed . . . and the electrode leads (21) are provided **The light transmitting glass plate (22) is**

hermetically secured to the ceramic molded frame (202) using black fritted glass **beforehand so as to cover the tapered opening (23) of the packaging substrate (20)**. The **solid-state image sensor (25) is placed** so that the bonding pads (26) of the solid-state image sensor (25) are aligned with the electrode leads (21) [N]o heating is required in the step of **incorporating the solid-state image sensor (25) into the packaging substrate (20)** to which the **light transmitting glass plate (22) has already been hermetically bonded**.

Pet. 18 (citing Ex. 1003, 3; Ex. 1002 ¶ 107).

Petitioner annotates Figure 1 of Yoshino to demonstrate that limitation 1d is taught by Yoshino. This annotation of Figure 1d is reproduced below.

Annotation of Figure 1 of Yoshino (Pet. 18)



Petitioner’s annotation of Yoshino’s Figure 1 shows “the glass plate (highlighted purple) and the image sensor (yellow) inserted into the wider opening of the through hole (green) of the package (blue).” Pet. 18 (citing Ex. 1002 ¶ 107). For that portion of limitation 1d reciting “secured to said package via an adhesive,” Petitioner points to its annotation of Figure 1 as “depict[ing] the bottom opening sealed by an adhesive (‘molded resin (28)’).” *Id.* (citing Ex. 1003, 3; Ex. 1002 ¶ 108). At this stage of the proceeding, we credit the Guidash Declaration testimony that “molded resin” is “sometimes used in the fabrication of package bodies that *functions here as an adhesive*.” Ex. 1002 ¶¶ 69, 108 (emphasis added); *see* Pet. 18.

Furthermore, the plain and ordinary meaning of adhesive supports
Petitioner’s argument, an adhesive tends to adhere.¹⁶

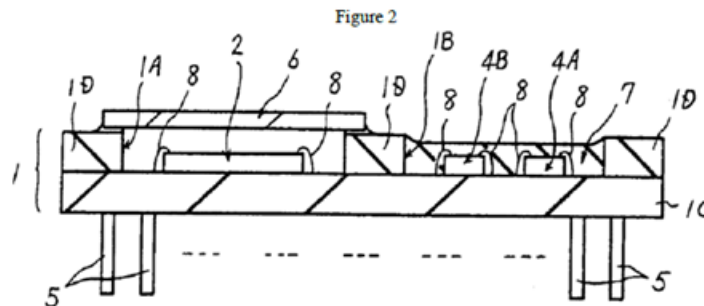
On this record and at this stage of the proceeding, Petitioner’s
argument and evidence show a reasonable likelihood that claim 1 is
anticipated by Yoshino.

C. Obviousness Under § 103(a) Over Yoshino and Izumi (Claim 6)

1. Izumi Overview (Ex. 1016)

Izumi discloses a first embodiment including a package of ceramic
material in which a solid state imaging device has a package made of resin
material. Ex. 1016, 4.¹⁷ “Solid state imaging element chip 2 comprises a
two dimensional photo sensor.” *Id.* The package has two concave cavities,
one to receive the chip and one to receive peripheral circuit chips 3 and 4A–
4D. *Id.* at Fig. 1.

Figure 2 is a cross section of a second embodiment of the same
structure as the first embodiment differing in that the package is formed of a
resin material. Ex. 1016, 5. Figure 2 of Izumi is reproduced below.



¹⁶ THE AMERICAN HERTIAGE DICTIONARY OF THE ENGLISH LANGUAGE, 16 (New College Edition 1979) (Ex. 3001) defines “adhesive” as “tending to adhere; sticky.”

¹⁷ References are to stamped numbers 002–007, exclusive of “00” and certificate of translation, overlaid on printed numbers 333–338.

Figure 2 includes base substrate 1C on which chip 2 and peripheral circuit chips 4A and 4B are mounted. *Id.* at 4–5, Fig. 2. Figure 1 shows the other peripheral chips 4C, 4D, and 3 referenced above. *Id.* at 4, Fig. 1.

2. Claim 6

Petitioner alleges that independent claim 6 would have been obvious over Yoshino and Izumi. Pet. 19–25. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 115–135.

Claim 1 limitations 1a–c are identical to claim 6 limitations 6a–c. *Compare* Ex. 1001, 9:20–25, *with id.* at 9:59–10:3. Petitioner cites to the showing made for claim 1 to show limitations 6a–6c. Pet. 20.

Limitation 6d recites “a substrate on which a solid-state image sensing device and a peripheral circuit chip are mounted being inserted into the package from a wider opening thereof.” For the relatively wider opening, Petition cites to the showing made for claim 1 and Yoshino. *Id.* (citing Ex. 1002 ¶ 121).

As to the “peripheral circuit chip” recitation in limitation 1d, Petitioner relies on Izumi, asserting that it would have been obvious to mount a solid state sensing device and peripheral circuit chip to a substrate. *Id.* at 21 (citing Ex. 1016, 4–5, Fig. 2). Petitioner argues that in Izumi Figure 2, “the image sensor and peripheral chip are in separate ‘cavity part(s)’ of the package.” *Id.* (citing Ex. 1016, 5; Ex. 1002 ¶ 125). Petitioner argues that claim 6 only requires the image sensor and peripheral circuit to be in the same package, which is taught in Izumi. *Id.* at 21–22 (citing Ex. 1002 ¶ 125). Petitioner concludes that one of ordinary skill “would have been motivated to use the substrate (and package divider) disclosed in Izumi

with Yoshino’s package.” Pet. 21–22 (citing Ex. 1016, 3 (Problems to be Solved); Ex. 1002 ¶ 126).

On this record and at this stage of the proceeding, Petitioner’s argument and evidence show a reasonable likelihood that claim 6 would have been obvious over Yoshino and Izumi.

D. Obviousness Under § 103(a) Over Yoshino, Nagano, and Wakabayashi (Claim 7)

1. Nagano Overview (Ex. 1018)

Nagano discloses a chip having a light-receiving part, which may be circular, and a circuit chip disposed on an upper surface thereof. Ex. 1018 ¶¶ 8, 9. Nagano has a substrate that is provided with electrodes for connection to another circuit. *Id.* ¶ 8.

2. Wakabayashi Overview (Ex. 1004)

Wakabayashi discloses a semiconductor image sensor enclosed in a plastic packaging material. Ex. 1004, Abstract.

3. Claim 7

Petitioner alleges that independent claim 7 would have been obvious over Yoshino, Nagano, and Wakabayashi. Pet. 25–28. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 136–153.

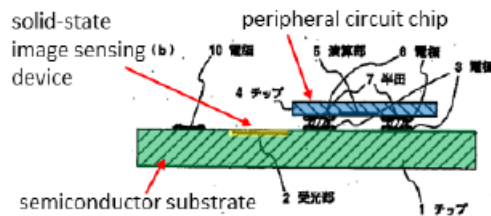
As discussed above in connection with claim 6, claim 1 limitations 1a–c are identical to claim 7 limitations 7a–c. Petitioner cites to the showing made for claim 1 to show limitations 7a–7c. Pet. 25.

We have reviewed the argument and evidence of Petitioner on the remaining claim 7 limitations 7d–7f and find that Petitioner has shown those limitations based on a combination of Yoshino, Nagano, and Wakabayashi. For example, limitation 7d recites “a semiconductor substrate having a solid-state image sensing device and a peripheral circuit chip disposed on an upper

surface thereof, said semiconductor substrate being inserted into a plastic package via the larger of two openings formed in said package.” Pet. 25.

For its showing of limitation 7d, Petitioner cites, in part, to an annotated version of Nagano Figure 1(b), reproduced below.

Annotation of Figure 1(b) of Nagano-Limitation 7d (Pet. 26)



Petitioner explains that Figure 1(b) of “Nagano discloses a **semiconductor substrate** (‘chip 1’, highlighted green) **having a solid-state image sensing device** (‘light-receiving part 2’, yellow) **and a peripheral circuit chip** (‘chip 4 having a computing part 5’, blue) **disposed on an upper surface thereof.**” Pet. 26–27 (citing Ex. 1018 ¶ 8, claim 1; Ex. 1002 ¶¶ 146–148). Petitioner argues that the preceding discloses that portion of limitation 7d reciting “a peripheral circuit chip disposed on an upper surface thereof.” *Id.* Petitioner cites its rationale in connection with claim 6 for the reason to combine Yoshino and Nagano. *Id.* at 27.

Wakabayashi is relied on to show the “plastic package” recitation of limitation 7d. Pet. 26 (citing Ex. 1004, Abstract). Petitioner concludes that using Wakabayashi’s plastic package for the package of Yoshino would be understood by a person of ordinary skill and would have achieved predictable results. *Id.* (citing 1002 ¶ 145).

On this record and at this stage of the proceeding, Petitioner's argument and evidence show a reasonable likelihood that claim 7 would have been obvious over Yoshino, Nagano, and Wakabayashi.

E. Obviousness Under § 103(a) Over Yoshino, Izumi/Nagano, Hirosawa, and Nita (Claim 8)

1. Hirosawa Overview (Ex. 1020)

Hirosawa discloses semiconductor chip 2 on which a light detection semiconductor element and a signal processing circuit element are formed. Ex. 1020, 3, Fig. 1. The components described are mounted in a package having light-shielding film 3.¹⁸ *Id.*

2. Nita Overview (Ex. 1011)

Nita discloses a package in which a light receiving section and storage section are mounted on chip 1, and a light shielding section is located above the substrate, on “transparent [glass] lid 4” of “package 2.” Ex. 1011 ¶¶ 15–16.

3. Claim 8

Petitioner alleges that claim 8 would have been obvious over Yoshino, Izumi/Nagano, Hirosawa, and Nita. Pet. 28–31. Petitioner cites the Guidash Declaration in support of its positions. See Ex. 1002 ¶¶ 154–166.

Claim 8 depends from claims 6 or 7 and recites “a shading film covers an entire upper surface of said substrate except an upper surface of the solid-state image sensing device.” Petitioner relies on its prior assertions Yoshino in view of Izumi for claim 6 and Yoshino and Nagano for claim 7. Pet. 28.

¹⁸ Petitioner points out that Hirosawa's Figure 1 labels the shading film “3” while the specification erroneously refers to it as “8.” Pet. 29.

Petitioner argues that Hirosawa’s Figure 1 depicts shading film 3 “**on the entire upper surface of the substrate except an upper surface of the solid-state image sensing device**, section 2L.” Pet. 29–30 (citing Ex. 1020, 3, Fig. 1; Ex. 1002 ¶¶ 160–161). Nita, it is argued, discloses that a light receiving section, i.e., the claimed “image sensing device,” and a storage section, i.e., the claimed “peripheral circuit chip,” are mounted on the chip, i.e., the claimed “substrate,” and that the light shielding section is located “**above the substrate**, on the ‘transparent glass lid 4’ of ‘package 2.’” *Id.* at 30 (citing Ex. 1011 ¶¶ 15–16, Figs. 3, 4; Ex. 1002 ¶ 162). Petitioner argues that “[u]sing a light-shading film, such as that of Hirosawa or Nita, over the entire area of the substrate not having the image sensor would have the predictable advantage of protecting the peripheral chip from light (or of minimizing light reaching the peripheral chip that might obtain with partial coverage).” *Id.* (citing Ex. 1002 ¶ 164). In addition, Petitioner notes that with regard to claim 6, where the combination of Yoshino and Izumi is asserted for unpatentability, Izumi describes blocking light by use of “resin sealing material 7.” *Id.* (citing Ex. 1016, 4; Ex. 1002 ¶ 165).

On this record and at this stage of the proceeding, Petitioner’s argument and evidence show a reasonable likelihood that claim 8 would have been obvious over Yoshino, Izumi/Nagano, Hirosawa, and Nita.

F. Obviousness Under § 103(a) Over Yoshino and Izumi/Nagano (Claim 9)

Petitioner alleges that claim 9 would have been obvious over Yoshino and Izumi/Nagano. Pet. 31–32. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 167–174.

Claim 9 depends from claims 6 or 7 and recites “an electrode pad formed on the substrate is connected to the inner lead via a bump.” We have

reviewed Petitioner's arguments and evidence regarding claim 9. Pet. 31–32; Ex. 1002 ¶¶ 168–174.

On this record and at this stage of the proceeding, Petitioner's argument and evidence show a reasonable likelihood that claim 9 would have been obvious over Yoshino and Izumi/Nagano.

G. Obviousness Under § 103(a) Over Yoshino, Izumi/Nagano, and Wakabayashi (Claim 10)

Petitioner alleges that claim 10 would have been obvious over Yoshino, Izumi/Nagano, and Wakabayashi. Pet. 32–34. Petitioner cites the Guidash Declaration in support of its positions. See Ex. 1002 ¶¶ 175–180.

Claim 10 depends from claims 6 or 7 and recites “an electrode pad formed on the substrate is connected to the inner lead via an anisotropic conductor which has only vertical conductivity.” We have reviewed Petitioner's arguments and evidence regarding claim 10. Pet. 32–34; Ex. 1002 ¶¶ 175–180.

On this record and at this stage of the proceeding, Petitioner's argument and evidence show a reasonable likelihood that claim 10 would have been obvious over Yoshino, Izumi/Nagano, and Wakabayashi.

H. Obviousness Under § 103(a) Over Yoshino, Izumi/Nagano, and Onishi (Claim 11)

1. Onishi Overview (Ex. 1014)

Onishi discloses “imaging equipment” with a transparent portion and conductive patterns connected to an imaging element including a body and a light receiving surface. Ex. 1014 ¶ 7. A space between the body and light-receiving surface is sealed by resin. *Id.* In a “second invention” embodiment, leads extend into this space, allowing the leads to flex so the

stress during the hardening of the sealing resin can be absorbed. *Id.* ¶¶ 16–17.

2. Claim 11

Petitioner alleges that claim 11 would have been obvious over Yoshino, Izumi/Nagano, and Onishi. Pet. 34–35. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 181–188.

Claim 11 depends from claims 6 or 7 and recites “an electrode pad formed on the substrate is connected to the inner lead at an outer portion of said lead, said outer portion of said lead extending into the openings of the package.” We have reviewed Petitioner’s arguments and evidence regarding claim 11. Pet. 34–35; Ex. 1002 ¶¶ 181–188.

Petitioner contends that “it would have been obvious to use Onishi’s extended inner lead with Yoshino’s package, or the package for an image sensor/peripheral chip substrate as rendered obvious by the combination of Yoshino/Izumi or Yoshino/Nagano.” Pet. 34–35 (citing Ex. 1014 ¶¶ 16–17; Ex. 1002 ¶ 187). Petitioner concludes that all that is required would have been to detach the inner lead of Yoshino from the package, allowing the lead to flex. *Id.* (citing Ex. 1002 ¶ 187).

On this record and at this stage of the proceeding, Petitioner’s argument and evidence show a reasonable likelihood that claim 11 would have been obvious over Yoshino, Izumi/Nagano, and Onishi.

I. Obviousness Under § 103(a) Over Yoshino and Tobase (Claim 12)

1. Tobase Overview (Ex. 1022)

Figure 1 of Tobase is reproduced below.

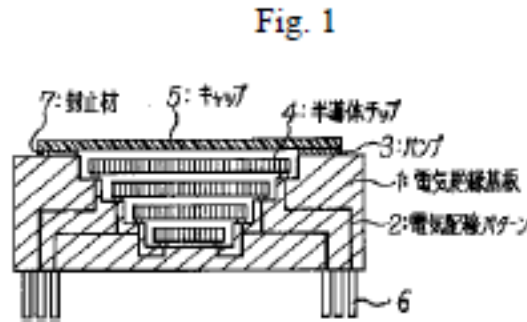


Figure 1 depicts semiconductor chips 4 mounted multi-step-wise in the vertical direction. Ex. 1022 ¶ 9. Bumps 3 are formed on the steps where semiconductor chips 4 are disposed. *Id.*

2. Claim 12

Petitioner alleges that independent claim 12 would have been obvious over Yoshino and Tobase. Pet. 35–39. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 189–205.

As discussed above in connection with claim 6, claim 1 limitations 1a–c are identical to claim 12 limitations 12a–c. Petitioner cites to the showing made for claim 1 to show limitations 12a–12c. Pet. 35–36.

The remaining limitation of claim 12 is 12d, which recites:

a solid-state image sensing device and a peripheral circuit chip both mounted in said package, said solid-state image sensing device being connected to a first inner lead exposed beneath a first step surface formed in said package, said solid-state image sensing device being secured to said package via an adhesive, and said peripheral circuit chip being connected to a second inner lead exposed beneath a second step surface formed in said package, said peripheral circuit chip being secured to said package via an adhesive.

Id. at 35. Petitioner argues that “Tobase discloses multiple ‘semiconductor chips’ mounted in a package with multiple **step surfaces**.” Pet. 36–37 (citing Ex. 1022 ¶ 9, Fig. 1).

Petitioner’s rationale for the combination is that “[i]t would have been obvious to use Tobase’s step structure in Yoshino’s package” to provide additional space savings benefit. Pet. 37–38 (citing Ex. 1002 ¶ 199). Further, Petitioner argues that Tobase suggests such a combination in explaining that “mounting density can be increased and the interconnector path lengths of the electrical interconnectors can be shortened and the signal propagation time thereby shortened, and high-speed operation of the multi-chip module thereby made possible.” *Id.* (citing Ex. 1022 ¶ 18; Ex. 1002 ¶ 199). Other benefits cited by Petitioner include eliminating the need for shading film. *Id.* at 38 (citing Ex. 1002 ¶ 200).

Petitioner also contends that it would be obvious to make one of the chips of Tobase a peripheral circuit chip such as disclosed by Yoshino’s solid state image sensor. Pet. 38 (citing Ex. 1002 ¶ 202). Further, Petitioner contends that “[i]f Yoshino were modified by using a stepped structure like Tobase’s Fig. 1, the **first and second inner leads** would be **exposed beneath a first and a second step surface formed in said package**.” *Id.* (citing Ex. 1002 ¶ 203). Petitioner references its showing for step 1d for securing the peripheral chip to the package by an adhesive. *Id.* (citing Ex. 1002 ¶ 203).

On this record and at this stage of the proceeding, Petitioner’s argument and evidence show a reasonable likelihood that claim 12 would have been obvious over Yoshino and Tobase.

J. Obviousness Under § 103(a) Over Yoshino and Hikosaka (Claim 13)

1. Hikosaka Overview (Ex. 1005)

Hikosaka discloses a process for producing a solid-state image sensing apparatus in which an image sensor is mounted in a through hole via face bonding of the image sensor via bumps. Ex. 1005, 2. Hikosaka's process includes using a video display and reference marks to position and connect the image sensor. *Id.* at 3–4. An image of a first reference mark captured by the image sensor is aligned with a second reference mark on the screen of the video display. *Id.*

2. Claim 13

Petitioner alleges that independent method claim 13 would have been obvious over Yoshino and Hikosaka. Pet. 39–44. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 206–230.

Petitioner argues that Yoshino discloses the elements of method claim 13 that are common to apparatus claim 1. Pet. 39. Petitioner argues that claim 13 adds an additional step of “simultaneously adjusting the optical positioning of said solid-state image sensing device,” and alleges that this step is taught by Hikosaka. *Id.* Specifically, Petitioner argues that “[i]t would have been obvious to use Hikosaka's simultaneous optical positioning to improve the positioning of the image sensor within Yoshino's package.” *Id.* (citing Ex. 1002 ¶ 206).

We agree that claim 13 adds the “optical positioning” step to what was claimed, albeit in apparatus limitations and not method steps, in claim 1. We have reviewed Petitioner's evidence and argument regarding claim 13 generally and optical positioning as allegedly shown in Hikosaka. *See* Pet. 40–44; Ex. 1002 ¶¶ 213–230.

On this record and at this stage of the proceeding, Petitioner's argument and evidence show a reasonable likelihood that claim 13 would have been obvious over Yoshino and Hikosaka.

K. Obviousness Under § 103(a) Over Yoshino, Izumi, Nagano, and Hikosaka (Claim 15)

Petitioner alleges independent method claim 15 would have been obvious over Yoshino, Izumi, Nagano, and Hikosaka. Pet. 44–47. Petitioner cites the Guidash Declaration in support of its positions. See Ex. 1002 ¶¶ 231–240.

Petitioner argues that Yoshino, Izumi, Nagano, and Hikosaka as applied to prior claim elements and steps disclose the steps of claim 15. For example, step 15b recites “mounting said solid-state image sensing device and said peripheral circuit chip on a substrate where a group of wirings is disposed in order to connect the solid-state image sensing device and the peripheral circuit chip to the group of wirings.” Petitioner cites to its showing on Yoshino relative to step 13a and the showing made in Izumi for step 6d. Pet. 44–45 (citing Ex. 1002 ¶ 232).

We have reviewed Petitioner's argument and evidence and, on this record and at this stage of the proceeding, Petitioner has shown a reasonable likelihood that claim 15 would have been obvious over Yoshino, Izumi, Nagano and Hikosaka.

L. Obviousness Under § 103(a) Over Yoshino, Tobase, and Hikosaka (Claim 16)

Petitioner alleges that independent method claim 16 would have been obvious over Yoshino, Tobase, and Hikosaka. Pet. 47–49. Petitioner cites the Guidash Declaration in support of its positions. See Ex. 1002 ¶¶ 241–251.

Petitioner argues that Yoshino, Tobase, and Hikosaka as applied to prior claim elements and steps disclose the steps of claim 16. For example, step 16b recites “inserting said solid-state image sensing device into the through hole.” Petitioner cites to its showing on Yoshino relative to element 1d. Pet. 48 (citing Ex. 1002 ¶ 243).

We have reviewed Petitioner’s argument and evidence and, on this record and at this stage of the proceeding, Petitioner has shown a reasonable likelihood that claim 16 would have been obvious over Yoshino, Tobase, and Hikosaka.

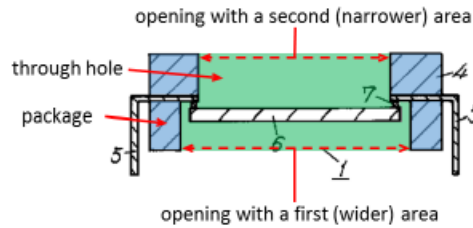
M. Obviousness Under § 103(a) Over Wakabayashi (Claim 1)

Petitioner alleges that independent claim 1 would have been obvious over Wakabayashi. Pet. 49–53. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 252–266.

Limitation 1a in the Petition, recites “[a] solid-state image sensing apparatus.” Petitioner argues Wakabayashi teaches a solid-state image sensing apparatus as a “solid-state image pickup device” with a “CCD chip.” Pet. 50 (citing Ex. 1004 ¶ 1; Ex. 1002 ¶ 253).

Limitation 1b recites “a package having a through hole therein, openings on both end faces thereof, and different opening areas of said openings.” *Id.* Petitioner points to Figure 1 of Wakabayashi, showing a package with openings on both end faces thereof, and different opening areas of said openings. Pet. 50–51 (citing Ex. 1004, Abstract, ¶ 5; Ex. 1002, ¶ 255). Petitioner’s annotation of Figure 1 is reproduced below.

Petitioner's Annotation of Wakabayashi Figure 1 (Pet. 51)



Annotated Figure 1 shows the narrower and wider openings (in red dotted line) and “the through hole is shown in green, the package body in blue.” *Id.* at 51.

Limitation 1c recites “a lead frame comprising inner leads and outer leads, said lead frame being sealed in said package.” *Id.* at 51. Wakabayashi teaches that “[t]he solid-state image pickup device according [to] the invention has . . . a package . . . interposing a lead frame and having, in its interior, a space for disposing a CDD chip, the inner lead sections of the lead frame being exposed to the space.” Ex. 1004 ¶ 5. Petitioner relies on the preceding disclosure and paragraph 10 of Wakabayashi, which describes leads 5 (shown in annotated Figure 1 above), to show limitation 1c. Pet. 51 (citing Ex. 1004 ¶¶ 5, 10; Ex. 1002 ¶¶ 256–257).

Limitation 1d recites “a solid-state image sensing device mounted in said package by being inserted from an inlet of said opening which has a wider area, and thereby sealing said through hole, said solid-state image sensing device being secured to said package via an adhesive.” *Id.* at 51–52.

To show limitation 1d, Petitioner relies on Wakabayashi’s disclosure that “[t]he solid-state image pickup device according the invention has the basic construction of comprising a CCD chip joined via bumps to the inner lead sections of a package.” Pet 51 (citing Ex. 1004 ¶ 5; Ex. 1002 ¶ 258). Petitioner acknowledges that “Wakabayashi does not expressly disclose that

the image sensor is mounted **by being inserted from an inlet of said opening which has a wider area,**” but asserts this would have been obvious. *Id.* at 52 (citing Ex. 1002 ¶ 259). Petitioner explains, among other arguments, that the wider opening would be seen by the person of ordinary skill as the most predictable result for achieving success. *Id.* (citing Ex. 1002 ¶ 260).

As to that part of limitation 1d requiring that “said solid-state image sensing device being secured to said package via an adhesive,” Petitioner cites to Wakabayashi’s disclosure that the “basic structure discussed above, the back face side of the chip is further **sealed with an adhesive resin 7.**”¹⁹ *Id.* at 53.

On this record and at this stage of the proceeding, Petitioner’s argument and evidence show a reasonable likelihood that claim 1 would have been obvious over Wakabayashi.

N. Obviousness Under § 103(a) Over Wakabayashi and Fujii (Claims 2–4)

1. Fujii Overview (Ex. 1024)

Fujii discloses a package for a solid-state image sensing device. Ex. 1024, Abstract. The package features a horizontal “ledge” projecting into its interior space that serves to hold the package’s transparent lid. *Id.* at Fig. 1; *see* Pet. 54–55.

¹⁹ Petitioner persuades us that Wakabayashi uses “7” when “9” is correct, as shown in Figure 2 of Wakabayashi. *See* Pet. 53 (citing Ex. 1002 ¶ 268).

2. Claim 2

Petitioner alleges that independent claim 2 would have been obvious over Wakabayashi and Fujii. Pet. 53–57. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 267–284.

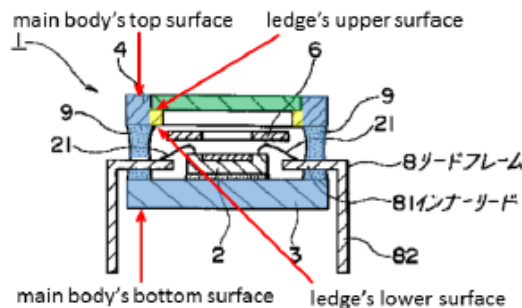
Petitioner cites to its prior showings that claim 1 would have been obvious over Wakabayashi to meet elements 2a, 2c, 2d, and 2e. Pet. 54–57 (citing Ex. 1002 ¶¶ 270, 279–283). We have reviewed the cited argument and evidence and determine on this record that Petitioner has shown a reasonable likelihood that limitations 2a, 2c, 2d, and 2e are shown by Wakabayashi.

Limitation 2b recites:

a package comprising a main body having a through hole therein, said main body having a top surface and a bottom surface, said package further comprising a ledge formed on said main body so as to extend inwardly toward the center of said through hole, said ledge comprising an upper surface and a lower surface.

Id. at 54. Petitioner relies on the disclosure of Figure 4 of Fujii. Petitioner’s annotation of Figure 4 is reproduced below.

Petitioner’s Annotation of Fujii Figure 4 (Pet. 54)



Petitioner’s annotation of Fujii’s Figure 4 depicts Fujii’s package in blue “**having a top surface and a bottom surface and a ledge (yellow) formed**

on said main body so as to extend inwardly toward the center of the package.” Pet. 54–55 (citing Ex. 1002 ¶¶ 272–275). Petitioner argues that Fujii has a ledge that holds transparent cap 5, highlighted in green.²⁰ *Id.* Petitioner concludes “[i]t would have been obvious to use Fujii’s **ledge** in Wakabayashi’s package, such that the ledge **extends inwardly toward the center of said through hole**, as illustrated below using Wakabayashi’s Fig. 2.” *Id.* at 55 (citing Ex. 1002 ¶¶ 276–277).

On this record and at this stage of the proceeding, Petitioner’s arguments and evidence show a reasonable likelihood that claim 2 would have been obvious over Wakabayashi and Fujii.

3. Claims 3 and 4

Petitioner alleges that claims 3 and 4, each of which depends from claim 2, would have been obvious over Wakabayashi and Fujii. Pet. 57–58. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 285–288.

We have reviewed Petitioner’s argument and evidence and, on this record and at this stage of the proceeding, Petitioner has shown a reasonable likelihood that claims 3 and 4 would have been obvious over Wakabayashi and Fujii.

O. Obviousness Under § 103(a) Over Wakabayashi, Fujii, and Onishi (Claim 5)

Petitioner alleges that claim 5, which depends from claim 2, would have been obvious over Wakabayashi, Fujii, and Onishi. Pet. 58. Petitioner

²⁰ Petitioner persuades us that the number “5” was omitted from Figure 4. Pet. 54–55 (citing Ex. 1024 ¶ 10; Ex. 1002 ¶¶ 276–277).

cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 289–292.

We have reviewed Petitioner’s argument and evidence and, on this record and at this stage of the proceeding, Petitioner has shown a reasonable likelihood that claim 5 would have been obvious over Wakabayashi, Fujii, and Onishi.

P. Obviousness Under § 103(a) Over Wakabayashi and Hikosaka (Claim 13)

Petitioner alleges that independent method claim 13 would have been obvious over Wakabayashi and Hikosaka. Pet. 58–60. Petitioner cites the Guidash Declaration in support of its positions. *See* Ex. 1002 ¶¶ 293–302.

We have reviewed Petitioner’s argument and evidence and, on this record and at this stage of the proceeding, Petitioner has shown a reasonable likelihood that claim 13 would have been obvious over Wakabayashi and Hikosaka.

III. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review is *instituted* with respect to the following grounds of unpatentability:

- (1) claim 1 as anticipated under § 102(b) by Yoshino;
- (2) claim 6 as obvious under § 103(a) over Yoshino and Izumi;
- (3) claim 7 as obvious under § 103(a) over Yoshino, Nagano, and Wakabayashi;
- (4) claim 8 as obvious under § 103(a) over Yoshino, Izumi/Nagano, Hirosawa, and Nita;
- (5) claim 9 as obvious under § 103(a) over Yoshino and Izumi/Nagano;

- (6) claim 10 as obvious under § 103(a) over Yoshino, Izumi/Nagano, and Wakabayashi;
- (7) claim 11 as obvious under § 103(a) over Yoshino, Izumi/Nagano, and Onishi;
- (8) claim 12 as obvious under § 103(a) over Yoshino and Tobase;
- (9) claim 13 as obvious under § 103(a) over Yoshino and Hikosaka;
- (10) claim 15 as obvious under § 103(a) over Yoshino, Izumi, Nagano, and Hikosaka;
- (11) claim 16 as obvious under § 103(a) over Yoshino, Tobase, and Hikosaka;
- (12) claim 1 as obvious under § 103(a) over Wakabayashi;
- (13) claims 2–4 as obvious under § 103(a) over Wakabayashi and Fujii;
- (14) claim 5 as obvious under § 103(a) over Wakabayashi, Fujii, and Onishi; and
- (15) claim 13 as obvious under § 103(a) over Wakabayashi and Hikosaka.

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(a), *inter partes* review of the '714 patent is hereby instituted commencing on the entry date of this Order, and pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial.

IPR2016-00941
Patent 5,952,714

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