

Petition for *Inter Partes* Review of
U.S. Patent No. 11,035,885

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORMFACTOR, INC.,
Petitioner,

v.

TECHNOPROBE S.P.A.,
Patent Owner.

Case IPR2024-00933

Patent No. 11,035,885 B2

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,035,885 B2**

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LISTING OF EXHIBITS

Exhibit	Description
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Ex. 1002	The ’885 Patent Prosecution History
Ex. 1003	Declaration of Frederick L. Taber
Ex. 1004	Korea Patent No. 10-1384714 (“Kim KR”)
Ex. 1005	Certified English Translation of Kim KR
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Ex. 1008	Certified English Translation of Tezuka
Ex. 1009	U.S. Pat. No. 6,417,684 (“Schmid”)
Ex. 1010	U.S. Pat. No. 5,225,777 (“Bross”)
Ex. 1011	U.S. Pat. No. 9,470,715 (“Fan”)
Ex. 1012	U.S. Pub. No. 2014/0197860 (“Hsu”)
Ex. 1013	Introduction to Probe Cards, by Rod Schwartz (1998 SWTest Conference)
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Ex. 1022	United States District Courts — National Judicial Caseload Profile, <i>available at</i> https://www.uscourts.gov/sites/default/files/fcms_na_distprofile1231.2023_0.pdf (last accessed May 9, 2024)
Ex. 1023	Curriculum Vitae of Frederick L. Taber
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Ex. 1027	Cover Pleading of Patent Owner's Infringement Contentions
Ex. 1028	SWTest Willtechnology Presentation
Ex. 1029	SWTest Willtechnology Presentation – WayBack June 3, 2016
Ex. 1030	SWTest Willtechnology Presentation – WayBack December 6, 2016
Ex. 1031	SWTest Willtechnology Presentation – June 7, 2016 Podium Proceedings

LIST OF CHALLENGED CLAIMS

Limitation	Claim Language
[1P]	A testing head configured to verify the operation of a device under test integrated on a semiconductor wafer, the testing head comprising:
[1A]	a plurality of contact elements, each comprising a body that extends between a first end portion and a second end portion, and
[1B]	at least one guide provided with a plurality of guide holes configured to house the contact elements,
[1C]	wherein the at least one guide comprises: a first conductive portion that includes and electrically connects a first group of guide holes, of the plurality of guide holes, to each other and is configured to contact corresponding first contact elements, of the plurality of contact elements, configured to carry a first type of signal; and
[1D]	a second conductive portion that includes and electrically connects the holes of a second group of the guide holes to each other, the second group housing second contact elements of the plurality of contact elements, the second contact elements being configured to carry a second type of signal,
[1E]	the first and second types of signals chosen between ground signals and power signals.
[2]	The testing head of claim 1, wherein the first conductive portion is locally interrupted by at least one non-conductive zone.
[3]	The testing head of claim 1, wherein the at least one guide comprises at least one coating dielectric portion that covers the at least one non-conductive zone.
[4]	The testing head of claim 1, wherein the first conductive portion is formed on a first face of the at least one guide, and the second conductive portion is formed on a second face of the at least one guide, the second face being opposite to the first face.
[5A]	The testing head of claim 1, wherein the at least one guide includes a lower guide, an intermediate guide, and an upper guide,

[5B]	the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap,
[5C]	each of the lower, intermediate and upper guides comprising respective guide holes for housing the contact elements,
[5D]	the first and second conductive portions being formed on respective faces of the upper, intermediate and lower guides.
[6A]	The testing head of claim 1, wherein the at least one guide includes a lower guide, an intermediate guide and an upper guide,
[6B]	the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap,
[6C]	each of the lower, intermediate and upper guides comprising respective guide holes for the housing the contact elements,
[6D]	the first and second conductive portions being formed on a same face of one of the upper, intermediate and lower guides and being physically and electrically separated from each other by at least one non-conductive zone.
[7]	The testing head of claim 1, wherein the at least one guide includes at least one third conductive portion that includes and electrically connects a third group of the guide holes to each other and house third contact elements configured to carry input/output signals between the device under test and a test equipment.
[8]	The testing head of claim 1, wherein the first conductive portion covers at least one portion of an inner surface of each guide hole of the first group of guide holes.
[9]	The testing head of claim 1, wherein the at least one guide comprises at least one common pad connected to the at least one conductive portion by a conductive track.
[10]	The testing head of claim 1, wherein the at least one guide comprises a further conductive portion at one of the guide holes that is configured to house a single contact element, the at least one guide comprising a common pad connected to the further conductive portion by a conductive track.
[11]	The testing head of claim 1, wherein the at least one guide comprises a further conductive portion at one of the guide holes that is configured to house a single contact element, the at least

	one guide comprising a conductive track that connects the conductive portion to other conductive portions.
[12]	The testing head of claim 1, wherein the first conductive portion is embedded in the at least one guide.
[13]	The testing head of claim 1, wherein the first conductive portion is one of a plurality of conductive portions overlapped to and electrically insulated from each other.
[14]	The testing head of claim 1, further comprising at least one conductive track that electrically connects the first and second conductive portions including and electrically connecting the holes of the first and second groups of the guide holes to each other, the contact elements included in the second group being configured to carry the first type of signal.
[15]	The testing head of claim 1, further comprising a circuit component, which is electrically connected at least to the first conductive portion of the at least one guide.
[16P]	A testing head configured to verify the operation of a device under test integrated on a semiconductor wafer, the testing head comprising:
[16A]	a plurality of contact elements, each comprising a body that extends between a first end portion and a second end portion; and
[16B]	at least one guide provided with a plurality of guide holes configured to house the contact elements,
[16C]	wherein the at least one guide comprises: a first conductive portion including and electrically connecting holes of a first group of the guide holes to each other, the first group housing first contact elements;
[16D]	a second conductive portion including and electrically connecting holes of a second group of the guide holes to each other, the second group housing second contact elements,
[16E]	the first and second contact elements being configured to carry respective same type of signal chosen between ground signals and power signals; and
[16F]	a lower guide, an intermediate guide, and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap,

[16G]	each of the lower, intermediate and upper guides comprising respective guide holes for housing the contact elements,
[16H]	the first and second conductive portions being formed on respective faces of the upper, intermediate and lower guides.
[17]	The testing head of claim 16, wherein the first conductive portion is formed on a first face of the at least one guide, and the second conductive portion is formed on a second face of the at least one guide, the second face being opposite to the first face.
[18]	The testing head of claim 16, wherein the at least one guide includes at least one third conductive portion that includes and electrically connects holes of a third group of the guide holes to each other and house third contact elements, of the plurality of contact elements, configured to carry input/output signals between the device under test and a test equipment.
[19]	The testing head of claim 16, wherein the at least one guide comprises at least one common pad connected to the first conductive portion by a conductive track.
[20]	The testing head of claim 16, wherein the at least one guide comprises a further conductive portion, which includes one of the guide holes configured to house a single contact element, the at least one guide comprising a common pad connected to the further conductive portion by a conductive track.
[21]	The testing head of claim 16, wherein the first conductive portion is embedded in the at least one guide.
[22]	The testing head of claim 16, wherein the first and second conductive portions are overlapped to and electrically insulated from each other.
[23P]	A testing head configured to verify the operation of a device under test integrated on a semiconductor wafer, the testing head comprising:
[23A]	a plurality of contact elements, each comprising a body that extends between a first end portion and a second end portion; and
[23B]	at least one guide provided with a plurality of guide holes configured to house the contact elements,
[23C]	wherein the at least one guide comprises: a first conductive portion including and electrically connecting holes of a first

	group of the guide holes to each other, the first group housing first contact elements;
[23D]	a second conductive portion including and electrically connecting holes of a second group of the guide holes to each other, the second group housing second contact elements,
[23E]	the first and second contact elements being configured to carry respective same type of signal chosen between ground signals and power signals; and
[23F]	a lower guide, an intermediate guide and an upper guide, the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap,
[23G]	each of the lower, intermediate and upper guides comprising respective guide holes for the housing the contact elements,
[23H]	the first and second conductive portions being formed on a same face of one of the upper, intermediate and lower guides and being physically and electrically separated from each other by at least one non-conductive zone.

I. Introduction

Petitioner FormFactor, Inc. (“FormFactor” or “Petitioner”) respectfully requests *inter partes* review of claims 1-23 (the “Challenged Claims”) of U.S. Patent No. 11,035,885 (Ex. 1001, “’885 patent”), which is assigned to Technoprobe S.p.A. (“Technoprobe” or “Patent Owner”).

The ’885 patent concerns test heads for testing electronic devices, such as a chip, integrated on a semiconductor wafer. Ex. 1001, Abstract. The ’885 patent describes as prior art well-known components of test heads including plate-shaped guides with holes housing contact elements (also called “probes” or “testing pins”). The ’885 patent’s purported improvement is adding “conductive portions” on the guide(s) which “electrically connect” a group of guide holes housing probes carrying the same kind of signal. All Challenged Claims require two conductive portions on a guide, one for ground signals and one for power signals.

U.S. Patent Application Publication No. 2015/0198632A1 to Kim (Ex. 1006, “Kim”) discloses *exactly* the same type of test head comprising a “guide plate” with “one or more conductive traces” connecting “conductive layer[s] formed in the guide hole” to “electrically connect” testing pins. Ex. 1006, [0015], [0017]. Kim specifically discloses the key elements of electrically connecting ground probes via one conductive portion and power probes via a second conductive portion.

Kim anticipates many of the Challenged Claims—which other patent offices already have recognized during the prosecutions of the '885 patent's foreign counterparts. The European Patent Office and Japanese Patent Office both rejected pending claims with the same subject matter as '885 patent claim 1 and other Challenged Claims as lacking novelty in view of Kim. *See* Ex. 1016, 443-47; Ex. 1018, 1-5. In response, Technoprobe had to narrow the claims corresponding to '885 patent claim 1. *See* Ex. 1016, 462; Ex. 1018, 10. Indeed, in Japanese prosecution, Technoprobe *explicitly* admitted that Kim disclosed the key elements of '885 patent claim 1. *See* Ex. 1018, 20-21.

Kim also renders the Challenged Claims obvious to the extent not disclosed in Kim, either alone or in combination with other references. The Challenged Claims are unpatentable.

II. Mandatory Notices

A. Real Party-in-Interest

Petitioner FormFactor, Inc. has sole control over this petition and is the real party-in-interest.

B. Related Matters

Technoprobe sued FormFactor in a co-pending district court action asserting infringement of the '885 patent, *Technoprobe S.p.A. v. FormFactor, Inc.*, Case No. 1:23-cv-00842-JCG (D. Del.) (the “Litigation”), filed August 4, 2023. Petitioner

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was served with the complaint in the Litigation on August 7, 2023. Thus, this petition is timely under 35 U.S.C. § 315(b).

C. Notice of Counsel and Service Information

Petitioner designates the following counsel:

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Petitioner consents to service by electronic mail at the following addresses:

TVPPTABDocket@orrick.com; PTABDocketJ3Z8@orrick.com. Petitioner's

Power of Attorney is attached.

The USPTO is authorized to charge the filing fee and any other fees incurred by Petitioner to the deposit account of Orrick, Herrington, & Sutcliffe LLP: 15-0665.

III. Requirements for IPR

A. Standing

Petitioner certifies that the '885 patent is available for IPR, and that Petitioner is not barred or estopped from requesting this review.

B. Challenge and Relief Requested

Petitioner relies on the following references: Kim, published on July 16, 2015; U.S. Patent No. 6,417,684 (Ex. 1009, "Schmid"), issued on July 9, 2002 (Ex. 1009); U.S. Patent No. 9,470,715 (Ex. 1011, "Fan"), issued on October 18, 2016; U.S. Patent No. 5,225,777 (Ex. 1010, "Bross"), issued on July 6, 1993; and the 2016 presentation at the Semiconductor Wafer Test Workshop, "A Proposal of a New Probe Head Design in Vertical Probe Cards for Low Crosstalk and PDN impedance," (Ex. 1028, "the 2016 SWTest Presentation") publicly available as of June 7, 2016. These references all predate the '885 patent's earliest priority claim (December 16, 2016), thus, all these references are prior art at least under AIA 35 U.S.C. §102(a)(1).

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

Ground 1: Kim anticipates claims 1-2, 4, 8-11 and 14.

Ground 2: Kim renders claims 1-2, 4, 7-11 and 14 obvious.

Ground 3: Kim and Schmid render claims 5-6, 16-20 and 23 obvious.

Ground 4: Kim and Fan render claim 3 obvious.

Ground 5: Kim and Bross render claims 12 and 13 obvious.

Ground 6: Kim and the 2016 SWTest presentation render claim 15 obvious.

Ground 7: Kim, Bross, and Schmid render claims 21 and 22 obvious.

This Petition is supported by the Declaration of Frederick L. Taber (Ex. 1003;
see also id., ¶¶ 1-49).

IV. Discretionary Denial is Unwarranted

A. 35 U.S.C. § 314(a)

The Board considers the factors set forth in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020) (precedential) (“*Fintiv*”) when determining whether a co-pending district court action bears on whether institution should be granted. These factors strongly favor institution here.

1. Possibility of a stay

FormFactor intends to move to stay the Litigation if institution is granted. The district court has not indicated how it will rule on such a motion. Thus, this factor is neutral. *See, e.g., Sand Revolution II, LLC v. Continental Intermodal Group – Trucking LLC*, IPR2019-01393, Paper 24 at 7 (PTAB June 16, 2020) (“*Sand Revolution*”) (the Board will not attempt to predict how the district court litigation will proceed).

2. The court's trial date

This factor favors institution. The district court entered a scheduling order on March 20, 2024 setting a February 2, 2026 trial date. Ex. 1020, 13. The IPR proceedings, if instituted, should be completed by approximately the end of December 2025, before the scheduled trial date. Moreover, the median time from filing to trial in Delaware was 38 months as of the most recent statistics published by the U.S. Courts; trial in the Litigation would be expected in October 2026 based on that median time. Ex. 1022, 14 (“Delaware”). “The PTAB will weigh this factor against exercising discretion to deny institution under *Fintiv* if the median time-to-trial is around the same time or after the projected statutory deadline for the PTAB’s final written decision.” Ex. 1026 (June 21, 2022 Memorandum from Director Vidal), 9.

3. Investment in the parallel proceeding

This factor favors institution. To date, the parties and Court have invested relatively little in the Litigation, particularly as to invalidity. The district court just ruled on FormFactor’s motion to dismiss on May 20, 2024, and FormFactor answered the Amended Complaint (Ex. 1021) on June 3, 2024. Fact discovery just commenced in February 2024. Technoprobe just served infringement contentions on May 31, 2024; FormFactor has not served invalidity contentions. The claim construction process has not begun, and the claim construction hearing is scheduled

for January 30, 2025, after the expected date of the institution decision. No depositions have occurred, no expert discovery has been conducted, and no summary judgment motions have been filed. *See Sand Revolution* at 11.

Moreover, FormFactor proceeded with reasonable diligence. FormFactor had no pre-suit notice of Technoprobe's infringement allegations. And it filed this Petition within 4 weeks of receiving Technoprobe's infringement contentions, whereby FormFactor first learned that Technoprobe was asserting *every* claim of the '885 patent. Ex. 1027, 1. "[I]t is often reasonable for a petitioner to wait to file its petition until it learns which claims are being asserted against it in the parallel proceeding." *Fintiv* at 11.

4. Overlap of issues with the parallel proceeding

This factor favors institution. If this IPR is instituted, FormFactor stipulates that it will not pursue any instituted grounds as invalidity defenses in the Litigation, thus eliminating any overlap in issues. Such stipulations weigh in favor of institution. *See Sand Revolution* at 11-12; *Apple Inc. v. Maxell, Ltd.*, IPR2020-00204, Paper 11 at 15-17 (PTAB June 19, 2020).

5. Overlap of parties

Both FormFactor and Technoprobe are parties in the Litigation. This, however, is of little moment as the parties overlap in most situations where the patent-at-issue is both the subject of an IPR petition and asserted in district court.

*6. Other circumstances that impact the Board's exercise of discretion,
including the merits*

The strength of this Petition strongly favors institution. *See Fintiv* at 14-15 (instituting particularly meritorious petitions is favored because it “may serve the interest of overall system efficiency and integrity”). Petitioner advances arguments based upon a previously unconsidered reference (Kim) that two other patent offices already have found discloses the subject matter of at least some of the Challenged Claims, as explained below in detail.

B. 35 U.S.C. § 325(d)

Denial under Section 325(d) also would be inappropriate. The petition relies upon prior art references that were not of record during prosecution of the '885 patent.¹ *See generally* Ex. 1002.

Korean Patent Publication No. 10-1421051 (the “'051 Reference,” *id.*, 414-422), which has the same inventor and assignee as Kim, was identified in an information disclosure statement during the '885 patent's prosecution, although it was not cited by the Examiner. *Id.*, 180; Ex. 1003, ¶ 89. The '051 Reference is not

¹ Kim and Schmid were identified by Technoprobe during prosecution of two continuations of the '885 patent but were not discussed by Technoprobe or the examiner.

cumulative of the prior art identified in this Petition. *See Becton, Dickinson & Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017). Indeed, during prosecution of the '885 patent's European counterpart, both the European Patent Office ("EPO") and Technoprobe noted the differences between Kim and the '051 Reference, as explained *supra* Section VII.B.

V. Overview Of The '885 Patent

A. The Patent's Admitted Prior Art

It is "well known" that a testing head (probe head) is a device that places "contact pads of a microstructure, such as an electronic device integrated on a wafer, into electrical contact with corresponding channels of a testing machine..." Ex. 1001, 1:20-24; Ex. 1003, ¶¶ 54-68, 82-83. Testing heads are "useful to detect and isolate defective devices." Ex. 1001, 1:26-31. The '885 patent relates to such "a testing head." *Id.*, 1:8-9, 5:66-6:3; Fig. 2A; Ex. 1003, ¶¶ 82-83.

Figure 1, labeled "PRIOR ART," illustrates one example of a conventional buckling beam vertical testing head structure. Ex. 1001, 1:58-64, Fig. 1; Ex. 1003, ¶ 84. It comprises an upper guide (2) and a lower guide (3). Ex. 1001, 1:58-61; Ex. 1003, ¶ 85. The guides have respective guide holes (4 and 5) which house contact probes (6). Ex. 1001, 1:61-62; Ex. 1003, ¶ 85. Each contact probe terminates at one end with a contact tip (7) that contacts a contact pad (8) of a device under test to contact the device under test with a test equipment. Ex. 1001, 1:65-2:3; Ex. 1003, ¶

85.

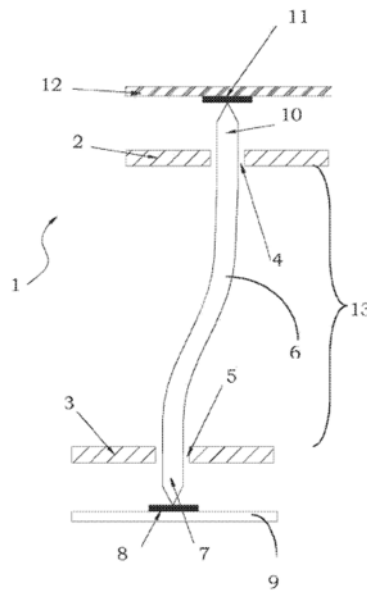


FIG. 1
PRIOR ART

Contact probes carry three different types of signals: (1) power, (2) ground, and (3) operating (*i.e.*, input/output signals). Ex. 1001, 2:37-42; Ex. 1003, ¶¶ 80-81, 86. “[I]t is well known” that the ground and power contact elements create “interferences, therefore causing noise in the input/output signals” “which limits the frequency performance of the testing head.” Ex. 1001, 2:46-49; Ex. 1003, ¶ 86. Also, “disadvantageous ground loops may occur” in the ground signals. Ex. 1001, 2:43-51; Ex. 1003, ¶¶ 73-74, 353. The ’885 patent discusses certain “known solution[s]” to these problems, but nonetheless asserts “the need to improve the

frequency performance of a testing head is strongly felt.” Ex. 1001, 3:1-3; Ex. 1003, ¶¶ 87, 216, 270.

B. The Patent’s Alleged Invention

The ’885 patent describes a metalized guide in which the contact elements carrying a same type of signal can be electrically connected. Ex. 1001, 3:34-38; Ex. 1003, ¶ 87. Fig. 2A is exemplary. It includes the same structures as the prior art testing head of Fig. 1; the difference is that the guide 40 also includes a conductive portion 30’ which electrically connects a first group of guide holes 40’ that house a group of the first (ground) contact elements 21’. Ex. 1001, 7:43-44. Contact elements carrying power signals are also electrically connected with a second conductive portion. Ex. 1001, 4:8:27-54; Ex. 1003, ¶ 87. But the ’885 patent admits that “[c]onductive structure apt to electrically connect contact probes to each other are disclosed” in several prior art patent documents, including the ’051 Reference. Ex. 1001, 2:64-67; Ex. 1003, ¶ 118.

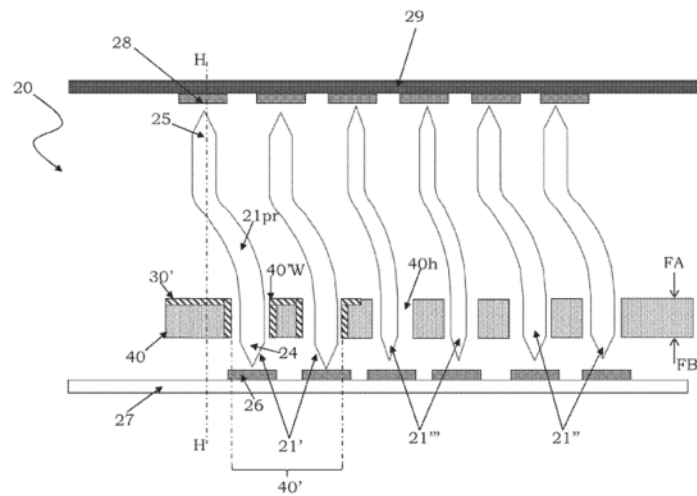


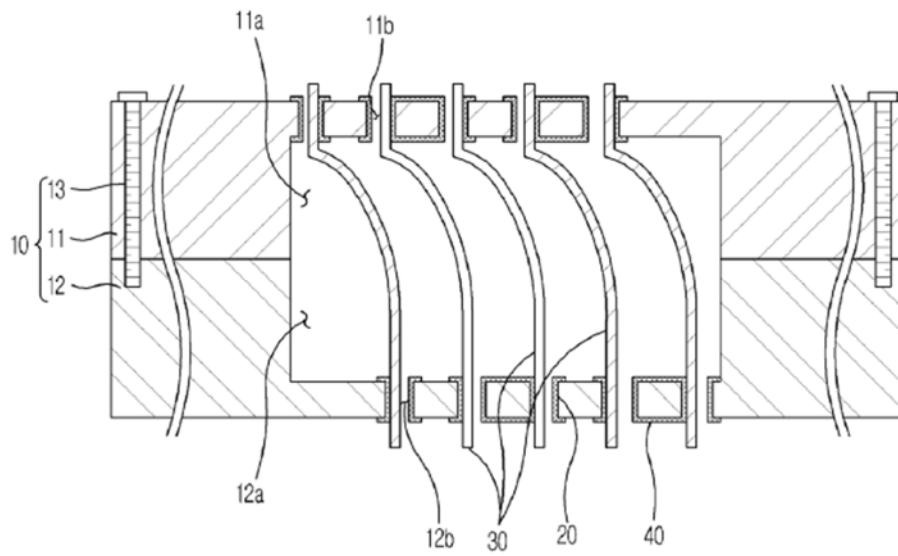
FIG. 2A

VI. Prior Art Overview

A. Kim

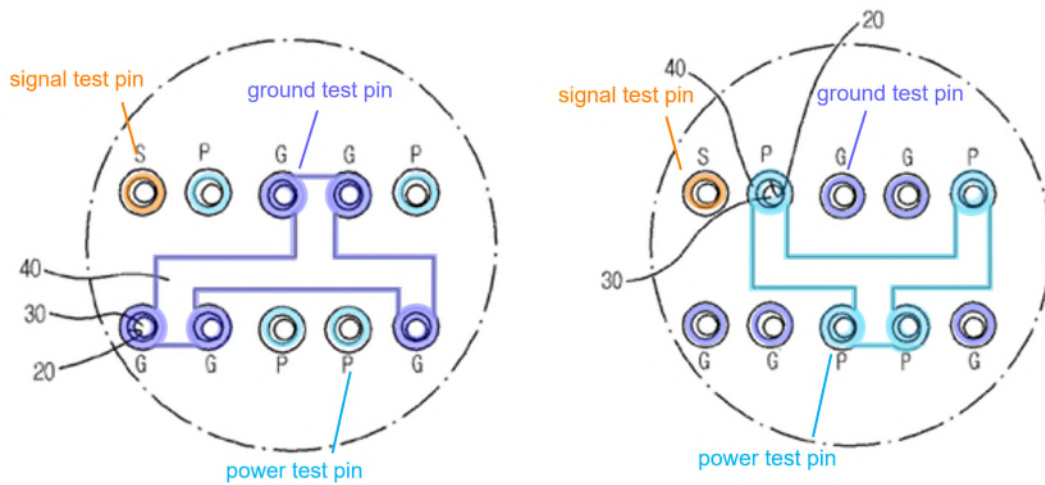
Kim is directed to the same type of semiconductor test device described in the '885 patent. Ex. 1006, Abstract; Ex. 1003, ¶ 127. Kim recognizes the same benefits of these structures as the '885 patent, *e.g.*, “improving the reliability of test results,” eliminating “noise” among other characteristics, and “enhancement in ... space efficiency” and “high frequency characteristics” *Compare* Ex. 1006, Abstract, [0015] *with* Ex. 1001, 3:7-13; Ex. 1003, ¶¶ 127, 201, 252, 270.

Kim's Figs. 2 through 6 illustrate one example. Ex. 1006, [0033]. It includes a guide plate (10), which supports testing pins (30), comprising an upper plate (11) and a lower plate (12), each with guide holes (11b, 12b). *Id.*, Fig. 2, [0033], [0034].



Like the '885 patent, Kim includes conductive elements—conductive trace (40) and conductive layer (20)—formed on the guide plate. Ex. 1006, [0033]. The testing pins (30) in contact with the conductive layers (20) are electrically connected to one another through the conductive trace (40). Ex. 1006, [0038], [0042].

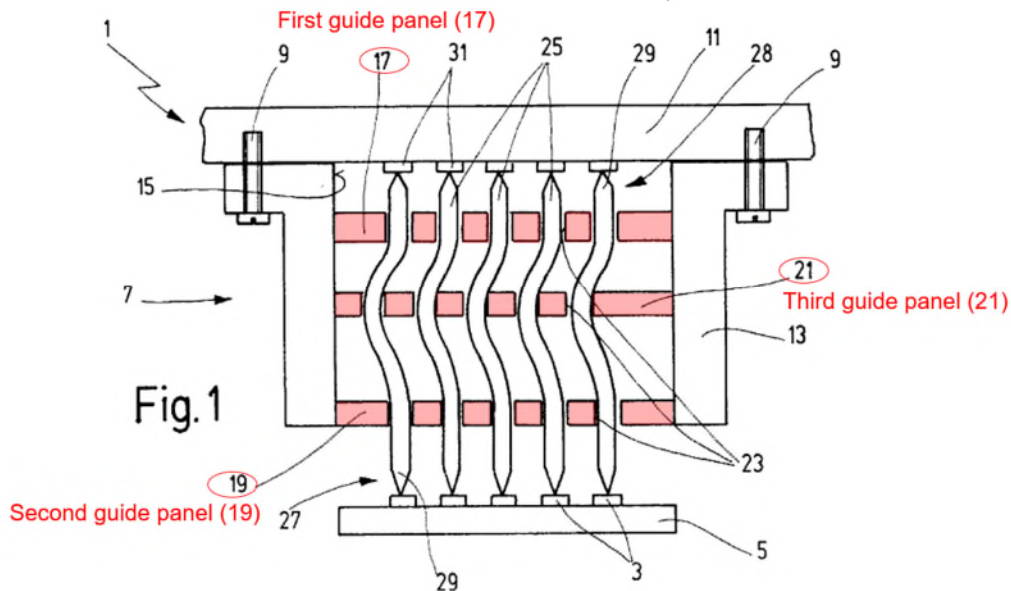
The testing pins that are electrically connected to one another carry the same type of signal such as ground or power signals. Ex. 1006, [0051], [0062]; Ex. 1003, ¶¶ 128-30. Figures 5A and 5B (below with annotations) show an example of the top and bottom surface of a guide plate including electrical connections between the guide holes housing ground and power pins, respectively. Ex. 1006, [0051], Figs 5A and 5B.



As a result, “the testing pins 30 of transmitting the same signal can be easily connected without interfering with the testing pin 30 of transmitting the other signal.” Ex. 1006, [0051].

B. Schmid

Schmid discloses a testing probe with three guide plates. Ex. 1009, 3:25-35, Fig. 1 (annotated and color-coding added); Ex. 1003, ¶ 132.



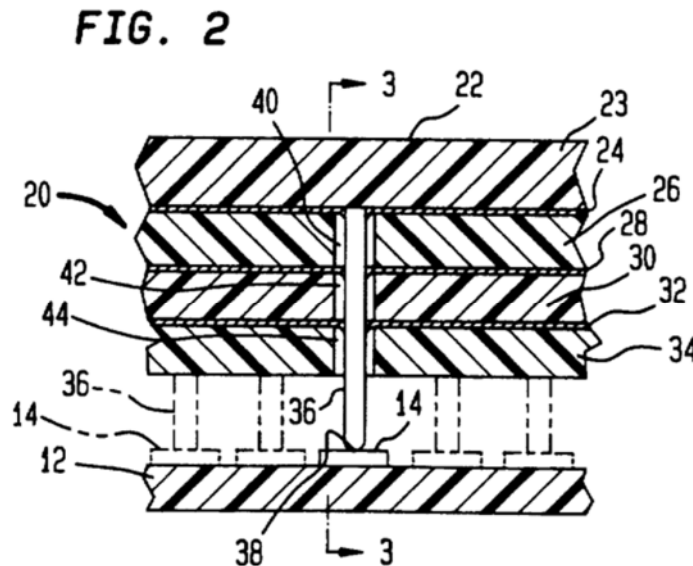
The test head (1) has a first guide panel (17), a second guide panel (19) and a third guide panel (21) that are held parallel to one another and at a distance from one another. Ex. 1009, 3:41-54; Ex. 1003, ¶ 133.

C. Fan

Fan describes a probe head for testing electronic devices. Ex. 1011, 1:13-43. Fan describes coating the guide plate with materials including an “insulating layer.” *Id.*, 3:1-7, 4:17-38, 5:1-32, Figs. 2, 4; Ex. 1003, ¶ 134.

D. Bross

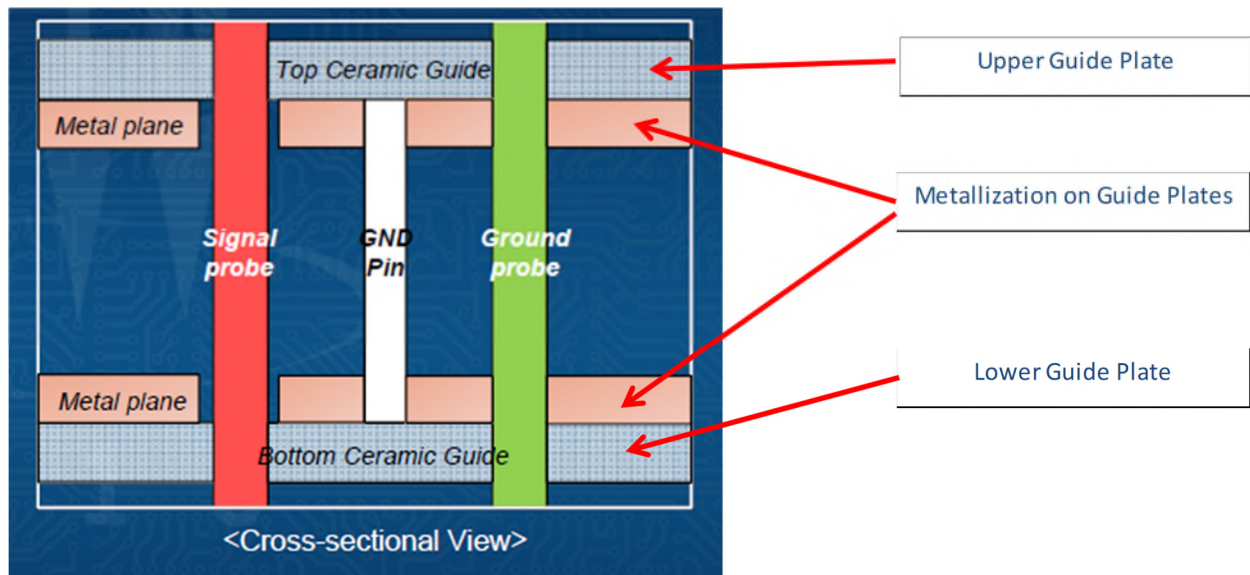
Bross describes an electrical test probe assembly using buckling beam contact elements and a method of fabricating it. Ex. 1010, Abstract, 1:5-10; Ex. 1003, ¶¶ 135-138. Bross describes “a multi-layer arrangement of insulating [23, 26, 30] and conducting layers [24, 28, 32] within the body of the probe assembly.” Ex. 1010, Abstract, Fig. 2, 4:41-49.



E. The 2016 SWTest Presentation

The 2016 SWTest Presentation was authored by two employees from Willtechnology Co., Ltd.—the assignee of Kim. Ex. 1003, ¶ 139. Like Kim, this presentation discloses metallized guide plates, including conductive portions connecting ground probes and power probes, respectively. See Ex. 1028, 8, 15 and 16; Ex. 1003, ¶ 139.

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Ex. 1028, 8 (annotated).

The 2016 SWTest Presentation also discloses connecting circuit components, such as capacitors, to the conductive portions.



Id., 15 (annotated); Ex. 1003, ¶ 140.

The Presentation was publicly presented at SWTest on Tuesday, June 7, 2016. This is confirmed by both the SWTest website and by Mr. Taber, who chaired the session at which the 2016 SWTest Presentation was presented. Ex. 1003, ¶¶ 141-

48; Ex. 1030; Ex. 1031, 52-70. As Technoprobe itself alleges in the Litigation, and as Mr. Taber confirms, presentations at SWTest conference were “public presentations” attended by hundreds of representatives in the semiconductor testing industry. *See* Ex. 1021, ¶¶ 26, 28, 29, 32; Ex. 1003; ¶ 142. In addition, the 2016 SWTest Presentation document itself was distributed to conference attendees contemporaneously. Ex. 1003, ¶ 144. The SWTest webpage provided download links to the eProceedings including the “SWTW 07 June - Tuesday Podium” that contains the Willtechnology Presentation no later than June 3, 2016. Ex. 1029; Ex. 1003, ¶¶ 145-46. And this content was available for free download to the public by no later than December 6, 2016. Ex. 1030; Ex. 1003, ¶¶ 147-48.

Accordingly, the 2016 SWTest Presentation was “disseminated or otherwise made available” such that “persons interested and ordinarily skilled” in the art could locate it exercising reasonable diligence and thus is a prior art “printed publication” under 35 U.S.C. § 102(a)(1). *See Jazz Pharms., Inc. v. Amneal Pharms., LLC*, 895 F.3d 1347, 1355–56 (Fed. Cir. 2018); *Apple, Inc. v. Uniloc 2017 LLC*, No. IPR2019-00252, 2020 WL 2549632, at *7 (P.T.A.B. May 19, 2020) (document presented at meeting attended by 95 representatives of various commercial entities who were skilled in the relevant art, without restrictions on how to dispose of documents, qualified as prior art).

VII. Relevant Prosecution History of the '885 Patent and Counterparts

A. United States

U.S. Pat. App. No.16/442,385 (“the ’385 Application”), which ultimately issued as the ’885 patent, was filed on June 14, 2019. Ex. 1001, Cover. In the sole office action, original claims 1-3, 9-14, 16-18, and 22-25 of the ’385 application were rejected as anticipated by reference “Kiyofuji.” Ex. 1002, 58-63; Ex. 1003, ¶¶ 91. Notably, the Examiner found that Kiyofuji taught a conductive portion on the guide that electrically connected a first set of guide holes configured to carry a first type of signal. Ex. 1002, 59.

In response, Technoprobe amended original independent claim 1 by incorporating features of claim 4: “a second conductive portion” that electrically connects a second group of the guide holes housing contact elements configured to carry a second type of signal, the first and second types of signals chosen between ground signals and power signals. Ex. 1002, 44-49, 51; Ex. 1003, ¶¶ 90, 92-93. Technoprobe also amended or rewrote other independent claims, which became issued claims 16 and 23, adding limitations requiring that the testing head have three guide plates. Ex. 1002, 44-49, 51; Ex. 1003, ¶¶ 94-95. The Examiner subsequently allowed the claims. Ex. 1002, 8-14; Ex. 1003, ¶¶ 96-97.

B. European and Japanese Counterparts

European patent application No. EP3555638A1 (“the ’638 Application”) is the counterpart to the ’885 patent. Ex. 1016, 11-14; Ex. 1003, ¶¶ 98-108. In relevant part, the EPO rejected the then-pending claims as lacking inventive step based on the ’051 Reference. Ex. 1016, 406-13; Ex. 1003, ¶ 109. In response, Technoprobe distinguished pending application claim 1 because the “conductive layer” of the ’051 Reference “connects to each other only ground probes, while the power probes are not connected to each other....” Ex. 1016, 424; Ex. 1003, ¶ 111. The limitations of ’638 Application claim 1 as then-amended correspond to those of ’885 patent claim 1. Ex. 1016, 433; Ex. 1003, ¶ 110.

The EPO then rejected the pending claims based on Kim, observing that Kim “provides some more details on the grouping of probes,” including electrically connecting power contact elements in addition to ground. Ex. 1016, 446-47; Ex. 1003, ¶ 112. In view of Kim, “the subject-matter of claim 1 is not new.” Ex. 1016, 447; Ex. 1003, ¶ 112.

In response, rather than dispute the EPO’s characterization of Kim, Technoprobe acknowledged that Kim “discloses the possibility of forming different conductive portions.” Ex. 1016, 455; Ex. 1003, ¶¶ 115, 117. Technoprobe *amended* Claim 1 to recite additional limitations in an effort to overcome the rejections based

on Kim. Ex.1016, 462; Ex. 1003, ¶ 114. The EPO has not taken further action in response, and the '638 Application remains pending.

Japanese Pat. App. No. 2019-531897 (“the '897 Application”) is the Japanese counterpart to the '885 patent. Ex. 1017, 1, 9; Ex. 1018, 1, 8; Ex. 1003, ¶ 119. During prosecution, the JPO rejected some pending claims as lacking novelty based on Kim and all claims as lacking inventive step over Kim and other prior art. Ex. 1018, 1-4; Ex. 1003, ¶¶ 120, 122. The limitations of rejected application claim 1 and claim 2 are substantially the same as those of '885 patent claim 1. *Compare* Ex. 1018, 10-15 *with* Ex. 1001, claim 1; Ex. 1003, ¶ 121.

In response, Technoprobe acknowledged that Kim discloses (1) “an upper plate and a lower plate with guide holes for accommodating test pins”; (2) a conductive part (conductive layer 20 in the guide hole and a conductive trace 40 formed on the surface of the guide) which covers multiple guide holes; (3) “[t]est pins within a group that transmit the same signal are electrically connected to each other by conductive parts”; and (4) “the test pins are disclosed to be for signal, *ground*, or *power*.” Ex. 1018, 20; Ex. 1003, ¶ 123 (emphasis added). That is, Technoprobe effectively admitted that Kim disclosed all elements of '885 patent claim 1. Technoprobe amended sole independent claim 1 to recite additional limitations. Ex. 1018, 10; Ex. 1003, ¶¶ 124-25. After another rejection and response, the JPO ultimately allowed the application.

VIII. Claim Construction

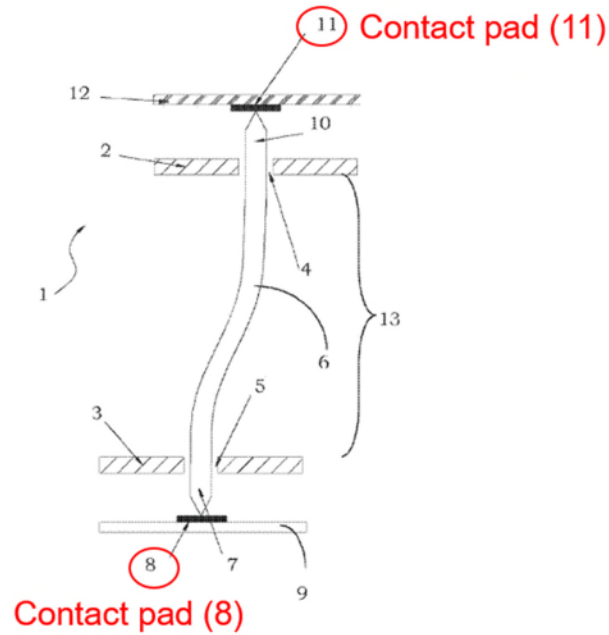
A. Level of Ordinary Skill in the Art

A POSITA would have had at least a bachelor's degree in electrical engineering, mechanical engineering, and materials engineering or another field applicable to wafer probing technology with three to five years of professional experience in designing and/or using probe technologies, or an equivalent level of skill, knowledge, and experience. Ex. 1003, ¶¶ 50-53. The level of ordinary skill would not change regardless of whether the '885 patent is entitled to a December 2016, February 2017, December 2017, or June 2019 filing date. *Id.*, ¶¶ 27, 50.

B. “common pad” (claims 9, 10, 19, 20)

For purposes of this proceeding, Petitioner proposes construing “common pad” as a “terminal for mechanical and electrical contact between two electrical components that allows access to the contact elements directly from the housing of the testing head.”

The '885 patent first teaches that a “contact pad” is a terminal for mechanical and electrical contact between two electrical components, such as between the contact probe (6) and the contact pads (8, 11) of the device under test (9) and space transformer (12). Ex. 1001, 1:65-2:3, 2:22-25, Fig. 1 (annotated below). This comports with the ordinary meaning of “pad” in the art. Ex. 1003, ¶¶ 70, 190-91.



The '885 patent later describes embodiments with a common pad (36') connected to contact elements by a conductive track. Ex. 1001,15:56-64, Fig. 8A (annotated and color-coding added); Ex. 1003, ¶¶ 192-193.

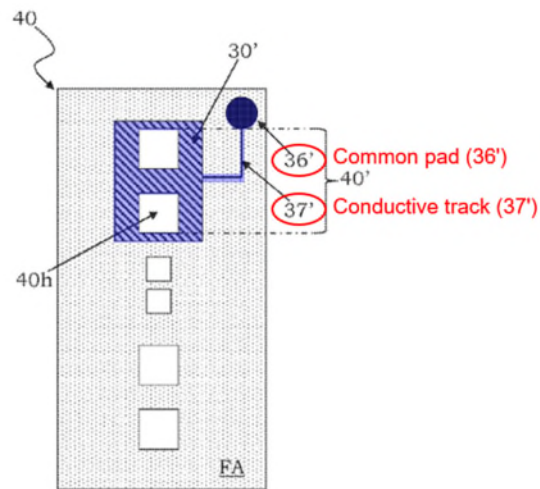


FIG. 8A

“The common pad 36’ may be connected by means of a first connection wire to a housing (not shown) of the testing head 20.” Ex. 1001, 16:1-3; *see also* 16:4-21, Figs. 8B and 8C (common power and signal pads); Ex. 1003 ¶ 193. “The presence of a common pad allows to access to the contact elements directly from the housing of the testing head, such a common pad therefore replacing the plurality of contact pads and also allowing monitoring of the respective signals.” Ex. 1001, 18:9-13; *see also* 16:22-28 (similar); Ex. 1003 ¶ 195. A POSITA thus would understand from the ’885 patent’s teachings that a “common” pad allows access to the contact elements directly from the testing head. Ex. 1003, ¶¶ 193-96.

C. “first and second types of signals” (claim 14)

Dependent Claim 14 is indefinite. Claim 1 recites a “first conductive portion” that electrically connects guide holes housing contact elements carrying a “first type of signal,” and a “second conductive portion” that electrically connects guide holes

housing contact elements carrying a “second type of signal.” Ex. 1001, claim 1. And “the first and second types of signals chosen between ground signals and power signals.” *Id.* Thus, the “first” and “second” types of signals are *different* types of signals, namely, ground and power. Ex. 1003, ¶ 215. The prosecution history of both the ’885 patent and its European counterpart confirms this understanding, as Technoprobe amended application claims in an effort to overcome Kiyofuji and the ’051 Reference by adding that both ground and power contact elements are separately electrically connected. *See supra* Section VII.

Claim 14 depends from claim 1, but the language of claim 14 contradicts claim 1. Claim 14 recites a “conductive track that electrically connects the first and second conductive portions.” Ex. 1001, claim 14. It further recites “contact elements included in the *second* group being configured to carry the *first* type of signal.” *Id.* (emphasis added).

Accordingly, claim 14 contains two irreconcilably inconsistent requirements: that the “second” group of contact elements be configured to carry both the “first” and the “second” type of signal (*i.e., both ground and power*). Ex. 1003, ¶¶ 215-17. Likewise, claim 14’s requirement of a “conductive track that *electrically connects* the first and second conductive portions” conflicts with claim 1 and is technically infeasible; indeed, the ’885 patent teaches that probes carrying different signals should be physically and electrically separated. Ex. 1001, 3:56-62; Ex. 1003, ¶ 217.

Thus, claim 14 is indefinite. *See Multilayer Stretch Cling Film Holdings, Inc. v. Berry Plastics Corp.*, 831 F.3d 1350, 1362 (Fed. Cir. 2016) (“A dependent claim that contradicts, rather than narrows, the claim from which it depends is invalid.”).

If Technoprobe argues that the claimed “first and second types of signals” in claim 14 are the same type of signal, however, the claim is unpatentable over the prior art as set forth in Section IX *infra*.

IX. How the Challenged Claims Are Unpatentable

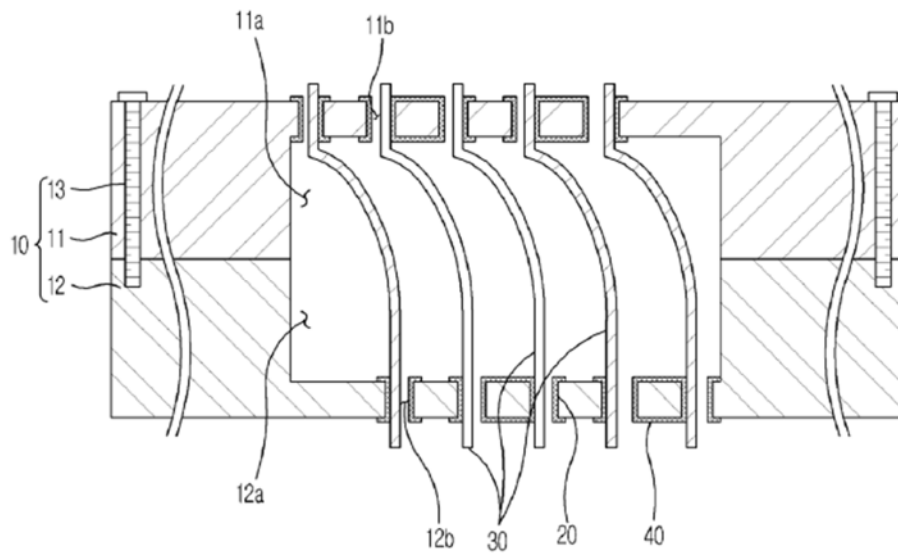
A. Ground 1: Kim Anticipates Claims 1-2, 4, 8-11 And 14

1. Claim 1

[1P] A testing head configured to verify the operation of a device under test integrated on a semiconductor wafer, the testing head comprising:

If the preamble is limiting, Kim discloses this limitation.

“Provided is a semiconductor testing apparatus....” Ex. 1006, Abstract. Kim illustrates in Fig. 2 an exemplary semiconductor test device.



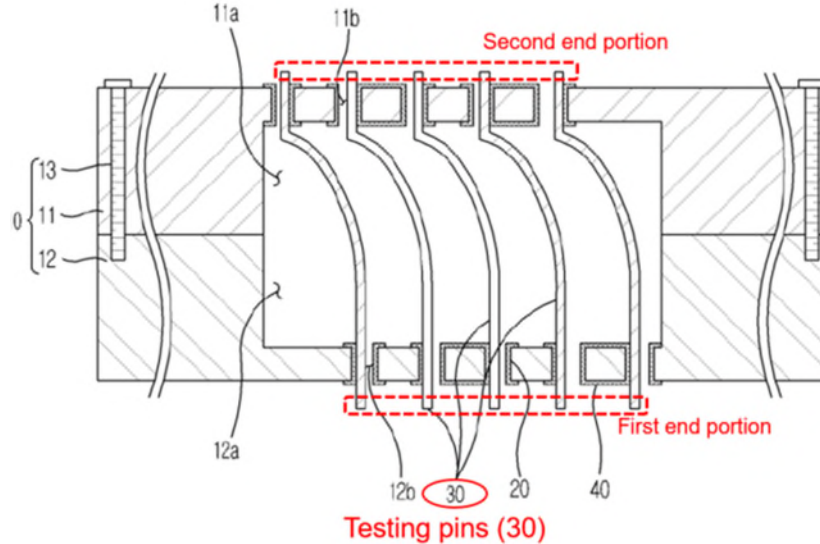
Ex. 1003, ¶¶ 150, 153. The guide plate (10) with upper and lower plates (11 and 12) includes testing pins (30) housed in the guide holes (11b, 12b). Ex. 1006, [0051], [0062], Fig. 2; Ex. 1003, ¶ 154. This structure mirrors the testing head (20) of the '885 patent. Ex. 1003, ¶¶ 151-52. Kim explains that the semiconductor testing device could be implemented in a probe card. Ex. 1006, [0031]; Ex. 1003, ¶ 153. Kim explains that such a probe card is used “for testing the electrical characteristic of the chip manufactured in the wafer level,” matching the functional language in the preamble of claim 1. Ex. 1006, [0005], [0006]; Ex. 1003, ¶¶ 153, 155.

[1A] a plurality of contact elements, each comprising a body that extends between a first end portion and a second end portion, and

Kim discloses this limitation. Ex. 1003, ¶ 161. Kim discloses “testing pins” which meet the claimed “plurality of contact elements.” *Id.*, ¶ 156.

The '885 patent uses the terms “contact elements” and “contact probes” interchangeably, and also describe the “contact elements” as “pins.” *See, e.g.*, Ex. 1001, 1:33-34, 4:39-41, 7:1-4, 11:65-67, 14:17-19; Ex. 1003, ¶ 156. For example, the '885 patent discloses that the claimed “contact elements” could be “pogo pins.” Ex. 1001, 2:32-33; Ex. 1003, ¶ 156. Similarly, Kim teaches that its testing pins (30) are, for example, a “cobra type probe” (a POSITA would know that Cobra refers to a buckling beam contact element) or various probes such as “pogo pins” or “wire probes.” Ex. 1006, [0040]; Ex. 1003, ¶ 156. A POSITA would thus understand that Kim’s “test pins” are the same as the '885 patent’s claimed “contact elements.” Ex. 1003, ¶ 156. *See In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009) (“[An anticipatory] reference need not satisfy an *ipsissimis verbis* test.”).

For example, Kim discloses a cross-sectional view illustrating an embodiment in Figure 2 (annotated). Ex. 1006, Fig. 2; Ex. 1003, ¶ 159.



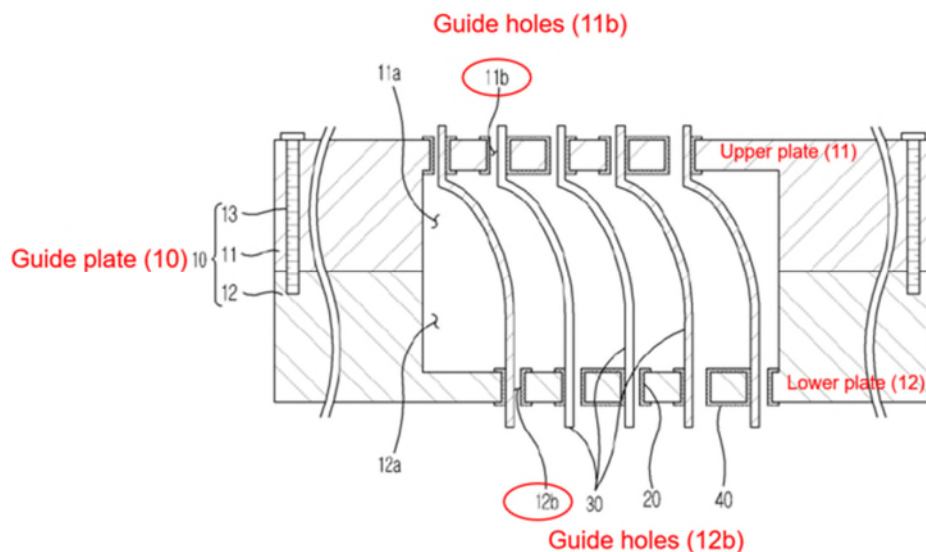
Kim's testing pins (30) extend from the guide holes (11b) of the upper plate (11) to the guide holes (12b) of the lower plate (12). Ex. 1006, [0024]-[0028]; Ex. 1003, ¶ 160. Kim describes the testing pins (30) throughout the disclosure of its embodiments in Figures 2-6. Ex. 1006, [0033]-[0034], [0038]-[0040], [0045]-[0047], [0050]-[0051], [0054]; Ex. 1003, ¶ 160.

Kim's testing pins comprise a body extending between the end of the testing pins making electrical contact with the Device Under Test (the claimed "first end portion") and the end of the testing pins electrically contacting the space transformer (the claimed "second end portion"). Ex. 1006, [0012]; Ex. 1003, ¶¶ 158, 160. This mirrors the '885 patent's disclosure of a "first end portion" at the contact tip (24) and a "second end portion" at the contact head (25). Ex. 1001, 7:13-15; Ex. 1003, ¶ 157. The "body" of the contact elements connects the two end portions. Ex. 1001, 2:32-

36; Ex. 1003, ¶ 157. Like the '885 patent's "contact elements," Kim's "testing pins" are used to transmit signals (ground, power, and input/output) to the device under test. Ex. 1003, ¶¶ 129-30, 158, 171.

[1B] at least one guide provided with a plurality of guide holes configured to house the contact elements;

Kim discloses this limitation. Ex. 1003, ¶ 164. Kim discloses a guide plate (10) comprising an upper plate (11) with a plurality of first guide holes (11b), and a lower plate (12) with a plurality of second guide holes (12b). Ex. 1006, [0034]-[0037], Fig. 2A (annotated); Ex. 1003, ¶ 162.



"The testing pin 30 of an approximately rod shape is inserted into the first guide hole 11b and the second guide hole 12b." Ex. 1006, [0039], Fig. 2; Ex. 1003, ¶ 163. Thus, either of the upper plate (11) and the lower plate (12) constitutes the

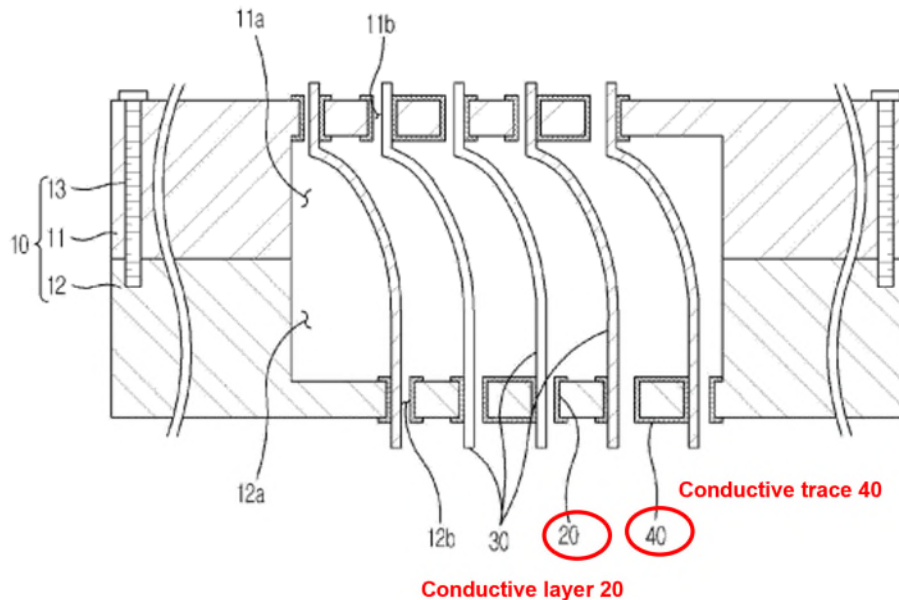
claimed “at least one guide configured to house the contact elements.” Ex. 1003, ¶ 163.

[1C] wherein the at least one guide comprises: a first conductive portion that includes and electrically connects a first group of guide holes, of the plurality of guide holes, to each other and is configured to contact corresponding first contact elements, of the plurality of contact elements, configured to carry a first type of signal; and

Kim discloses this limitation. Ex. 1003, ¶ 168.

First, Kim discloses that the guide comprises conductive layers (20) and a conductive trace (40). *Id.*, ¶ 165. Two or more of the conductive layers (20) connected by some or all of the conductive trace (40) collectively constitute the claimed “first conductive portion” that “electrically connects a first group of guide holes” “to each other” and “is configured to contact corresponding first contact elements.” *Id.*

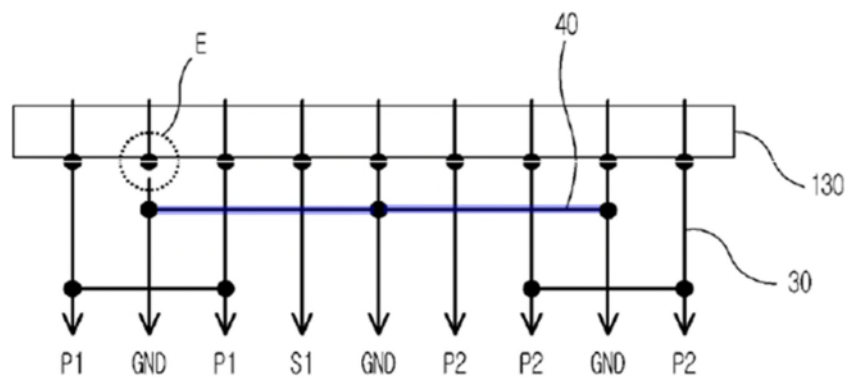
“The conductive layer 20 is formed at one side of the upper plate 11” or lower plate 12. Ex. 1006, [0038]; Ex. 1003, ¶ 165. The conductive layers (20) are formed on “an inner surface of the guide hole.” Ex. 1006, [0017], Abstract, Fig. 2 (annotated below); Ex. 1003, ¶ 165. Additionally, “[t]he guide plate 10...provide[s] the forming area of the conductive trace 40.” Ex. 1006, [0034]. This conductive trace (40) is formed using a conductive material on the inner or outer side of the upper plate (11) or lower plate (12). *Id.*, [0042], Fig. 2 (annotated below); Ex. 1003, ¶ 165.



“[O]ne side of the conductive trace 40 is connected to one side of the conductive layer 20 and the other side thereof is connected to one side of other conductive layer 20.” Ex. 1006, [0043]. As a result, “one side thereof [the guide hole] is electrically contacted with one side of the conductive layer 20 and it is connected electrically through the conductive layer 20 with the conductive trace 40,” such that conductive layers 20 and conductive trace 40 electrically connect a group of guide holes. *Id.*, [0039]; Ex. 1003, ¶ 165. And this “first conductive portion” is configured to electrically contact corresponding first contact elements: “[t]he testing pin 30 is electrically contacted with the conductive layer 20 and electrically connected to the conductive trace 40.” Ex. 1006, [0039]. As such, “[t]he conductive layer 20 serves to electrically connect the testing pin 30 and the conductive trace 40 ... to each other.” *Id.*, [0038], [0039]; Ex. 1003, ¶ 165.

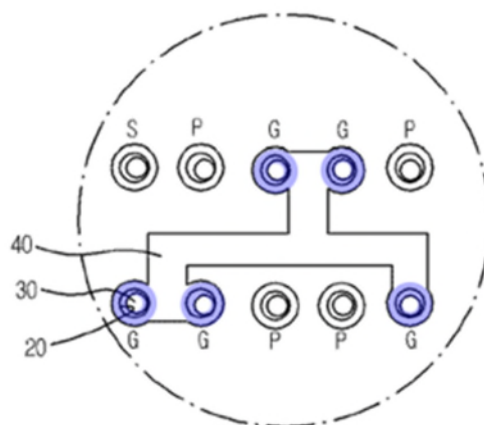
In sum, “[a]ccording to the present invention, the testing pin is rendered to electrically connect to another testing pin ... through the conductive layer formed in the guide hole.” Ex. 1006, [0063], Abstract, [0003], [0015]; Ex. 1003, ¶ 165.

Second, Kim teaches that the “first contact elements” (the testing pins 30 that are electrically connected via the conductive layers 20 and conductive trace 40) are “configured to carry a first type of signal.” Ex. 1003, ¶ 166. “[T]he conductive layers 20, with which *the testing pin of transmitting the same signal is contacted*, are connected to each other.” Ex. 1006, [0044] (emphasis added). “For example, as shown in FIG. 3, the plurality of the conductive layers 20, with which the testing pin for ground is contacted, can be connected to each other. Accordingly, two testing pins for ground, several tens of the testing pins for ground, or several thousands of the testing pin for ground can be connected to each other according to the connectivity pattern.” *Id.* Fig. 3 (below, color-coding added) “is a conceptual diagram showing a state in that a conductive traces according to one embodiment of the present invention is connected between conductive layers, with which the testing pin of transmitting the same signal is contacted.” *Id.*, [0025]. Figure 3 illustrates that the conductive trace (40) connects between the testing pins (30) transmitting the same type of ground signals. Ex. 1003, ¶ 167.



Kim also includes Figures 5a and 5b, show the upper and lower surface of an upper guide plate. Ex. 1006, [0027], [0028].

Fig. 5a illustrates the testing pins (30) carrying ground signals (represented by “G”) are electrically connected via the conductive layers (20) formed within a group of guide holes and the conductive trace (40) electrically connecting the conductive layers (20). *Id.*, Fig. 5a (color-coding added); Ex. 1003, ¶ 166.



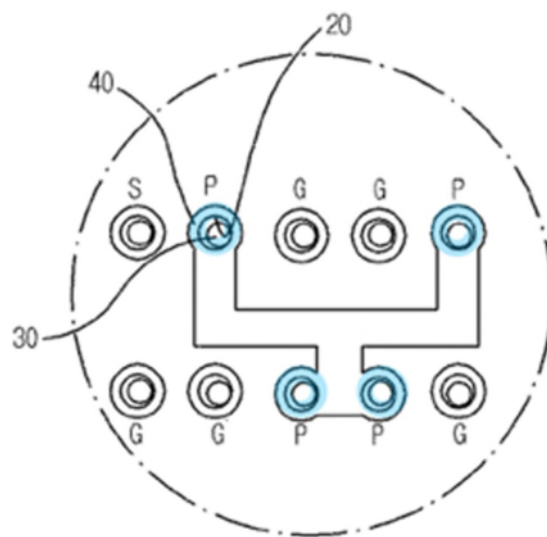
“[T]he plurality of the conductive layers 20, with which the testing pins 30 of *transmitting the same signal* are contacted, and the conductive traces for connecting them are set to a plurality of groups and each group is formed at the upper surface and the lower surface of the upper plate 11 respectively, so that the testing pins 30 of transmitting the same signal in the narrow testing area can be easily connected.” Ex. 1006, [0050] (emphasis added); *see also id.*, [0051] (on the upper surface, “the plurality of the conductive layers 20, with which the testing pins 30 for *ground* are contacted”) (emphasis added). Kim discloses in several other places that testing pins transmitted the same type of signal (*e.g.*, ground) are electrically connected. *Id.*, [0019], [0032], [0062], [0064]; Ex. 1003, ¶¶ 262-64.

[1D] a second conductive portion that includes and electrically connects the holes of a second group of the guide holes to each other, the second group housing second contact elements of the plurality of contact elements, the second contact elements being configured to carry a second type of signal,

Kim discloses this limitation, which mirrors limitation [1C] for a “second” conductive portion, group of guide holes, contact elements, and type of signal. The disclosures cited above for limitation [1C] thus also apply to limitation [1D] and are incorporated herein. Ex. 1003, ¶ 172.

In addition to electrically connecting the group of testing pins carrying ground signals, Kim further teaches how to electrically connect another group of testing pins (30) carrying another type of signal, for example, power signals. *Id.*, ¶ 169.

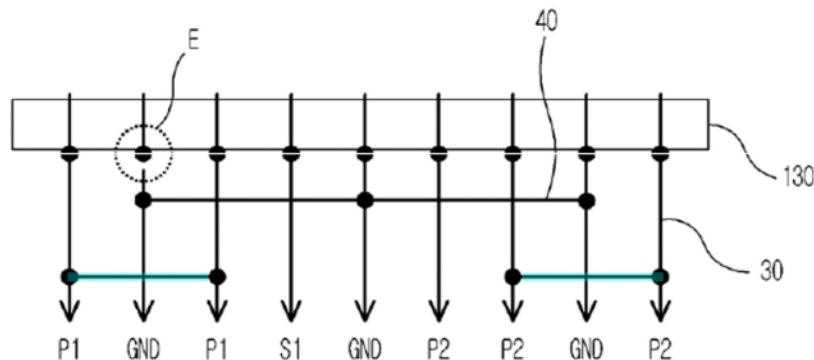
For example, Kim describes and illustrates in Fig. 5b that testing pins carrying power signals (represented by “P”) are electrically connected via the conductive layers (20) and conductive trace (40). Ex. 1006, [0051], Fig. 5b (color-coding added); Ex. 1003, ¶ 169.



Kim explains and illustrates in Figs. 2 and 5b that a plurality of guide holes (11b) are formed on the lower surface of the upper plate (11) of the guide plate (10) and a group of those guide holes houses testing pins (30) for power signals. Ex. 1006, [0051]; Ex. 1003, ¶ 170. And the group of testing pins for power signals is electrically connected via the conductive layers (20) and the conductive trace (40). Ex. 1006, [0051]; Ex. 1003, ¶ 170. As explained above, Figure 5b is the lower surface of the upper guide plate. Ex. 1006, [0027], [0028]; Ex. 1003, ¶ 170. Accordingly, Figures 5a and 5b show two *different* “conductive portions” (two

different sets of conductive layers 20 and conductive traces 40) which, as described above, connect with two *different* sets of guide holes and contact elements. Ex. 1003, ¶ 170.

The Figure 3 conceptual diagram similarly shows two other conductive traces connecting between testing pins (30) transmitting a second type of signal, power (the pins labelled “P1” and “P2”). Ex. 1006, Fig. 3 (color-coding added); Ex. 1003, ¶¶ 170-72.



[1E] the first and second types of signals chosen between ground signals and power signals.

Kim discloses this limitation. Ex. 1003, ¶ 176. Without limiting to a specific type of signal, Kim explains that its invention applies to testing pins transmitting identical or the same signals, using ground and power as examples. *See, e.g.*, Ex. 1006, [0042]-[0045], [0051], Figs. 3, 5a, and 5b; Ex. 1003, ¶ 174.

As discussed above in connection with limitation 1[C], the “first type” of signal is a ground signal. “[T]wo testing pins for *ground*, several tens of the testing

pins for **ground**, or several thousands of the testing pin for **ground** can be connected to each other according to the connectivity pattern.” Ex. 1006, [0044] (emphasis added). Kim depicts these connections in Figure 3 (ground pins labeled as “GND”) and Figure 5a (ground pins labeled as “G”). Ex. 1003, ¶¶ 167-68.

As discussed above in connection with limitation 1[D], the “second type” of signal is a power signal. Kim depicts these connections in Figure 5 (power pins labeled as “P1” and “P2”) and Figure 5b (power pins labeled as “P”). A POSITA would understand that the “P” testing pins in Kim transmit power. *Id.*, ¶ 171.

Indeed, Technoprobe acknowledged to the EPO that Kim “discloses the possibility of forming different conductive portions.” Ex. 1016, 455. Technoprobe acknowledged to the JPO that Kim discloses “[t]est pins within a group that transmit the same signal are electrically connected to each other by conductive parts” and “the test pins are disclosed to be for signal, **ground**, or **power**.” Ex. 1018, 20 (emphasis added).

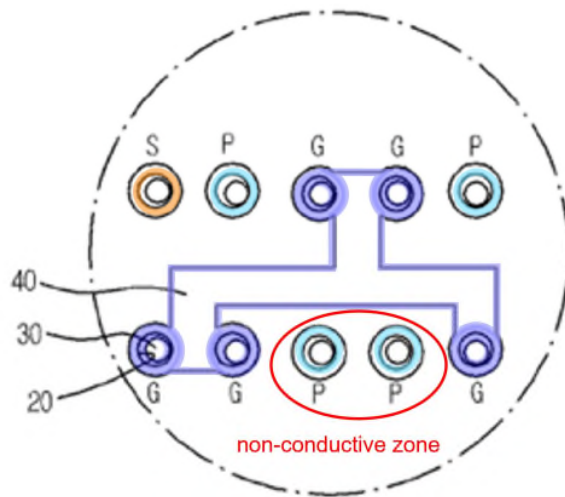
Thus, Kim teaches that the claimed “first and second type of signals” carried by two separate groups of the testing pins (30) are chosen between ground signals and power signals. Ex. 1003, ¶ 175.

As Kim discloses all elements of claim 1, claim 1 is unpatentable as being anticipated by Kim.

2. Claim 2

[2] The testing head of claim 1, wherein the first conductive portion is locally interrupted by at least one non-conductive zone.

Kim discloses the additional limitation of claim 2 and thus anticipates claim 2. *Id.*, ¶ 181. As illustrated in Fig. 5a, the first conductive portion (connecting the guide holes for ground testing pins) is locally interrupted. On the bottom “row” of test pins, for example, there is a gap in the conductive trace between the second and third ground testing pins, which “locally interrupts” that first conductive portion. The non-conductive zone is identified in the annotated Fig. 5A, below.



This gap is a non-conductive zone; the material of the upper and lower guide plates is non-conductive material. Ex. 1006, [0062] (the testing pins (30) for power signals are insulated from the testing pins (30) for ground signals by the guide plate (10) in which the conductive materials formed at the edge of the guide plate is removed.); Ex. 1003, ¶ 179. Indeed, if the guide itself were conductive, the

conductive layers 20 and conductive trace 40 in Kim would be unnecessary. Ex. 1003, ¶¶ 179-80.

This is also how the '885 patent describes and illustrates the “first conductive portion” locally interrupted by at least one non-conductive zone. The '885 patent explains that when “the first conductive portion 30' and the second conductive portion 30” are formed on two opposite faces of the same guide” then the contact elements carrying ground and power signals may be very close to each other, *e.g.*, alternated with each other. Ex. 1001, 13:7-9, 13:37-44. In that case, the conductive portions 30' and 30” are locally interrupted by suitable non-conductive zones 31' and 31”. *Id.*, Fig. 5B. “The non-conductive zones 31' and 31” therefore locally prevent an electrical connection between adjacent contact elements apt to carry different signals.” *Id.* at 13:34-36; Ex. 1003, ¶¶ 177-78. What the '885 describes and depicts in this embodiment is the same as what Kim describes and depicts in its Figs. 5A and 5B. Ex. 1003, ¶ 180.

3. Claim 4

[4] The testing head of claim 1, wherein the first conductive portion is formed on a first face of the at least one guide, and the second conductive portion is formed on a second face of the at least one guide, the second face being opposite to the first face.

Kim discloses the additional limitation of claim 4 and thus anticipates claim

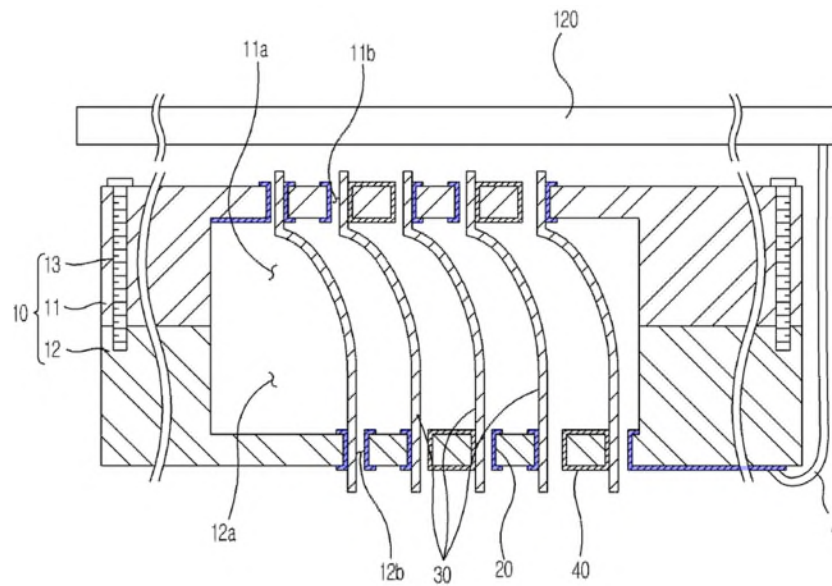
4. As explained above with respect to limitations [1C] and [1D], Kim describes an

embodiment where the first conductive portion is formed on the *upper surface* of the upper plate (11), and the second conductive portion is formed on the *lower surface* of the upper plate (11). *Id.*, ¶¶ 183-84. Thus, the first and second conductive portions are formed respectively on first and second faces of the guide. And the upper surface and the lower surface of the upper plate (11) are “opposite to” each other. *Id.*, ¶ 185. This is the same way the ’885 Patent describes two surfaces “opposite to” each other, *e.g.*, FA and FB in Figure 2A (the upper and lower surfaces of the same guide plate). Ex. 1001, 7:56-63; Ex. 1003, ¶ 182.

4. Claim 8

[8] The testing head of claim 1, wherein the first conductive portion covers at least one portion of an inner surface of each guide hole of the first group of guide holes.

Kim discloses the additional limitation of claim 8 and thus anticipates claim 8. Ex. 1003, ¶¶ 186-88. As explained above with respect to limitation [1C], the conductive layers 20, which are part of the “first conductive portion,” are formed on an inner surface of the guide holes, and thus cover at least one portion of an inner surface of each guide hole of the first group of guide holes. Ex. 1006, [0017], Abstract, Fig. 2 (color-coding added); Ex. 1003, ¶¶ 186-87.

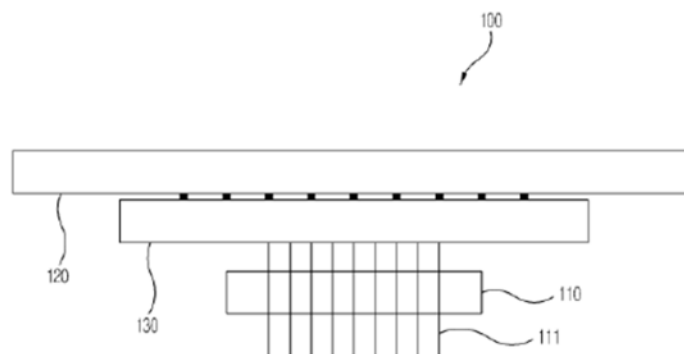


5. Claim 9

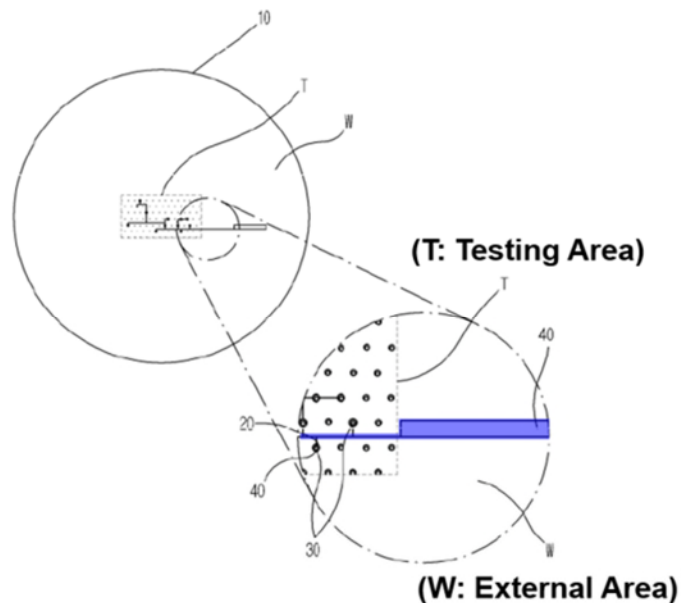
[9] The testing head of claim 1, wherein the at least one guide comprises at least one common pad connected to the at least one conductive portion by a conductive track.

Kim discloses the additional limitation of claim 9 and thus anticipates claim

9. Kim discloses a probe card including a main board (120), a space transformer (130), a guide plate (110) and a plurality of test pins (111). Ex. 1006, [0010], Fig. 1; Ex. 1003, ¶ 197.



The conductive trace (40) connecting the group of the conductive layers (20) and testing pins (30) carrying a same type of signal can be extended from the testing area (T), where the conductive layers (20) are formed, to the external area (W) on the guide plate (10). Ex. 1006, [0046], [0047], Fig. 4 (color-coding added); Ex.1003, ¶¶ 198-200. Thus, the “guide comprises at least one common pad” as claimed and described in the ’885 patent. Ex. 1003, ¶ 189.



“[T]he conductive trace 40 according to [this] embodiment of the present invention can be directly connected to the main board without the separate space transformer on the external area W.” Ex. 1006, [0010], [0048]; Ex. 1003, ¶ 201. The extension of the conductive trace (40) in the external area (W) alleviates spatial constraints and allows the formation of a conductive trace (40) with thicker wire

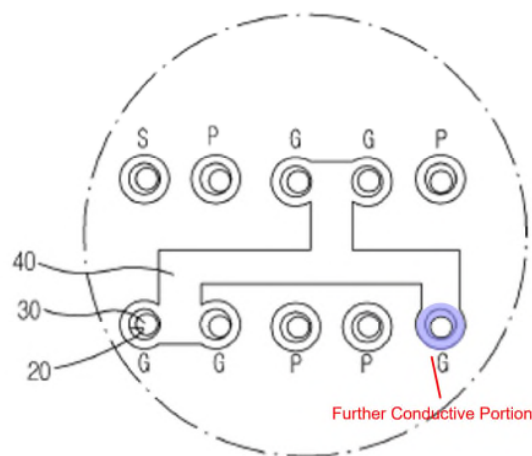
connection between the conductive trace (40) and the main substrate, thereby enhancing high-frequency efficiency. Ex. 1006, [0049]; Ex. 1003, ¶ 201. This connection through wire J is shown in Kim’s Figure 6. The “testing pin is rendered to electrically connect to another testing pin *or an external substrate* through a conductive layer formed in the guide hole.” Ex. 1006, [0015]; *see also id.*, [0064] (“after the testing pins of transmitting the same signal are electrically connected to each other through a lower surface of the lower plate of the guide plate, the conductive trace 40 is electrically connected to the main board through the external area deviated from the testing area,” making clear that the conductive portion connecting multiple testing pins may be extended to the external area.).

Thus, the portion of Kim’s conductive trace (40) extended to the external area (W) with a thicker width on the guide plate (10) that connects to the main board via a wire as described above constitutes the claimed “common pad” because it is a “terminal for mechanical and electrical contact between two electrical components that allows access to the contact elements directly from the housing of the testing head” (*e.g.*, main substrate (120)), and that “common pad” is connected to the “at least one conducting portion” by the rest of the extended conductive trace, which constitutes the claimed “common track.” Ex. 1003, ¶ 202.

6. Claim 10

[10] The testing head of claim 1, wherein the at least one guide comprises a further conductive portion at one of the guide holes that is configured to house a single contact element, the at least one guide comprising a common pad connected to the further conductive portion by a conductive track.

Kim discloses the additional limitation of claim 10 and thus anticipates claim 10. *Id.*, ¶ 203. As to the first part of claim 10 (“a further conductive portion...”), Kim discloses this limitation as shown in, *e.g.*, Figure 5a. The conductive layers 20 and/or conductive trace 40 connecting the ground guide holes satisfy both the “first conductive portion” of claim 1 along with the “further conductive portion” of claim 10. *Id.*, ¶¶ 205-06. For example, the conductive layer 20 at the bottom right single ground guide hole is the “further conductive portion at one of the guide holes,” with that guide hole serving as the “one of the guide holes that is configured to house a single contact element.” This is illustrated in annotated Figure 5a, below:



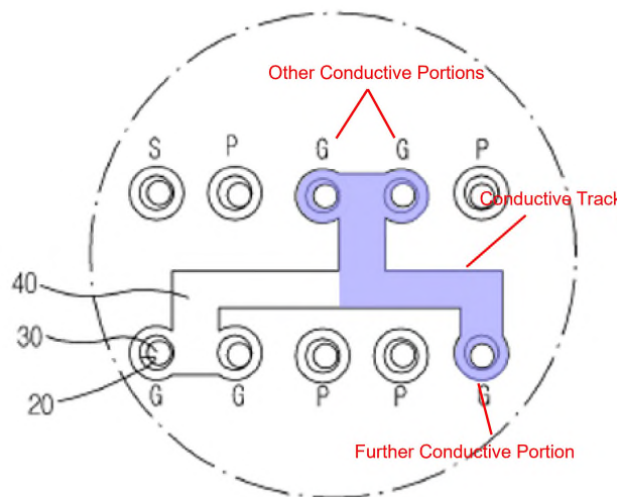
The second part of claim 10 (the clause beginning with “the at least one guide...”) mirrors in substance claim 9, and thus is disclosed in Kim as well. *Id.*, ¶ 204. The conductive trace 40 as shown in Figure 5a is extended to the external area W and meets the “common pad” and “conductive track” portions of the limitation as described in Section IX.A.5 with respect to claim 9, thereby connecting the “common pad” to the “further conductive portion” (which is electrically connected to the conductive trace 40 as described in the immediately preceding paragraph. *Id.*, ¶¶ 204, 207.

7. Claim 11

[11] The testing head of claim 1, wherein the at least one guide comprises a further conductive portion at one of the guide holes that is configured to house a single contact element, the at least one guide comprising a conductive track that connects the conductive portion to other conductive portions.

Kim discloses the additional limitation of claim 11 and thus anticipates claim 11. *Id.*, ¶¶ 208, 213. Claim 11 is similar to claim 10. The difference is that the “conductive track” in claim 11 connects the “further conductive portion” to “other conductive portions” rather than a “common pad” as in Claim 10. As described in Section IX.A.6, Kim discloses “a further conductive portion at one of the guide holes that is configured to house a single contact element” (*e.g.*, the conductive layer 20 at the bottom right single ground guide hole 5a). That “further conductive portion” is connected to “other conductive portions” (*e.g.*, one or more of the other

conductive layers (20) in contact with the testing pins (30) carrying ground signals within the guide holes (11b)). All or part of the conductive trace (40) formed on the guide plate (10), which connects the “further conductive portion” and “other conductive portions,” thus constitutes the claimed “conductive track.” *Id.*, ¶¶ 208, 211. This is illustrated in annotated Figure 5a, below, *id.*, ¶ 211:



This mirrors Figure 9B of the '885 patent, which shows two first conductive portions (30') of the guide (40) are electrically connected to each other by means of a conductive track (39) in the guide. Ex. 1001, 16:49-59, Fig. 9B (annotated and color-coding added); Ex. 1003, ¶¶ 209-10, 212.

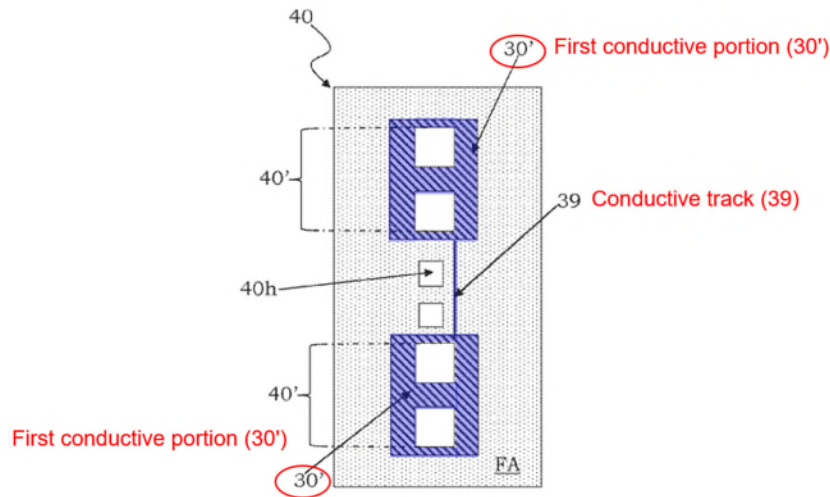


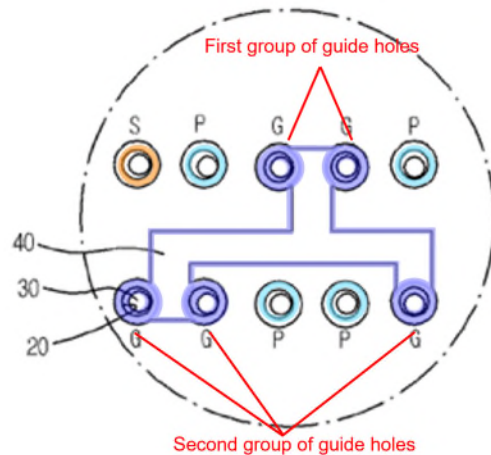
FIG. 9B

8. Claim 14

[14] The testing head of claim 1, further comprising at least one conductive track that electrically connects the first and second conductive portions including and electrically connecting the holes of the first and second groups of the guide holes to each other, the contact elements included in the second group being configured to carry the first type of signal.

If not indefinite (*supra* Section VIII.C), then Kim discloses the additional limitation of claim 14 and thus anticipates claim 14. Kim discloses a plurality of conductive layers (20) electrically connecting a plurality of guide holes (11b) formed on the upper plate (11) of the guide plate (10) for housing a plurality of “contact elements” (testing pins (30)) carrying the same type of signal (ground), the “first type of signal.” *Supra* Section IX.A.1. Ex. 1003, ¶ 214. As illustrated in the annotated Fig. 5a below, the guide holes can be grouped separately. *Id.*, ¶ 219. The conductive layers 20 at these “first and second groups of guide holes” are the claimed

“first” and “second conductive portions” of claim 14. *Id.* And a “conductive track” (conductive trace 40) electrically connects those “first” and “second” conductive portions. *Id.*, ¶¶ 218-20.



B. Ground 2: Kim Renders Claims 1-2, 4, 8-11 And 14 Obvious

1. All Claims

Because Kim anticipates claims 1-2, 4, 8-11, and 14, Kim also renders those claims obvious. *Id.*, ¶ 221. “[A] disclosure that anticipates under § 102 also renders the claim invalid under § 103, for ‘anticipation is the epitome of obviousness.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019).

Furthermore, if Technoprobe argues that Kim does not anticipate, then Kim, when considered in view of the knowledge of a POSITA, renders these claims

obvious for the reasons set forth in Section IX(A) and for the additional reasons discussed below. Ex. 1003, ¶ 222. Kim also renders claim 7 obvious. *Id.*

First, any differences in terminology between Kim and the '885 patent are, at most, no more than obvious variants of Kim and not patentable distinctions. For example, a “testing pin” or “probe needle” (Kim) is not meaningfully different from a “contact probe” or “contact element” (the '885 Patent). Ex. 1006, [0006] (“The probe card includes a plurality of testing pins (probe needle) corresponding to the terminal of the wafer.”); Ex. 1003, ¶ 224. The same is true for other terminology differences between Kim and the '885 patent. Ex. 1003, ¶ 224.

Second, Kim discloses that “the present invention is not limited to the probe card” and instead it may be applied to “all semiconductor testing apparatus having multiple test pins.” Ex. 1006, [0031]. A POSITA would have understood that it would at least have been obvious to apply the teachings of Kim to yield the “testing head” claimed in the Challenged Claims, as Kim itself teaches. Ex. 1003, ¶ 225.

Third, Kim describes “FIG. 2 through FIG. 6” as describing “the semiconductor testing apparatus 1 according *to one embodiment* of the present invention.” Ex. 1006, [0033] (emphasis added). But even if the arguments in Section IX.A are viewed as combining the teachings of different embodiments in Kim, it would have been obvious to combine those teachings. “Combining two embodiments disclosed adjacent to each other in a prior art patent does not require a

leap of inventiveness.” *Boston Scientific Scimed, Inc. v. Cordis Corp.*, 554 F.3d 982, 991 (Fed. Cir. 2009). For example, a POSITA would have understood that the conductive trace as depicted in Figs. 5a and 5b could have been extended to an external area W, as depicted in Fig. 4 to yield the benefits described with respect to Fig. 4, *e.g.*, improving workability and high frequency performance. Ex. 1006, [0048]; Ex. 1003, ¶¶ 226-27.

Fourth, Kim claims priority to Korean Patent Application No. 10-2014-0004576 and incorporates its contents by reference. Ex. 1006, [0001]. The Korean priority patent application issued as Korean patent KR10-1384714 (Ex. 1004), a certified translation of which is attached as Ex. 1005 (“Kim KR”). A POSITA thus would have looked to the contents of that Korean application as relevant to understanding Kim’s disclosures. Ex. 1003, ¶¶ 228-29. Indeed, incorporated material “is effectively part of the host document as if it were explicitly contained therein.” *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000).

Kim KR includes the same Figures as Kim, including the same Fig. 5b. Ex. 1003, ¶¶ 230-31. Kim KR states: “as shown in Fig. 5b, a plurality of conductive layers (20) in contact with *the power test pins (30b)* and the conductive traces (40) connecting the same are formed on the lower surface of the upper plate (12).” Ex. 1005, [0044]. Kim KR confirms Kim’s disclosure of electrically connecting *power*

contact elements (and their respective guide holes), thereby also confirming that this element at least would have been obvious to a POSITA in view of Kim. Ex. 1003, ¶ 231.

Fifth, Technoprobe's express and implicit admissions before the EPO and JPO that the claimed subject matter was not patentable over Kim are further evidence that Kim at least renders those claims obvious. *Supra* Section VII.B.

Additional reasons why certain of the dependent Challenged Claims would have been obvious over Kim are set forth below. Ex. 1003, ¶ 232.

2. Claims 2, 9, 10, 11, and 14

A POSITA would understand that, implementing Kim's disclosures, more than one group of electrically connected guide holes may be formed on one side of a guide plate. Indeed, Kim KR discloses this explicitly: "the present invention is not limited to forming each group only on the upper surface and lower surface of the upper plate (11). Depending on the number of groups, it is possible to form more than one electrically connected group on a single surface." Ex. 1005, [0045]; *see also* Ex. 1006, [0052] (similar); Ex. 1003, ¶ 247. Kim also discloses that the present invention may have "one *or more* conductive traces formed at one side of a surface of the guide plate." Ex. 1006, [0017] (emphasis added). Figure 3 conceptually depicts two separate electrical connections of two separate groups of power testing pins, labeled respectively as P1 and P2. *Id.*, Fig. 3; Ex. 1003, ¶ 248. And Kim

explicitly discloses many different methods for forming desired shapes for the conductive layers and the conductive trace on the surface of the guide plate while the '885 patent is silent on this point. Ex. 1006, [0056]-[0062], Fig. 7; Ex. 1003, ¶¶ 240-46.

From all these disclosures and the knowledge of a POSITA, a POSITA would understand that the conductive portion(s) formed on the guide plates could be in singular or multiple groups, and could be arranged, divided, and patterned in whatever way necessary and best suited to the needs of a particular product or application. Ex. 1003, ¶ 234. The additional limitations of dependent claims 2, 9, 10, 11, and 14² specify patterns of conductive material on the guide (*e.g.*, “locally interrupting” a conductive portion with a non-conductive zone or adding a “further conductive portion,” a “common pad,” or connections between conductive portions via a “common track”). *Id.*, ¶ 233. If not disclosed expressly or inherently in Kim, these specific patterns would have been merely routine design choices (not unlike the metallization design choices with a printed circuit board, *id.*, ¶ 69, and/or other types of substrates) to implement Kim’s disclosures well within a POSITA’s skill, knowledge, and creativity. *Id.*, ¶ 249; *see also* ¶¶ 235-39.

² If claim 14 is not indefinite, as discussed above.

Specifically as to claim 2, Kim discloses an example where some conductive material has been removed to ensure that “the testing pins 30 for signal or the testing pins 30 for power are insulated with the testing pins 30 for ground.” Ex. 1006, [0062]. A POSITA would understand from this and other disclosures in Kim that locally interrupting the “first conductive portion” would be advantageous to ensure that pins carrying different signals would be electrically isolated. Ex. 1003, ¶ 250.

As to the “common pad” limitations of claims 9 and 10, according to the ’885 patent, the common pad allows to access to the contact elements directly from the housing of the testing head, such a common pad therefore replacing the plurality of contact pads and allowing monitoring of the respective signals. Ex. 1001, 18:9-13; Ex. 1003, ¶ 251. A POSITA would understand that the claimed “common pad” thus allows an external electrical component (*e.g.*, PCB) to electrically access or monitor a same type of signal carried by a group of contact elements without the need to connect the external electrical component to the plurality of contact pads of the device under test. Ex. 1003, ¶ 251.

It would have been obvious to use the extended portion of the conductive trace (40) as taught by Kim as a “common pad” to replace a direct connection between an external electrical component (*e.g.*, PCB) and a plurality of contact pads of the device under test to electrically access or monitor a same type of signal carried by a group of contact elements, the same purpose served by the “common pad”

disclosed in the '885 patent. *Id.*, ¶ 252. Indeed, Kim explicitly teaches that the thick wire portion of the conductive trace (40) minimizes the signal transmission route through the testing pin (30) with a high impedance and the signal transmitted to the testing pin (30) can be directly transmitted to the main board (120). Ex. 1006, [0054]; Ex. 1003, ¶ 252. Like the '885 patent, the extended portion of the conductive trace in Kim is the same material as the “first conductive portion,” just larger, and any differences in the shape of the pad between Kim and the '885 patent are immaterial. Ex. 1003, ¶ 258.

And it was general knowledge in the art to use a pad transmitting signals carried by contact elements to an external electrical component for monitoring or testing purposes. *See, e.g.*, Japanese Patent Pub. No. H11-352182 (“Tezuka”)³ (Ex. 1007, certified English translation at Ex. 1008), [0021], [0022], [0025], [0039], [0040], Figs. 6, 9A (color-coding added) (disclosing a “lead-out wiring (40)” collectively connected to a wiring pattern (33) and a “pad for testing (47)” used to detect defect of each IC mounted on an IC socket.). Ex. 1003, ¶¶ 253-58.

³ FormFactor may rely upon other references for their teachings about what was well-known in the art or to show how a POSITA would have understood Kim’s disclosures. *See Realtime Data*, 912 F.3d at 1372-73.

If Technoprobe argues that claim 10 requires *only* a single contact element be connected to the common pad, Kim discloses or at least would render obvious such a requirement. Kim discloses that “*a testing pin* is rendered to electrically connect to another testing pin *or an external substrate* through a conductive layer formed in the guide hole.” Ex. 1006, [0003] (emphasis added), Abstract, [0015]. Kim thus is clear that any number of testing pins (single or multiple) may be connected to the “common pad” via a “conductive track.” Ex. 1003, ¶ 259. How many testing pins are thus connected would have been a routine design choice to a POSITA depending on which signal(s) or testing pin(s) the designer wished to monitor. *Id.*

Finally, the “conductive track” that connects two conductive portions in claims 9, 10, 11, and 14, to the extent not disclosed in Kim, likewise is at most an example of the type of specific pattern of conductive material that would be an obvious design choice to a POSITA implementing Kim’s disclosures, for the reasons already discussed above. *Id.*, ¶ 260; Ex. 1006, [0003], Abstract, [0015], [0017], [0052], [0057]-[0062]; Ex. 1005, [0045].

3. Claim 7

[7] The testing head of claim 1, wherein the at least one guide includes at least one third conductive portion that includes and electrically connects a third group of the guide holes to each other and house third contact elements configured to carry input/output signals between the device under test and a test equipment.

Kim renders obvious claim 7. Ex. 1003, ¶¶ 261, 266. As discussed above, Kim explicitly teaches conductive portions that electrically connect first and second groups of guide holes configured to carry ground and power signals. Kim also discloses testing pins configured to carry input/output signals. Figs. 5a and 5b depict a guide hole for “S,” and Fig. 3 depicts a testing pin “S1.” A POSITA would understand that these refer to the input/output signal guide holes and testing pins (“S” standing for “signal”) configured to carry input/output signals between the device under test and test equipment. *Id.*, ¶¶ 262-63. Technoprobe acknowledged to the JPO that Kim discloses “the test pins are disclosed to be for *signal*, ground, or power.” Ex. 1018, 20 (emphasis added). Likewise, Kim explains that the testing pins (30) for [input/output] signal can be insulated from the testing pins (30) for ground. Ex. 1006, [0062]. Indeed, a POSITA would understand that a testing head would include multiple input/output signal testing pins. Ex. 1003, ¶ 263.

Kim explains that “testing pins of transmitting the same signal” may be electrically connected to each other, without limiting the types of signals. Ex. 1006,

[0019], [0025], [0032], [0042], [0044], [0045]. Technoprobe also acknowledged this to the JPO. Ex. 1018, 20 (emphasis added).

Thus, at minimum it would be obvious to a POSITA that Kim's guide holes housing testing pins carrying input/output signals also could be electrically connected via a third conductive portion, forming a third group of guide holes, in the same way as the first and second groups of guide holes are electrically connected. Ex. 1003, ¶¶ 263-64. A POSITA would understand that the test pins (30) for ground signals and power signals as taught by Kim are used only as examples to illustrate that pins carrying the same signal can be connected via a conductive trace and conductive layers. *Id.*, ¶ 263. Indeed, Kim explains the possibility of having the conductive trace on each of the sides of both the upper and lower die, hence 4 separate traces. Ex. 1006, [0018]. And both the upper surface and lower surface of both the upper plate (11) and lower plate (12) may have more than one electrically connected group of test pins. *Id.*, [0052]. A POSITA would have been motivated to electrically connect these signal testing pins in Kim to achieve the benefits described in Kim, including that "the signal transduction route is minimized through the testing pin and the impedance is decreased, thereby remarkably improving the high frequency performance." *Id.*, [0016], [0048], [0064]; Ex. 1003, ¶¶ 264-65.

C. Ground 3: Claims 5-6, 16-20 and 23 Are Obvious Over Kim and Schmid

1. Overview of Obviousness Arguments and Motivation to Combine

Claim 5-6, 16-20, and 23 all are similar to claims challenged in Grounds 1 and 2, except that they specify that the claimed test head includes three guides (a lower guide, an intermediate guide, and an upper guide).

It would have been obvious to modify the testing heads disclosed in Kim by adding a third, or an intermediate, guide plate as disclosed in Schmid to yield the subject matter claimed in claims 5-6, 16-20, and 23. Ex. 1003, ¶¶ 267-68.

First, Kim and Schmid describe the same type of probe head structure used for the same applications. Ex. 1006, [0005], [0006], [0033], [0034], [0037], Figs. 2-6, Ex. 1009, 3:25-54, Ex. 1003, ¶¶ 269-70. Both Kim and Schmid disclose using “buckling beam” type probes as examples. Ex. 1006, [0040]; Ex. 1009, 3:48-54; Ex. 1003, ¶¶ 52, 67, 71-72, 156, 133.

Second, a POSITA would have understood from Schmid’s teachings that it would be beneficial to add a third (intermediate) guide to the type of testing heads described in Kim. Ex. 1003, ¶ 271. Schmid teaches that it is preferable to use three guide plates instead of two. Ex. 1009, Abstract (“A plurality of at least two and *preferably* three guide panels are located in the space between the test points and the contact points.”); *id.*, 2:34-37 (“preferred” embodiment includes a third,

intermediate guide). Schmid explains why: “The third guide panel also ensures that the contact elements do not touch one another, particularly during a test procedure, so that, if appropriate, electrical insulation between the contact elements can be dispensed with, and this reduces the cost of the test head.” *Id.*, 2:49-53.

Indeed, using three guides was a well-known design choice to a POSITA, as reflected in other references besides Schmid: *See* Ex. 1014, 1:29-58, 2:64-3:4, Fig. 1; Ex. 1015, 2:53-64, 3:22-29, Figs. 3 and 4C; Ex. 1003, ¶ 272. A POSITA would have been familiar with vertically oriented buckling beam probing technology and would have understood and been able to implement the various techniques that had been used to probe semiconductor devices. Ex. 1003, ¶ 273. Thus, a POSITA would have both known reasons to add a third guide to Kim’s teachings and reasonably expected success in so doing. *Id.*, ¶ 274.

Third, as the JPO observed, providing a third guide was merely “a design change that can be made by a person skilled in the art.” Ex. 1018, 3, 28; Ex. 1003, ¶¶ 122, 275. Technoprobe did not disagree with that observation of the JPO. Ex. 1018, 21. Indeed, the ’885 patent itself does not identify anything novel about adding the third guide plate, nor does it describe any unusual benefits of the third guide plate. Ex. 1003, ¶ 277. The EPO likewise noted that adding a third guide plate was “well-known” and “obvious” to a POSITA. Ex. 1016, 447; Ex. 1003, ¶ 113.

Fourth, a POSITA beginning with the disclosures of Schmid likewise would have found it obvious to add the teachings of Kim to Schmid's disclosures to yield the inventions claimed in subject matter claimed in claims 5-6, 16-20, and 23. Ex. 1003, ¶¶ 276, 278, 279. Kim teaches that metalized conductive patterns can be formed on the upper or lower plates. Ex. 1006, [0052]; Ex. 1005, [0045]. A POSITA thus would have understood that Kim's addition of conductive electrical connections to guide plates could be applied in a three-guide system like Schmid. Ex. 1003, ¶ 276.

Accordingly, the combination of Kim and Schmid is nothing more than the combination of prior art elements according to known methods to yield predictable results of improving signal noise, and frequency performance, as Kim teaches its inventions would achieve. Ex. 1006, [0003], [0015], [0054], [0063]; Ex. 1003, ¶¶ 278, 279.

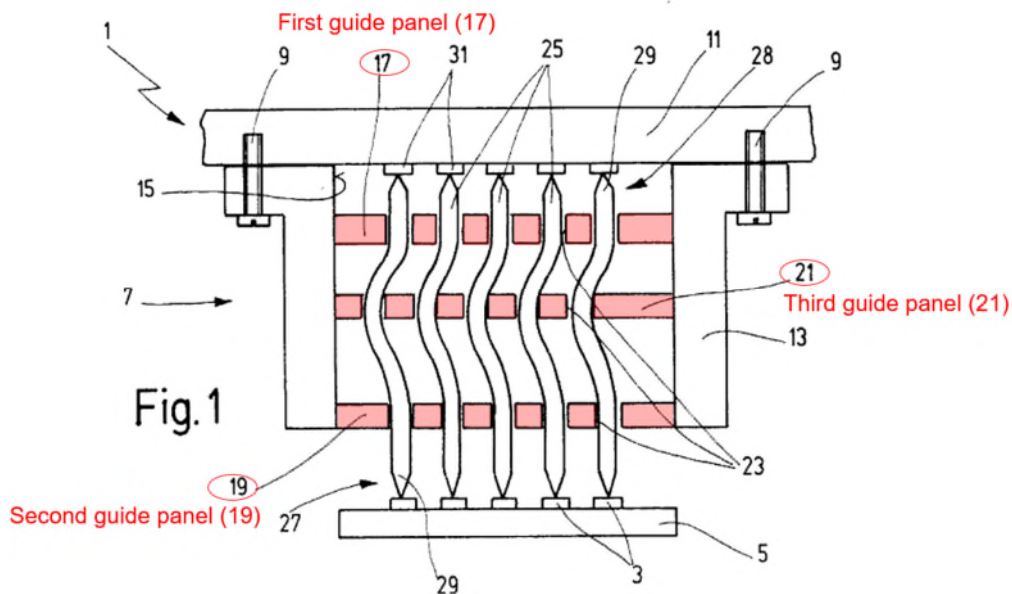
2. Claim 5

[5A] The testing head of claim 1, wherein the at least one guide includes a lower guide, an intermediate guide, and an upper guide

As explained in Sections IX.A.1 and IX.B.1, *supra*, Kim discloses or at least renders obvious "the testing head of claim 1."

Schmid discloses claim [5A]. Ex. 1003, ¶ 283. As shown in Fig. 1 (annotating and color-coding added), Schmid discloses a test head (1) having a first guide panel

(17), a second guide panel (19) and a third guide panel (21). Ex. 1009, 3:41-45; Ex. 1003, ¶¶ 281-282. Schmid states that the third guide plate (21) is in the intermediate space between the first guide panel (17) and the second guide panel (19). Ex. 1009, 3:58-63, Fig. 1.

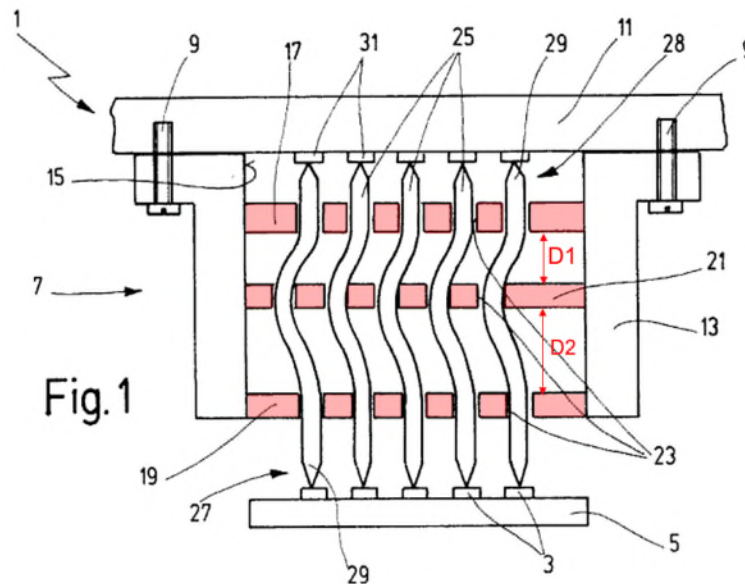


Thus, Schmid’s first guide panel (17) constitutes the claimed “upper guide,” the second guide panel (19) constitutes the claimed “lower guide”, and the third guide panel (21) constitutes the claimed “intermediate guide.” Ex. 1003, ¶ 282.

[5B] the lower guide and the intermediate guide being separated from each other by a first gap, the intermediate guide and the upper guide being separated from each other by a second gap

Schmid discloses claim [5B]. *Id.*, ¶ 286. Schmid teaches that the first guide panel (17), the second guide panel (19) and the third guide panel (21) are held parallel to one another and at a distance from one another along the axis of the sleeve

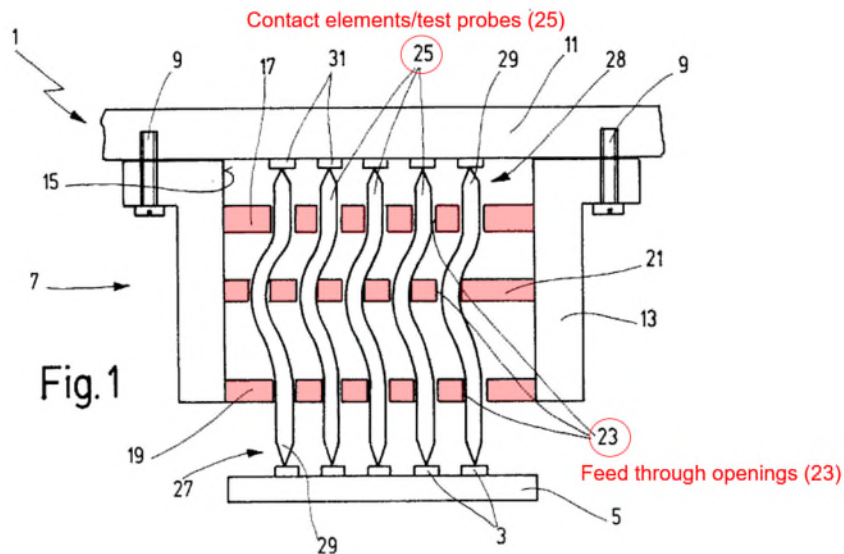
of a sleeve shaped base body (13). Ex. 1009, 3:41-45, Fig. 1 (annotated and color-coding added); Ex. 1003, ¶ 284.



As illustrated in Fig. 1, the distance (D1) between the first guide panel (17) and the third guide panel (21) constitutes the claimed “first gap” and the distance (D2) between the second guide panel (19) and the third guide panel (21) constitutes the claimed “second gap.” Ex. 1003, ¶ 285.

[5C] each of the lower, intermediate and upper guides comprising respective guide holes for housing the contact elements

Schmid discloses claim [5C]. *Id.*, ¶ 289. Schmid teaches that each of the guide panels (17, 19, 21) has several feed through openings (23) through which pin shaped contact elements (25), also referred to as test probes, are axially displaceably guided. Ex. 1009, 3:45-49, Fig. 1 (annotated and color-coding added); Ex. 1003, ¶ 287.



As illustrated in Fig. 1, Schmid's feed through openings (23) formed on each of the guide panels (17, 19, 21) constitutes the claimed "guide holes" for housing the contact elements (25). Ex. 1003, ¶ 288.

[5D] the first and second conductive portions being formed on respective faces of the upper, intermediate and lower guides

As discussed with respect to limitations [1C] and [1D], Kim discloses the claimed "first and second conductive portions." *Supra* Section IX.A.1. Moreover, Kim explicitly teaches that the first and second conductive portions can be formed on the upper and/or lower guides and can be formed on the same guide face or different guide faces. Ex. 1006, [0052]; *see also* Ex. 1005, [0045]; Ex. 1003, ¶¶ 291-96. A POSITA thus would have understood that the combination of Kim teaching a conductive pattern using the conductive layers (20) and the conductive trace (40) to electrically connect two different groups of testing pins (30) carrying

two different types of signals (*e.g.*, ground and power signals) with Schmid's teaching of three separate guide panels (17, 19, 21) would constitute limitation [5D]. Ex. 1003, ¶ 297.

3. Claim 6

Claim 6, for the most part, has the same limitations as claim 5. *Id.*, ¶ 299. *See Supra* §§ IX.A.1, IX.B.1, IX.C.2 regarding the unpatentability of claim 5; Ex. 1003, ¶ 300.

The only added aspect of claim 6 is that the “first and second conductive portions being formed on a *same face* of one of the upper, intermediate, or lower guides and being physically and electrically separated from each other by at least one non-conductive zone” (emphasis added). Ex. 1003, ¶ 301. As noted previously, a POSITA would have understood that the conductive portions taught in Kim could be arranged and patterned in various ways, including having both the first (ground) and second (power) portions formed on the same face of one guide. *Id.*, ¶¶ 302-05.

Specifically, “[t]he plurality of the conductive layers 20, with which the testing pins 30 of transmitting the same signal are contacted, and the conductive traces for connecting them are set to a *plurality of groups*.” Ex. 1006, [0050] (emphasis added); Ex. 1003, ¶ 306. Kim then notes that while “in the drawings [Figures 5a and 5b], each group is formed at only the upper surface and the lower surface of the upper plate,” “*each group can be formed at the upper surface and*

the lower surface of both upper and lower plates 11 and 12 according to the number of the groups.” Ex. 1006, [0052]; *see also id.*, [0017] (“one or more conductive traces” can be formed on one surface of the guide plate); Ex. 1005, [0045] (“the present invention is not limited to forming each group only on the upper surface and lower surface of the upper plate (11). Depending on the number of groups, it is possible to form more than one electrically connected group on a single surface.”); Ex. 1003, ¶¶ 307-08. Kim also teaches, as a POSITA would have understood, that conductive portions carrying different types of signals would be physically and electrically separated from each other by a non-conductive zone. Ex. 1006, Figs. 5a and 5b, [0062]; Ex. 1003, ¶¶ 309-11. A POSITA would have understood that Kim’s system could be implemented with both first and second (power and ground) conductive materials on one side of a guide plate, and would have had reason to do so, for instance, when multiple ground and/or power groups are present or to easily follow the layout of the device under test. Ex. 1003, ¶¶ 309-11.

Accordingly, claim 6 would have been obvious to a POSITA in view of Kim and Schmid. *Id.*, ¶¶ 300, 312.

4. Claim 16

Claim 16 has the same limitations as claims 1 and 5, and thus is obvious over Kim and Schmid. *See supra* §§ IX.A.1, IX.B.1, IX.C.2 regarding the unpatentability of claims 1 and 5; Ex. 1003, ¶¶ 313-15.

5. Claim 17

Claim 17 has the same limitations as claims 4 and 16, and thus is obvious over Kim and Schmid. *See supra* §§ IX.A.1, IX.A.3, IX.B.1, IX.C.2 regarding the unpatentability of claims 4 and 16; Ex. 1003, ¶¶ 316-18.

6. Claim 18

Claim 18 has the same limitations as claims 7 and 16, and thus is obvious over Kim and Schmid. *See supra* §§ IX.A.1, IX.B.1, IX.B.3, IX.C.4 regarding the unpatentability of claims 4 and 16; Ex. 1003, ¶ 319.

7. Claim 19

Claim 19 has the same limitations as claims 9 and 16, and thus is obvious over Kim and Schmid. *See supra* §§ IX.A.1, IX.A.5, IX.B.1, IX.B.2, IX.C.4 regarding the unpatentability of claims 9 and 16; Ex. 1003, ¶¶ 320-22.

8. Claim 20

Claim 20 has the same limitations as claims 10 and 16, and thus is obvious over Kim and Schmid. *See supra* §§ IX.A.1, IX.A.6, IX.B.1, IX.B.2, IX.C.4 regarding the unpatentability of claims 10 and 16; Ex. 1003, ¶¶ 323-25.

9. Claim 23

Claim 23 has the same limitation as claims 1 and 6 and thus is obvious over Kim and Schmid. *See supra* §§ IX.A.1, IX.B.1, IX.C.3 regarding the unpatentability of claims 1 and 6; Ex. 1003, ¶¶ 326-327.

D. Ground 4: Claim 3 is Obvious Over Kim and Fan

[3] The testing head of claim 1, wherein the at least one guide comprises at least one coating dielectric portion that covers the at least one non-conductive zone.

The combination of Kim and Fan renders obvious the subject matter of claim 3. Ex. 1003, ¶¶ 328-29. As to claim 3’s additional limitation, the ’885 patent has only a limited description of any “coating dielectric portion.” *Id.*, ¶ 330.

Fan discloses a probe head including a plate 100. Ex. 1011, 3:1-7, Figs. 1A, 1B, and 4; Ex. 1003, ¶ 331. And the guide plate “can be made of *non-conductive materials....*” Ex. 1011, 3:41-42; *see also id.*, 1:62-63; Ex. 1003, ¶ 333.

Fan illustrates in Fig. 4 an “insulating layer 600” used to cover some or all of the surface of the guide plate. Ex. 1011, 5:1-14, Fig. 4; *see also id.*, 1:65-67 (“In one or more embodiments, the probe head further includes an insulating layer disposed between the metal layer and the plate”), 2:1-3 (“In one or more embodiments, the probe head further includes an insulating layer covering the entire surface of the plate.”). As would be understood by a POSITA, a “dielectric” material is insulating. Ex. 1003, ¶ 331.

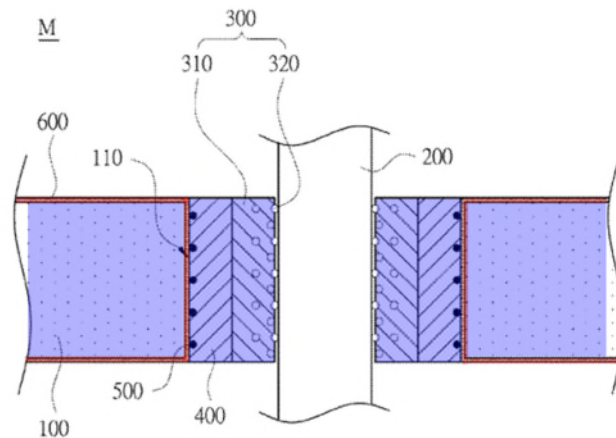


FIG. 4

Fan further teaches that the “insulating material can be *coated* on the [plate].” Ex. 1011, 5:15-34; Ex. 1003, ¶ 332.

Accordingly, Fan teaches, or at least renders obvious, a testing head that “comprises at least one coating dielectric portion [insulating layer 600] that covers the at least one non-conductive zone [a portion of guide 100 made of a non-conductive material].” Ex. 1003, ¶ 334.

A POSITA would have found it obvious to coat non-conductive zones on the face of the guide plate disclosed in Kim (*supra* Sections IX.A.1 and IX.B.1) with the insulating material disclosed in Fan, thereby yielding the subject matter of ’885 patent claim 3. *Id.*, ¶ 335. Both Kim and Fan are directed at semiconductor testing probes. *Id.* Kim teaches that testing pins carrying different types of signals, and conductive portions carrying different types of signals, should be electrically separated (“insulated”) from each other by a non-conductive zone. *E.g.*, Ex. 1006,

Fig. 5a, Fig. 5b, [0062]; Ex. 1003, ¶ 335. Fan teaches coating using an insulating layer to insulate two conductive materials that are meant to be kept electrically separate. Ex. 1011, 5:1-35; Ex. 1003, ¶ 335.

Accordingly, a POSITA would have understood that applying Fan's teaching to Kim by coating non-conductive zones on the guide plate taught in Kim with an insulating (dielectric) material would improve Kim by helping to ensure that testing pins and conductive portions carrying different signal types remain electrically separated. Ex. 1003, ¶ 336. If Fan's disclosures of coating insulating layers are read to be limited to embodiments where the guide is conductive, a POSITA nonetheless would have understood that the purpose of coating the insulating layer in Fan is to help electrically separate two conductive materials, and this same purpose would be applicable in Kim by coating the non-conductive zones on the guide plate between testing pins and conductive portions carrying different signal types. *Id.* A POSITA would have expected success given Fan's teachings explaining how to coat a guide plate. *Id.*

E. Ground 5: Claims 12 and 13 are Obvious Over Kim and Bross

A POSITA would have been motivated to combine Kim with Bross. Kim and Bross both relate to a test probe assembly. *Id.*, ¶¶ 337-38. Kim discloses a guide with conductive portions, *supra* Section IX.A.1, and various exemplary methods for forming those conductive layers, Ex. 1006, [0056]-[0062]. A POSITA would have

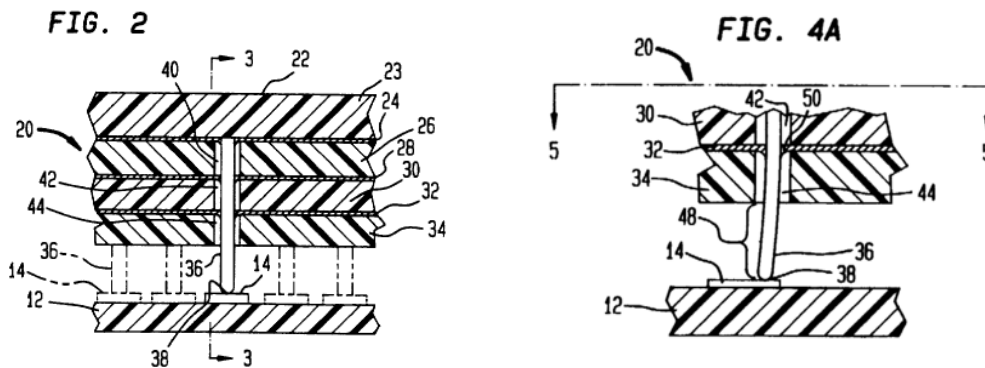
found it obvious to select from known manufacturing methods, such as the ones from Bross, to form the conductive portion(s) in the guide of Kim. Ex. 1003, ¶ 338. Bross discloses that the laminating method or multilayer technique (metallization of guide plates) is well known in the art. Ex. 1010, 4:49-52; Ex. 1003, ¶ 339. Additionally, “[t]he positions, spacings, and shapes of the conductive traces 56a, 56b, etc., are provided in accordance with design rules well known to those skilled in the art of designing and fabricating multi-layer circuitry”. Ex. 1010, 6:36-40, 7:46-48; Ex. 1003, ¶ 339. These techniques have the desirable result that “each probe element makes good mechanical and electrical contact to one or more selected conductors of the conductive layers.” Ex. 1010, 2:21-24; Ex. 1003, ¶ 339. Thus, a POSITA would be motivated to use the well-known laminating methods described by Bross, applied to Kim, to embed one or more of the conductive portions within the guide plate and would have reasonably expected success in doing so. Ex. 1003, ¶ 340. The resulting combination of Kim with Bross would yield the subject matter of claims 12 and 13. *Id.*, ¶¶ 340-41.

1. Claim 12

[12] The testing head of claim 1, wherein the first conductive portion is embedded in the at least one guide.

Bross discloses a first conductive portion embedded in a guide. Bross describes a “multi-layer” probe assembly with alternating conductive (24, 28, 32)

and insulating (23, 26, 30, 34) layers, such that the conductive layers are embedded within the probe assembly. Ex. 1010, Abstract, Claim 1, Figs. 2, 4A, and 5, 6:23-32; Ex. 1003, ¶ 345. Bross's "conductive layers," like the conductive portions in Kim, contain conductive traces (e.g., 56a, 56b) that electrically connect the probes. Ex. 1010, 6:30-31; Ex. 1003, ¶ 345. In the combination of Kim and Bross, the "first conductive portion" would be embedded in the guide rather than on the surface of the guide. Ex. 1003, ¶ 345.



Finally, if the claimed term "embedded" can be met just by having the conductive layer formed on the inside of the guide hole, Kim discloses claim 13, as explained above with respect to Claim 8. *See* Section IX.A.4; Ex. 1003, ¶¶ 342-44.

2. Claim 13

[13] The testing head of claim 1, wherein the first conductive portion is one of a plurality of conductive portions overlapped to and electrically insulated from each other.

Bross discloses "a multi-layer arrangement of insulating and conducting layers within the body of the probe assembly." Ex. 1010, Abstract; Ex. 1003, ¶ 347.

Bross's Figure 2, discussed above, shows a "multi-layer arrangement" comprising a plurality of conductive portions (24, 28, 32) overlapped to each other and electrically insulated from each other by insulating layers (23, 26, 30, 34). Ex. 1003, ¶ 347. In the combination of Kim and Bross, the conductive portions (e.g., first and second conductive portions of claim 1) would be embedded in the guide in an overlapping and electrically insulated pattern as in Bross. *Id.*, ¶ 347.

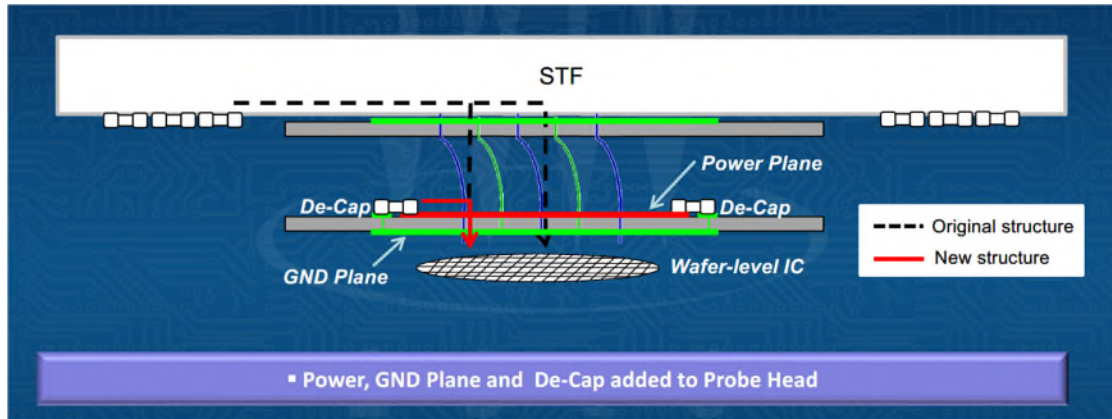
Finally, if this limitation may be met simply by having the first and second conductive portion on opposite faces (top and bottom) of a guide plate, then Kim discloses this as shown in, e.g., Kim Figs. 5a and 5b. *Id.*, ¶ 346.

F. Ground 6: Claim 15 is Obvious Over Kim and the 2016 SWTest Presentation

[15] The testing head of claim 1, further comprising a circuit component, which is electrically connected at least to the first conductive portion of the at least one guide.

The 2016 SWTest Presentation discloses the additional limitation of dependent claim 15, such that, combined with Kim, it would render obvious the subject matter of claim 15. *Id.*, ¶ 351. First, like Kim, the 2016 SWTest Presentation discloses a "first conductive portion" electrically connecting probes carrying ground signals (and a "second conductive portion" electrically connecting probes carrying power signals). Ex. 1028, 8, 15, 16; Ex. 1003, ¶ 349. It discloses electrically

connecting a circuit component, capacitors (de-caps), to the ground plane (the first conductive portion) of the guide plate. Ex. 1003, ¶¶ 75-79, 353-55.



Ex. 1028, 15; Ex. 1003, ¶ 350.

A POSITA would be motivated to combine Kim with the 2016 SWTest Presentation to yield the subject matter of claim 15. Ex. 1003, ¶¶ 348-49. Kim and the 2016 SWTest Presentation both describe the same type of device, metalized guide plates, developed by the same company, Willtechnology Co. Ltd. *Id.* It would have been obvious to combine the two references related to the same technology developed from the same company. *Id.* De-caps are common electrical components that were known to be used in probe cards to improve power integrity, so a POSITA would be knowledgeable about their use, function and benefit and would have been motivated to add them to probe cards to improve their performance. *Id.*, ¶ 350. The 2016 SWTest presentation expressly provides the motivation by teaching that adding “decaps” on the probe head, combined with power and ground planes (i.e., in the

same kind of device described in Kim), “leads to lower power impedance.” Ex. 1028, 19; Ex. 1003, ¶¶ 75-79, 349, 353.

G. Ground 7: Claims 21 and 22 are Obvious Over Kim, Bross, and Schmid

A POSITA would have been motivated to combine Kim and Schmid to achieve the features recited in claim 16. *Supra* Section IX.C. A POSITA would have been motivated to combine Kim and Bross to achieve the features recited in claims 12 and 13. *Supra* Section IX.E. And in turn, a POSITA would have been able to combine the teachings of Kim, Bross, and Schmid, and nothing would have discouraged that combination. Ex. 1003, ¶¶ 356-57.

1. Claim 21

Claim 21 has the same limitations as claims 12 and 16 and thus is obvious over Kim, Schmid, and Bross. *See supra* §§ IX.A.1, IX.B.1, IX.C.2, IX.E.1 regarding the unpatentability of claims 12 and 16; Ex. 1003, ¶ 358.

2. Claim 22

Claim 22 has the same limitations as claims 13 and 16 and thus is obvious over Kim, Schmid, and Bross. *See supra* §§ IX.A.1, IX.B.1, IX.C.2, IX.E.2 regarding the unpatentability of claims 13 and 16; Ex. 1003, ¶ 359.

H. Secondary Considerations of Non-Obviousness

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

1002. Regardless, even if such considerations existed, none would overcome the strong *prima facie* showing of obviousness. Ex. 1003, ¶ 360.

X. Conclusion

As explained above, Petitioner is likely to prevail in showing that at least one of the Challenged Claims is unpatentable and requests that IPR be instituted and that the Challenged Claims be canceled.

Respectfully submitted,

Dated: June 28, 2024

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CERTIFICATE OF WORD COUNT

The undersigned certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW complies with the type volume limitation in 37 C.F.R. § 42.24(a)(1)(i). According to the utilized word-processing system's word count, the petition—excluding the caption, table of contents, table of exhibits, mandatory notices, certificate of word count, and certificate of service—contains 13,957 words.

Dated: June 28, 2024

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U.S. Patent No. 11,035,885

CERTIFICATE OF SERVICE

The undersigned hereby confirms that the foregoing PETITION FOR IPR and associated exhibits were caused to be served on June 28, 2024 via overnight courier upon the following counsel of record for Patent Owner:

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