

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MICRON TECHNOLOGY, INC.,
Petitioner

v.

YANGTZE MEMORY TECHNOLOGIES COMPANY, LTD.,
Patent Owner

Case No.: IPR2024-00789
U.S. Patent No. 10,861,872
Issue Date: December 8, 2020

Title: THREE-DIMENSIONAL MEMORY DEVICE AND METHOD
FOR FORMING THE SAME

PETITIONER'S REPLY

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1001	U.S. Patent No. 10,861,872 B2 to Liu et al.
1002	File History of U.S. Patent No. 10,861,872 to Liu et al.
1003	Declaration of Dr. Sanjay Banerjee (“Banerjee”)
1004	<i>Curriculum Vitae</i> of Dr. Sanjay Banerjee
1005	U.S. Patent No. 9,859,297 B2 to Park et al. (“Park”)
1006	U.S. Patent Publ. No. 2019/0081061 A1 to Tessariol et al. (“Tessariol”)
1007	Aritome, “NAND Flash Memory Technologies” (2016)
1008	Silvagni, “3D NAND Flash Based on Planar Cells,” Computers 2017
1009	Micheloni et al., “Inside Solid State Drives (SSDs)” (2 nd Ed. 2018)
1010	U.S. Patent No. 10,381,369 B2 to Kim et al.
1011	U.S. Patent No. 10,475,737 B2 to Tang et al.
1012	Certified English Translation of Chinese Patent Application Publ. No. CN108766971 to Liu (“Liu”)
1013	Chinese Patent Application Publ. No. CN108766971 to Liu
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1015	YMTC’s Exemplary Infringement Claim Chart for U.S. Patent No. 10,861,872 – (Ex. 49) 128L [PROTECTIVE ORDER MATERIAL – FILED UNDER SEAL]
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1041	Transcript of the deposition of Dr. Kelin Kuhn, dated March 28, 2025, in IPR2024-00789, concerning U.S. Patent No. 10,861,872
1042	Deposition Exhibit 6 from the deposition of Dr. Kelin Kuhn, dated March 28, 2025, in IPR2024-00789, concerning U.S. Patent No. 10,861,872

I. INTRODUCTION

In the ID, the Board preliminarily did not adopt the Petition’s primary construction of “dummy source structure,” instead construing it as a structure that “does not function as a source.” ID, 11-13. The Board’s negative limitation was one basis for the Board questioning whether the Park ground would render the claims unpatentable. *Id.*, 30. But the Board preliminarily found that under its construction, the Tessariol ground teaches all challenged claims and renders them obvious. *Id.*, 24.

If the Board maintains its construction, it need address only the Tessariol ground to resolve patentability. As to claim 1, PO’s only argument is that the claimed “conductive contact” must, in effect, be an “interconnect.” The Board already rejected this interpretation, because the specification uses permissive language in describing that a “conductive contact” *may* function as an “interconnect.” ID, 23. What’s more, PO’s expert (Dr. Kuhn) admits that the “conductive contact” shown in the figure 2L embodiment of the ’872 patent—just like Tessariol’s dummy via—simply lands on a substrate and includes no separate connection on top. PO cannot demand that the prior art disclose more than the ’872 patent itself. Regardless, even under PO’s construction, Tessariol discloses and renders this limitation obvious. PO’s only argument against motivation fell apart

during trial because its own expert admits the modification in the ground would simplify manufacturing.

Respectfully, the Board should revisit its preliminary construction of “dummy source structure.” Requiring that a “dummy source structure” not function as a source cannot be correct, because the ’872 specification says it does not function as a source (i.e., connect to channel structures) only “*in some embodiments*” and never discloses the “dummy source structure” connecting to channel structures with a “dead-end” (as PO speculates could explain away this specification disclosure). And the full record now demonstrates that locating these structures in the voids used for the gate line replacement process is an essential aspect of the invention. Indeed, the claims themselves would have been understood to refer to this very process. Under Petitioner’s construction, Park renders the claims unpatentable.

II. CLAIM CONSTRUCTION

A. Dummy Source Structure

As an initial matter, PO is incorrect when it asserts that “dummy source structure” has a plain and ordinary meaning. POR, 14. The overall term “dummy source structure” is a term specific to the ’872 patent, which a Google search confirms. “Dummy” as a qualifier typically refers to an *inoperable component* that structurally *resembles the non-dummy component*. In fact, the parties agreed that “dummy structure” in a 3D NAND patent means “electrically inoperable structure

that mimics a physical property of an operative structure.” Ex. 1036, 2. This is the plain and ordinary meaning of “dummy” in 3D NAND prior art. *E.g.*, Ex. 1037, 5:33-36, 13:57-64, Ex. 1038, 21:7-11; Ex. 1039, 7:1-6; Ex. 1040, 10:7-10; Ex. 1006, [0053], [0068]. Indeed, Dr. Kuhn agrees that a “dummy” resembles its non-dummy counterpart. Ex. 1041, 119:14-120:17; Banerjee-Reply, ¶¶ 15-23.

Put simply, if “dummy source structure” did have a plain and ordinary meaning, it would be an inoperable structure that resembles a source structure. But that meaning does not apply here, because the specification states that a “dummy source structure” can be an operable structure and imposes no meaningful structural limitations. Pet., 26-27. Accordingly, it is critical to construe “dummy source structure” according to the specification’s description.

1. “Dummy Source Structure” Is the Structure that Occupies the Void Used for the Gate Line Replacement Process

In the ID, the Board preliminarily found that “[o]n this record,” “it was “not persuaded that the gate replacement process is an essential part of the claimed invention, such that it should be treated as a part of the claimed 3D memory device.” ID, 12-13. The full record produces a different conclusion.

Read in context, the claims effectively recite the ’872 patent’s replacement-gates, because claim 1 recites “interleaved *conductive layers* and dielectric layers.”¹

¹ Emphasis added throughout.

Ex. 1001, Claim 1. The '872 specification states: “In 3D memory fabrication processes, a gate-replacement process is often used to form interleaved *word line*/dielectric stacks, *in which sacrificial layers are replaced* with *conductive layers* to form gate electrodes/word lines.” *Id.*, 4:30-33. While gate-replacement is an option, the '872 patent teaches that option enables its “conductive layers,” which the claims recite. The '872 patent explains the alleged problems with using GLSs to deposit this “conductive material” to form the “conductive layers” during gate-replacement. *Id.*, 4:67-5:30. So the '872 patent “replac[es] the GLSs with dummy source structures” to solve these problems, e.g., because the “conductive material travels short distances” from the “dummy source structures.” *Id.*, 5:31-6:4. Notably, all embodiments and all claims of the '872 patent employ these “conductive layers.” *Id.*, 1:36, 1:46, 1:66, 2:2, 2:26-27; Banerjee-Reply, ¶¶ 24-32.

Accordingly, given that the claims recite “conductive layers” and “dummy source structures,” it is proper to interpret these claims as involving the gate-replacement process, because the '872 specification discloses “replacing the GLSs with dummy source structures” as necessary to creating the “conductive layers” (which it uses “restrictively” for this purpose) without the alleged problems of the conventional gate-replacement process. *Andersen Corp. v. Fiber Composites, LLC*, 474 F.3d 1361, 1367 (Fed. Cir. 2007) (limiting apparatus claim according to method

of manufacture because patent uses term “restrictively” and describing necessity to use process to create structure).

PO raises four arguments against this construction. None of them withstands scrutiny.

First, PO argues that Petitioner’s construction reads out “dummy” from the term. POR, 19. As §II.A.2 demonstrates, however, Petitioner’s construction tracks the specification. Banerjee-Reply, ¶ 34.

Second, PO argues that Micron’s construction imports a method step. POR, 20. In support, PO cites two inapposite cases: *Vanguard* and *Cont’l Circuits*. In *Vanguard*, the issue was whether to read into claim 1 a “co-extrusion” requirement. *Vanguard Prods. Corp. v. Parker Hannifin Corp.*, 234 F.3d 1370, 1371-72 (Fed. Cir. 2000). Importantly, one of the claims (claim 10) expressly recited this limitation, and the court “declined to read [claim 10’s limitation] into claim 1.” *Id.* *Cont’l Circuits* involved statements in the specification that “describe how to make the claimed invention using the preferred [method]” along with other “prior art techniques.” *Cont’l Circuits LLC v. Intel Corp.*, 915 F.3d 788, 797 (Fed. Cir. 2019). It thus made little sense to limit the claim to the preferred method to which the claims did not refer. Moreover, unlike *Vanguard* and *Cont’l Circuits*, Petitioner is not arguing that “dummy source structures” must be limited by its method of manufacture, e.g., it may include either a dielectric or conductive core. Rather,

Petitioner’s position is that however the “dummy source structures” are formed, they are limited by their location, that is, they have to occupy the voids where gate-replacement process occurs, because the alleged novelty of the claims is “replacing the GLS” with “dummy source structures” to form the “conductive layers,” and this is the only meaningful limitation to describe such dummy source structures. Ex. 1001, 5:31-34, Pet. 26-27; Banerjee-Reply, ¶ 35.

Third, PO’s specification citations do not support its position. POR, 20-22. As to column 5:49-58, PO contends the “for example” means gate-replacement is optional. But this ignores that the entire paragraph is referring to the gate-replacement process and misinterprets what “for example” modifies. The first sentence recites “[a]lso, the arrangement of the dummy source holes,” because it is referring back to the immediately preceding paragraph (5:31-48) that discusses “replacing the GLSs with dummy source structures” to perform the gate-replacement process, which states those structures could be in an “array” arrangement. Then, the “[f]or example” sentence refers to the fact that the gate-replacement conductive material “can” form the “dummy source structures” as well as the gates. Ex. 1001, 5:52-55 (“subsequently form the dummy source structures”). The specification also discloses that, “after the gate-replacement process,” the dummy source structure may be made with a “dielectric” core. *Id.*, 16:56-58.

Its other citations similarly do not suggest alternatives to gate-replacement. Column 4:30-33 refers to the fact that at the time, the “gate-replacement process is often used,” but when it is used, it creates the claimed “conductive layers” that the invention allegedly improves upon by using “dummy source structures.” Ex. 1001, 4:30-6:4. Column 16:40-49 is discussing various options to fill the dummy source hole after it was used for the gate line replacement process, ensuring each option still enables “carry[ing] out the gate-replacement process.” Banerjee-Reply, ¶¶ 36-39.

Fourth, rather than limiting to an embodiment (POR, 22), Micron’s construction broadly embraces that the “dummy source structure” may be either a dielectric or conductive pillar. Banerjee-Reply, ¶ 40.

2. PO’s Negative Limitation Is Legally Erroneous

The specification draws a contrast between “source structures” and “dummy structures.” PO incorrectly interprets² this passage to mean dummy source structures cannot function as a source:

² In district court, Micron asserts that in the alternative to its construction, PO’s construction is indefinite, because the outer bounds of PO’s construction are uncertain. Micron’s alternative indefiniteness argument is irrelevant to this proceeding even if the Board adopts PO’s construction, because Tessariol discloses “dummy source structures” within those uncertain bounds, namely, its dummy vias,

Source structures formed in the inner region *may be connected with surround channel structures* (e.g., channel structure 220 of memory string 218 shown in FIG. 2E) via a common source, such as a doped region (not shown) in substrate 202. *In some embodiments, dummy source structure 246 may not connect to channel structures* in the inner region. *Instead*, dummy source structure 246 may be formed simultaneously with source structures in the inner region, while *functioning as a mechanical supporting structure* after gate-replacement process, without connecting to channel structures in the inner region.

Ex. 1001, 16:33-44.

Here, the specification is stating that the source structures “*may*” function as sources to the memory channels. And “*in some embodiments*,” dummy source structures *may not*. And the specification identifies a function (support) that dummy source structures may perform “*[i]nstead*” of functioning as a source to the memory channels. The ’872 patent confirms, and PO’s expert agrees, that when it refers to an embodiment having a feature, other embodiments may not include that feature.

which are identical to final dummy source structures shown in Figure 2L of the ’872 patent. §III.A.

Ex. 1001, 3:1-7; Ex. 1041, 103:5-104:22. As a legal matter, by stating that a dummy source structure may not function as a source in some embodiments, “[i]t follow[] that [in] other embodiments,” the dummy source structure may function as a source. *Guardant Health, Inc. v. Vidal*, No. 2021-1104, 2023 WL 3262962, at *2 (Fed. Cir. May 5, 2023) (nonprecedential); Banerjee-Reply, ¶¶ 41-47.

PO now admits that the specification indicates that the “dummy source structures” “may” connect to the channel structures. POR, 17. According to PO, however, this connection does not mean that the “dummy source structure” functions as a source. *Id.* PO posits some sort of electrical dead-end along the connection. *Id.* This tortures the plain language of the specification. The above passage conveys that “source structures” may function as a source, and *in some cases*, the dummy source structures *may not*. What follows is that *in other cases*, the dummy source structures, too, *may* function as a source. Critically, this passage’s use of “connect” can only refer to an electrical connection, in which the source and dummy source structure electrically connect to provide the source voltage. Banerjee-Reply, ¶¶ 48-50 (citing Ex. 1023 to illustrate these source connections). The specification never discloses this made-up electrical dead-end halfway to the channels, e.g., localized doping leading to the channels and abruptly ending just before getting there.

Finally, it is noteworthy that the Board’s (and PO’s) construction includes a negative limitation, i.e., a “dummy source structure” may not function as a source.

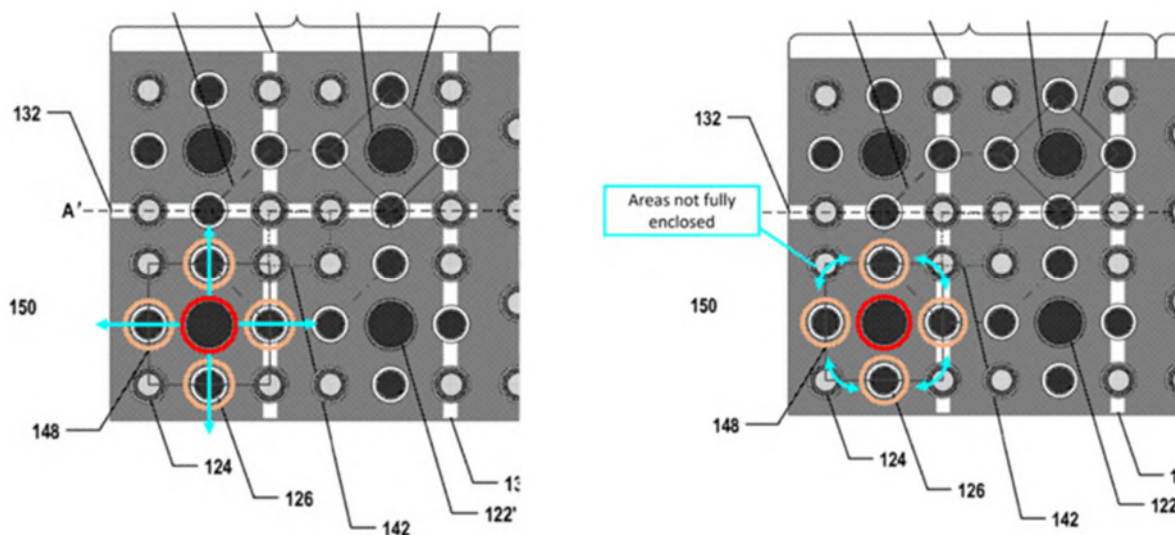
In citing various cases addressing “negative limitations,” the Federal Circuit has explained that negative limitations are only appropriate if they are apparent from “the words of the claim” or through an “express disclaimer or independent lexicography” *Ethicon LLC v. Intuitive Surgical, Inc.*, 847. F. App’x 901, 907 (Fed. Cir. 2021) (internal citations omitted). Here, a negative limitation is not apparent from the claim language itself because the ’872 patent departs from the plain meaning of “dummy.” §II.A. And the specification never states, definitionally or otherwise, that a “dummy source structure” cannot act as a source (only “in some embodiments”). Banerjee-Reply, ¶ 51.

B. Surrounding

The Board should determine *when* laterally-extending dummy source structures (such as Park’s) “surround” a staircase contact, because the ’872 patent states that the dummy source structures may be laterally-extending structures. Ex. 1001, 8:8-11, 11:44-46. Such structures can be configured to “surround” a staircase contact, because they are an express embodiment of the ’872 patent. An examination of the specification demonstrates that two laterally-extending dummy source structures (such as in Park) “surround” a staircase contact to a greater extent than the four-structure embodiments in the specification. Banerjee-Reply, ¶¶ 52-56.

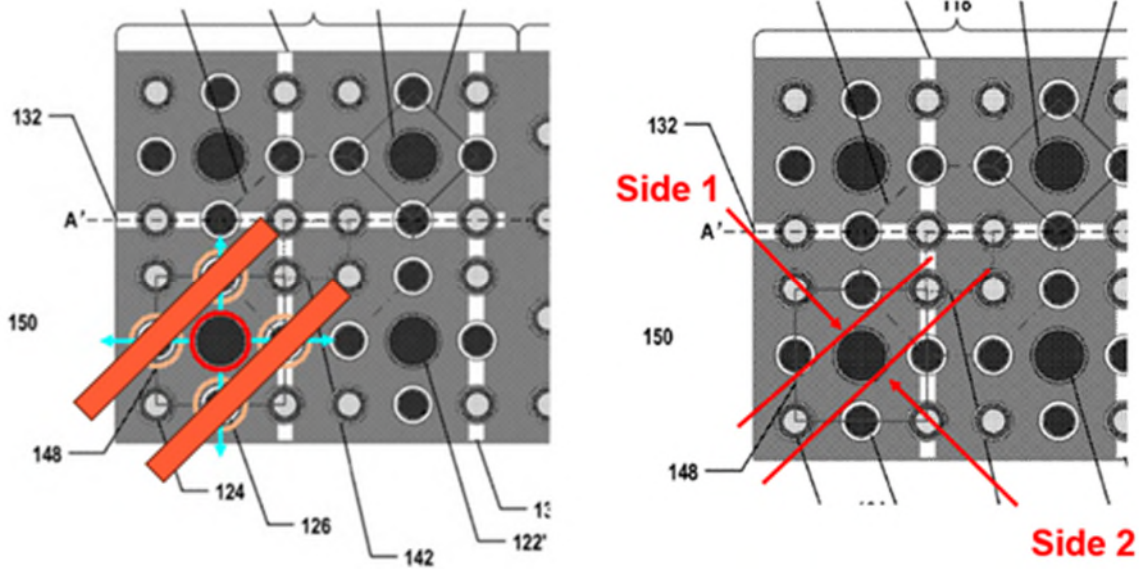
The Petition explains that “surrounding” in view of the ’872 patent must be met in two cases: (1) when four lines are drawn radially from the staircase contact,

they intersect with a dummy source structure, or (2) when the extent of the enclosed border around the staircase contact is greater than shown in the '872 embodiments.



Pet., 35-36 (annotating Fig. 1A of '872 patent).

PO's argument that objects on two sides of a staircase contact cannot surround it falls apart when examined against an express embodiment of the '872 patent. POR, 24. As shown below using orange bars, if the dummy source structures were to become laterally wider (*see* Ex. 1001, 8:8-11, 11:44-46) in the express embodiment, one could characterize the dummy source structures as surrounding the contact only on two sides. Yet those wider structures necessarily must satisfy the “surrounding” limitation because they surround the contact to a greater degree than the four smaller dummy source structures. Dr. Kuhn admits that the two structures below surround more of the contact border than the embodiment with four dummy source structures above. Ex. 1041, 144:24-145:12, Ex. 1042.



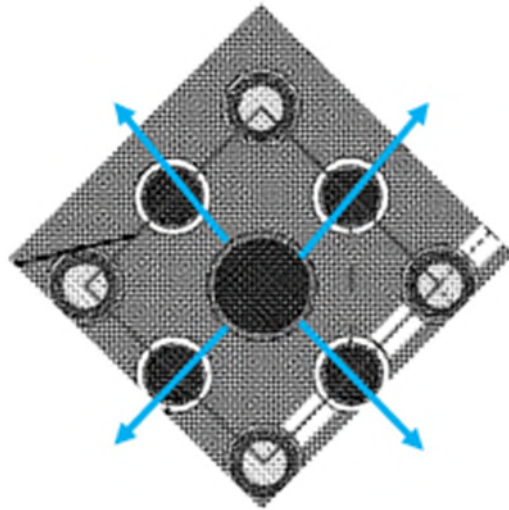
Ex. 1001, Fig. 1A (partial and annotated).

PO argues that because a contact can be “between” two objects (e.g., GLSs), those two objects cannot then surround the contact. POR, 24-25 (citing Ex. 1001, 4:56-61). But there, the “between” is referring to the fact that the holes are “between” the GLSs. This does not speak to whether the GLSs “surround” holes. Banerjee-Reply, ¶ 47.

Next, PO attempts to frame the dispute as “whether exactly two parallel dummy structures can ‘surround’ a word line contact.” POR, 26. As demonstrated above, two long, parallel structures (like Park’s) can surround a contact to the same (or a greater) degree as four dummy source structures.

PO tries to distinguish Park by arguing that the lines must be drawn from the “center” (0°, 90°, 180°, 270°) of the contact. POR, 26-27. This argument fails, however, because it attempts to limit the claims to a single embodiment. The

specification expressly allows for other dummy source structure arrangements, e.g., rotating the dummy source structures as shown below. Ex. 1001, 8:51-53. This measure is whether four lines, with 90° degrees separation, intersect with dummy source structures.



Id., Fig. 1A (partial and annotated); Banerjee-Reply, ¶¶ 58-59.

Notably, Dr. Kuhn admits that even a single structure can “surround,” but did not even consider that the dummy source structures could be laterally-extending structures or how that impacts the meaning of “surround.” Ex. 1041, 114:1-115:3, 138:1-8.

Finally, PO’s attempt to distinguish Micron’s extrinsic evidence fails. Although the 492 patent refers to “two surrounding NAND cells,” PO argues that this passage refers to *more than* “two” NAND cells. POR, 27-28 (citing Ex. 1019, 2:14-16). Moreover, that same passage refers to “in the adjacent left and right BLs”

(each corresponding to one NAND cell), further confirming that it is referring to only two elements that “surround[]” an object. Ex. 1019, 2:14-16; Banerjee-Reply, ¶ 60. PO cannot rewrite evidence. Dr. Kuhn had to admit that she may have “misread” the ’492 patent. Ex. 1041, 153:7-154:1.

C. Conductive Contact

In its POPR, PO sought to distinguish Tessariol by arguing that “conductive contact” requires “a current flow path of a circuit.” ID, 21. The Board rejected this argument because the ’872 patent (1) describes the “conductive contact” as the conductive filling material in the insulator liner, and (2) only states that the contact functions may function as an interconnect, i.e., permits current flow. *Id.*, 23-24. In its POR, PO tries to make the same failed argument, but this time under the guise of construing “conductive contact” to mean “a conductive structure that permits current flow with an adjoining conductive structure.” POR, 28. The Board should reject this argument for the same reasons as set forth in the ID and for additional reasons as well.

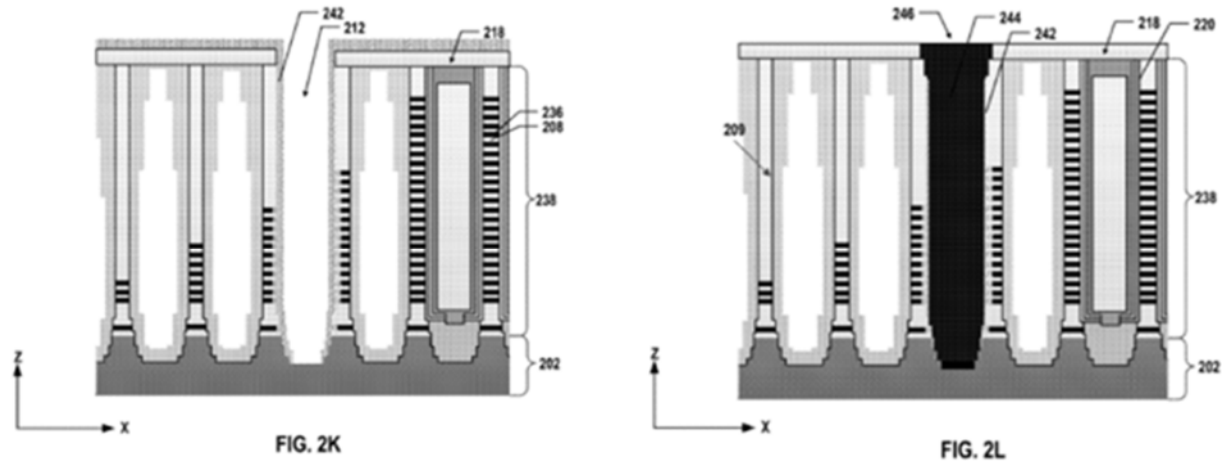
As an initial matter, PO’s arguments with respect to “dummy source structure” and “conductive contact” are internally inconsistent. Recall that the claims require that the “dummy source structure” includes a “conductive contact.” On the one hand, PO argues that “dummy,” “as the qualifying term ‘dummy’ suggests,” means the “dummy source structure” is functioning as “mechanical

support structure” and that it would have an “electrical dead end.” POR, 15, 17. On the other hand, PO now argues that this same “dummy” structure must “permit current flow.” *Id.*, 28, 32. If the Board were to accept PO’s construction of “dummy source structure,” then PO’s arguments about the meaning of the “conductive contact” in the same “dummy source structure” must fail.

Each of PO’s arguments lack merit. ***First***, PO argues that the term “contact” justifies grafting the additional limitation that the “contact” must connect to an “adjoining conductive structure.” POR, 29-30. This argument fails for a host of reasons. To start, Dr. Kuhn admits that “contact” itself is a broad term, that it does not require a functional contact that connects to an adjoining structure, and that interpreting “contact” requires a close examination of the specification.³ Ex. 1041, 31:24-32:10, 155:7-156:14. That close examination demonstrates that the ’872 patent describes the “conductive contact” as a uniform vertical conductive member that extends down towards the substrate. Ex. 1001, 16:21-32. Nothing about this description requires that the “conductive contact” have an “adjoining conductive

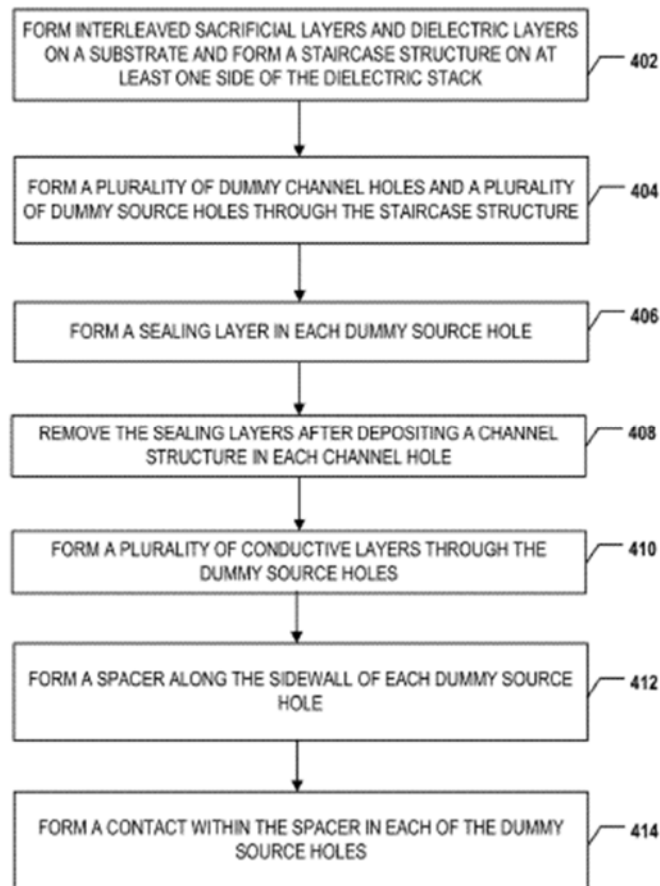
³ Dr. Kuhn admits that PO’s construction excludes certain types of “contacts.” PO’s construction is therefore improper, because PO never cites any definition or disclaimer in the specification to justify such exclusion. Ex. 1041, 20:1-21:10.

structure.” As shown below, the “contact” is simply a fill of conductive metal (246) into a hole (212) with an insulating liner (242).



Id., Figs. 2K, 2L. The '872 patent uniformly describes a “contact” as merely the vertical member through the stack. *Id.*, 2:2-8, 11:37-39, 16:13-21, 16:50-53, 18:38-41. Banerjee-Reply, ¶¶ 62-67. Indeed, Figure 4 illustrates that the “contact” is complete after filling the hole (step 414)—with no reference to an “adjoining structure.”

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Ex. 1001, Fig. 4. This construction does not read “contact” out of the claim. POR, 29-30. Rather, it interprets “contact” to be a conductive vertical member extending through the stack that may function as an interconnect *if* put to that use. After all, “dummy” suggests that the contact may, in fact, be inoperable. Banerjee-Reply, ¶¶ 68-69.

Second, although unclear, PO appears to advance a construction that requires the “conductive contact” to electrically connect to an adjoining structure (e.g., a blob

of doped polysilicon in the substrate, *see infra*), but not necessarily to a peripheral device. POR, 29-31. This argument must fail because the specification does not even hint at such an embodiment. PO relies on figure 2L. That figure shows a “conductive contact” 244 that does not connect to any adjoining structure. Dr. Kuhn admits that the specification does not describe the bottom of 244 connecting to an adjoining structure that would enable current flow, because the specification never describes any doping in that region. Ex. 1041, 21:12-21 (need doping), 28:3-29:4 (same), 72:1-19 (does not describe doping in region 118), 74:22-75:21 (same), 78:7-14 (same), 89:10-90:14 (no doping), 87:20-89:25 (same), 133:24-134:10 (according to PO, doping needed for structure to qualify as a “contact”). And rather than saying that an adjoining structure would be understood to be on top of 244, Dr. Kuhn said the opposite: the specification does not indicate whether there would be such an adjoining structure. *Id.*, 76:15-78:2. In short, PO’s construction requires “a little block of doping” on the bottom of contact 244 that the ’872 patent never describes. *Id.*, 87:20-89:25. And PO’s assertion that the top of conductive contact 244 is “exposed” and thus could contact an adjoining structure there (POR, 30-31) does not withstand scrutiny, because its own expert admits that nothing is shown on the top of the contact. *Id.*, 76:15-78:2; Banerjee-Reply, ¶ 70.

Next, PO attempts to sidestep the Board’s finding in the Institution Decision. The Board found that because the specification uses permissive language when

describing that the “conductive contact” may function as an interconnect, it is improper to construe the term to require this function. ID, 23. Recognizing that the Board was correct, PO now argues that “(e.g., contact 244)” in 16:63-66 refers to an example of a “conductive material to form an interconnect.” POR, 31. But it also admits that this sentence means that the contact “may or may not function as an interconnect.” *Id.*, 31. PO’s argument makes no sense, because it rewrites the sentence into referring to an interconnect that may or may not be an interconnect: “contact 244,” i.e., “conductive material to form an interconnect,” “[may or may not function] as an interconnect.” Banerjee-Reply, ¶ 71.

As can be seen, PO improperly is attempting to construe “conductive contact” to mean an “interconnect.” Dr. Kuhn recognizes that the ’872 patent uses “interconnect” to refer to an element that electrically connects two elements. Ex. 1041, 34:8-24, 159:24-161:21, 163:9-164:20; Ex. 1001, 5:40-43 (“*In some embodiments*, one or more dummy source structures are in contact with the substrate *and may provide interconnect* between the 3D memory device and peripheral devices.”), 11:47-50 (same), 16:63-67 (same). But the specification never states or suggests a “conductive contact” must interconnect two elements. Thus, it would be legal error to interpret “conductive contact” contrary to its specification’s description and, instead, as “interconnect.” *Acumed LLC v. Stryker Corp.*, 483 F.3d 800, 807

(Fed. Cir. 2007) (finding that the specification illustrated that patentee knew how to limit claims, but did not do so); Banerjee-Reply, ¶ 72.

Third, PO's citation to extrinsic evidence does not stand for proposition that a conductive contact must function as an electrical interconnect. POR, 33; Banerjee-Reply, ¶¶ 73. First, PO cites a definition for "electrical contact," not contact. *Id.* Dr. Kuhn admits "electrical contact" refers to an "interconnect," and the '872 patent does not limit "conductive contact" to an "interconnect" (*see above*). Ex. 1041, 35:14-37:13. Second, PO cherry picks from two definitions of "contact." The first (Ex. 2009) also includes "or a part or device by which such a connection is made" and the second (Ex. 2010) also includes "[a] part or device which serves to open or close an electric circuit. Such a part or device may or may not act with another part or device." POR, 33. This is precisely what the conductive core does, because it provides a conductive path through the stack, which may or may not make an electrical connection depending on whether it functions as an interconnect. Nothing about these definitions (other than an electrical contact) requires that the contact perform as an interconnect. If it did (it doesn't), it is legally irrelevant, because it contradicts the specification (*see above*). *Tempo Lighting, Inc. v. Tivoli, LLC*, 742 F.3d 973, 977 (Fed. Cir. 2014) (finding error in relying on "extrinsic evidence that was inconsistent with the more reliable intrinsic evidence").

Importantly, PO ignores the file history. The Applicant added this limitation to overcome the prior art. When doing so, the Applicant did not ascribe any functional property to it or identify any adjoining structure, but distinguished the prior art by focusing solely on its internal structure, i.e., the core: “Nothing in Jeong’s pillar is conductive contact, as the pillar consists of insulating layers, a semiconductor pattern, and a charge storage layer. By contrast, as explained at paragraph [0057] of the present application: ‘In some embodiments, dummy source structure 178 includes a dummy source hole filled with conductive materials as a contact 179.’ Ex. 1002, 514-15; Banerjee-Reply, ¶ 65.

III. TESSARIOL

A. Claim 1

Although PO spends much time addressing Tessariol’s conductive vias (POR, 55-58), the Petition demonstrates (and the Board preliminarily agreed) that Tessariol’s dummy vias both disclose and render obvious the “conductive contact” limitation. Pet., 90-91; ID, 22-24.

1. Tessariol’s Dummy Vias Disclose a “Conductive Contact”

First, PO relies on its incorrect construction of “conductive contact” in attempting to distinguish Tessariol’s dummy vias. POR, 59-60. This construction fails for the reasons set forth above in §II.C. PO’s position also is internally inconsistent. Although PO cites the ’872 specification at 16:63-66 to argue that Tessariol’s dummy via’s must “function as an interconnect,” PO elsewhere admits

in the POR that this same portion of the specification recites an optional requirement for a “conductive contact.” *Compare* POR, 32 *with id.*, 59.

Second, PO argues that Tessariol’s dummy vias cannot permit current flow (i.e., operate as an interconnect), because they land on a substrate and have no connection at top. POR, 60. The Board should reject this argument because it relies on PO’s erroneous construction of “conductive contact.” §II.C. The argument also fails because it asks more of the prior art than the ’872 patent discloses. As §II.C demonstrates, the “conductive contact” of Figure 2L lands on a substrate (with no description of any doping) and has no connection on top.⁴ PO characterizes Tessariol’s dummy vias in the same way. POR, 59-60. As such, they cannot be distinguished from the ’872 patent’s conductive contacts. Banerjee-Reply, ¶ 76.

Finally, even if PO’s construction was correct, Tessariol discloses it. Banerjee-Reply, ¶ 78. Tessariol’s dummy vias do not just land on a substrate (POR, 60), rather they land on “conductively-doped semiconductor substrate.” Ex. 1006,

⁴ PO’s attempt to highlight, with reference to Figure 2L, an alleged “exposed conductive contact 244” in the ’872 patent is disingenuous. POR, 59. Figure 2L of the ’872 patent obviously does not depict a complete device, because not does not show any layers on top. Banerjee-Reply, ¶ 77. Just like Figure 2L, Tessariol’s dummy via has an “exposed” top during manufacture. Ex. 1006, Fig. 12.

[0028]. This is precisely the doped material that Dr. Kuhn described as what would qualify as an “adjoining structure” because it allows current flow. Ex. 1041, 87:20-89:25, 133:24-134:10.

2. Tessariol’s Dummy Vias Render Obvious a “Conductive Contact”

Even if an “adjoining structure” on Tessariol’s dummy vias were a claim requirement (it’s not), the Petition demonstrates that it would have been obvious to include an “adjoining structure” (e.g., above interconnect structure, *see* Ex. 1006, Fig. 16), because it simplifies processing and reduces cost. Pet., 90-91.

PO argues that Dr. Banerjee’s testimony is conclusory. POR, 62. Not so. As Dr. Banerjee explains, including the interconnects on top of the dummy vias allows for simultaneous processing and saves costs. Banerjee, ¶¶ 204, 216. This is not controversial. Dr. Kuhn admits that by including the interconnects on the dummy vias, this allows for a consistent, repeating interconnect pattern, which simplifies design and fabrication and enables other benefits. Ex. 1041, 32:11-19, 107:21-108:12, 177:1-179:15.⁵ It was well known that a consistent pattern is easier to

⁵ PO’s cites to Dr. Kuhn’s declaration (¶¶ 203-205), but those paragraphs are merely a copy of the Petition (which is inconsistent with her sworn testimony) and should be given no weight. The irregular pattern, as she recognizes in her deposition, is

fabricate. Banerjee-Reply, ¶¶ 80-82.

Tessariol supports this interpretation, as the dummy structures only “may” comprise an electrical dead end. Ex. 1006, [0068]. If these were operable, these would connect to peripheral devices under the substrate. *Id.*, [0027], [0039]; Banerjee-Reply, ¶ 83. If they were left inoperable but simply include the top contact to simplify manufacturing per above (they would remain with an electrical dead end). *Id.*

B. Claims 3 and 4

PO argues that Tessariol’s figures cannot demonstrate that these limitations are met. POR, 65-66. As an initial matter, PO misstates the law. *Hockerson-Halberstadt* holds that it is improper to rely on prior art figures—without more—for “precise proportions” and “particular sizes.” *Hockerson-Halberstadt, Inc. v. Avia Group Int’l*, 222 F.3d 951, 956 (Fed. Cir. 2000). Relative dimensions, however, are properly decipherable from figures. *See Synopsys, Inc. v. ATopTech, Inc.*, 685 F. App’x 951, 954 (Fed. Cir. 2017). And the Petition demonstrates that Tessariol’s figures indicate, in relative terms, that the dummy vias are an equal distance from the staircase contact. Pet., 65-67.

more difficult to fabricate and requires irregular masking patterns. Banerjee-Reply, ¶ 82.

Next, PO fails to appreciate Tessariol's complete disclosure when it suggests that Tessariol is "silent" as to dummy via configuration. POR, 65. Tessariol discloses: "Openings 54 and 56 are shown as being collectively arrayed in straight-line rows and columns. However, any alternate configuration may be used including, for example, staggering (not shown) alternating openings 54/56 in rows and/or columns." Ex. 1006, [0037]. In other words, Tessariol expressly discloses that dummy via pattern is a uniform pattern, as shown in the figures. Banerjee-Reply, ¶ 86.

Finally, claims 3 and 4 relate to the "nominal" distance, which the '872 patent defines as: "a desired, or target, value of a characteristic or parameter for a component or a process operation, set during the *design phase* of a product or a process, *together with a range of values above and/or below the desired value.*" Ex. 1001, 4:9-15. In other words, this claim relates to "designed" values and does not recite final, specific dimensions. Thus, Tessariol's figures, which reflect its "design," are alone sufficient to satisfy this limitation. Banerjee-Reply, ¶ 85.

IV. PARK

A. Claim 1

1. Park's Dummy and Common Source Lines Surround the Staircase Contact

First, PO argues that Park's dummy and common source lines cannot surround the staircase contact because the staircase contact is only between those

lines. POR, 40-42. As §II.A-B demonstrates, the question is not whether the staircase contact is “between” Park’s lines, but whether Park’s lines “surround” the staircase contact. As §II.A-B further demonstrates, the ’872 patent expressly discloses that the dummy source structure may assume the form of Park’s lines that divide the array, and Park’s lines “surround” the staircase contact to a greater degree than express embodiments of the ’872 patent.

Second, PO argues that Park’s common source lines cannot surround the staircase contact because these lines are similar to prior art GLSs for the gate-replacement process. POR, 42-44; Ex. 1001, 5:1-48. What led to allowance was that the “dummy source structures” had a conductive contact, not that they had a particular shape. Pet., 21-22. What’s more, the ’872 specification and file history expressly state that the dummy source structures may be laterally-extending members, just like GLSs. *Id.*, 22 (citing file history), 26 (citing specification); Banerjee-Reply, ¶ 88.

2. Park’s Common Source Lines Are “Dummy Source Structures”

PO argues that Park’s common source lines are not dummy source structures, because they function as a source. POR, 45-47. As §II.A.2 demonstrates, the Board should reject the negative claim limitation on which this argument depends.

B. Claims 2 and 11

POR relies on importing its negative limitation into “dummy source structure,” and its arguments fail for the same reasons. §II.A.2.

C. Claims 3 and 4

PO argues that neither of Park’s (1) dummy source lines and (2) source lines are “nominally equal lateral distances to the staircase contact.” POR, 48-49. As an initial matter, PO misstates the law. *See* §III.B. The Petition demonstrates that these figures indicate, in relative terms, that each set of lines is equal distance from the staircase contact. Pet., 65-67.

Moreover, claims 3 and 4 relates to the “nominal” distance, which the ’872 patent defines, e.g., during “design.” *See* §III.B. Thus, the figures of Park, which represent the “design,” are alone enough to satisfy this limitation. In fact, Park expressly recognizes its figures are just a design, stating that variations may result due to “manufacturing techniques.” Ex. 1005, 4:65-5:17; Banerjee-Reply, ¶ 91.

D. Claim 5

PO raises the same argument about “surrounding” that it made for claim. It fails here for the same reasons. §II.B.

E. Claim 6

PO argues that the common source lines cannot be in a row from “east to west” because they extend through the cell region. POR, 52. This is irrelevant, however, because PO does not dispute the Petition’s definition of a “row.” Pet., 69

(“a number of objects arranged in a usually straight line”). Under that definition, the source lines indisputably are “objects” (like match sticks) arranged in a straight line from east to west. Banerjee-Reply, ¶ 93.

V. CONCLUSION

For the foregoing reasons above, and those set forth in the Petition and supporting exhibits, the '872 patent's claims are unpatentable as obvious.

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

The undersigned certifies that the foregoing Petitioner's Reply complies with the type volume limitation in 37 C.F.R. § 42.24. 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 5,466 words.

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CERTIFICATE OF SERVICE

The undersigned hereby confirms that the foregoing Petitioner's Reply and associated exhibits were caused to be served on April 25, 2024 via electronic mail, upon the following attorneys of record for the Patent Owner:

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