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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte STEFAN SCHWAB
and HERBERT HUTTER

Appeal 2019-004821
Application 15/371,554
Technology Center 1700

Before LINDA M. GAUDETTE, GEORGE C. BEST, and
DEBRA L. DENNETT, *Administrative Patent Judges*.

DENNETT, *Administrative Patent Judge*.

DECISION ON APPEAL¹

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant² appeals from the
Examiner's decision to reject claims 1, 2, 4–22, and 28–33 of Application

¹ In our Decision, we refer to the Specification (“Spec.”) of Application No. 15/371,554 filed Dec. 7, 2016 (“the ’554 App.”); the Final Office Action dated May 16, 2018 (“Final Act.”); the Appeal Brief filed Jan. 11, 2019 (“Appeal Br.”); the Examiner’s Answer dated Apr. 1, 2019 (“Ans.”); and the Reply Brief filed May 31, 2019 (“Reply Br.”).

² We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as INFINEON TECHNOLOGIES AUSTRIA AG. Appeal Br. 2.

15/371,554, which constitute all the claims pending in this application. We have jurisdiction under 35 U.S.C. § 6(b).

For the reasons set forth below, we AFFIRM IN PART.

According to the '554 Application, smaller semiconductor devices cause an increasing risk that migrating ions will reach, for example, the gate oxide, leading to a shift in the threshold voltage and possibly a failure of the device. Spec. ¶ 2. To address this issue, the subject matter of the invention relates to semiconductor devices having a barrier and an encapsulation for a semiconductor device that provide improved barrier or ion getter properties. Spec. ¶ 3.

Claim 1, reproduced below from the Claims Appendix of the Appeal Brief, illustrates the claimed subject matter:

1. A semiconductor device, comprising:
 - a first semiconductor chip comprising a semiconductor substrate;
 - a barrier layer disposed at least on, in or at a portion of the first semiconductor chip; and
 - an encapsulation enclosing the first semiconductor chip and the barrier layer,wherein the barrier layer comprises a polymer material and an organic metal complexing agent covalently bound to the polymer material.

REFERENCES

The Examiner relies on the following references:

Name	Reference	Date
Wong	US 4,278,784	July 14, 1981
Takahashi et al. ("Takahashi")	US 5,287,000	Feb. 15, 1994
Krieger et al. ("Krieger")	US 2003/0173612 A1	Sept. 18, 2003
Amano et al. ("Amano") ³	JP 2002-359326 A	Dec. 13, 2002

REJECTIONS

The Examiner maintains the rejections under 35 U.S.C. § 103⁴ of (1) claims 1, 2, 4–7, 9–12, 14–22, and 28–33 over Amano in view of Wong; and (2) claims 1, 2, 4, 5, 7, 8, 12–17, and 19–21 over Krieger in view of Takahashi. Final Act. 2–5.

DISCUSSION

*Rejection of claims 1, 2, 4–7, 9–12, 14–19 as obvious over Amano in view of Wong*⁵

Appellant argues that the rejection of claims 1, 2, 4–12, and 14–19 over Amano in view of Wong is an improper group rejection that discusses

³ The Examiner relies on a computer translation of Amano, to which Appellant has not objected. *See* Final Act. 2; *see generally* Appeal Br. and Reply Br.

⁴ Because this application was filed after the March 16, 2013, effective date of the America Invents Act, we refer to the AIA version of the statute.

⁵ In the Answer, the Examiner withdrew the earlier rejection of claim 8 over Amano in view of Wong. Ans. 3.

some features of claim 1, but does not address the specific requirements of dependent claims,⁶ thus depriving Appellant of any meaningful opportunity to respond to the rejection. Appeal Br. 12–13.

In the Final Office Action, the Examiner finds that Amano teaches a sealing resin layer is disposed on a portion of a semiconductor chip that catches ions, but fails to teach that the sealing layer has an organic metal complexing agent covalently bound to the polymer material. Final Act. 2. The Examiner finds that Wong teaches a polymeric silicone sealant for semiconductor devices that prevents mitigation of ions and comprises a 2.2.1-cryptand or a 2.2.2-cryptand covalently bound to a silicone polymer. *Id.* The Examiner also finds that Wong’s Examples teach the claim 9 amounts. *Id.* The Examiner concludes that it would have been obvious to use Wong’s sealing layer as the sealing layer of Amano to prevent mitigation of ions. *Id.*

In the Answer, the Examiner states that Appellant has not provided any specific arguments against the rejection, thus the Board should maintain the rejection. Ans. 7. The Examiner notes that the Final Office Action states “Wong teaches the claimed amount of claim 9 (Examples).” *Id.* In contrast to the Final Office Action, in the Answer, the Examiner finds that “Wong is used for the encapsulation,” without further comment. *Compare* Final Act. 2, *with* Ans. 7.

The Examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a prima facie case of unpatentability. *In re*

⁶ Appellant separately argues for patentability of claim 8 over Amano in view of Wong, but the rejection is withdrawn, making Appellant’s argument moot as to claim 8. *See* Appeal Br. 9–11, Ans. 3.

Oetiker, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If the Examiner meets that burden, Appellant bears the burden of coming forward with evidence or argument in rebuttal. *Id.* However, where, as here, the references cited by the Examiner fail to establish a prima facie case of obviousness, the rejection is improper and will be overturned. *In re Fine*, 837 F.2d 1071, 1074 (Fed. Cir. 1988).

The Examiner fails to substantiate that all limitations of claims 1, 2, 4–7, 9–12, and 14–19 are disclosed in the cited references or would have been obvious to one of ordinary skill in the art before the filing date of the claimed invention. Specifically, the Examiner fails to substantiate any disclosure of *both* the barrier layer and the encapsulation required by independent claims 1 and 19. *See* Final Act. 2; Ans. 7. The Examiner’s single sentence in the Answer that “Wong is used for the encapsulation” is insufficient in light of the Examiner’s earlier reliance on Wong for teaching sealants comprising specific cryptands to meet the *barrier layer* limitation. *Compare* Ans. 7, *with* Final Act. 2.

Because the rejection is not sufficient to render independent claims 1 and 19 obvious, it is likewise insufficient to render the claims depending from claim 1 obvious. In particular, contrary to the Examiner’s finding that “Wong teaches the claims amount of claim 9 (Examples)” (Final Act. 2), nothing in Wong’s Examples teaches or suggests “wherein a concentration of the organic metal complexing agent covalently bound to the polymer material is in a range of 1 mol of the organic metal complexing agent per 200 g of the polymer material to 1 mol of the organic metal complexing agent per 1,500,000 g of the polymer material,” as required by claim 9. *See* Appeal Br. 15 (Claims App.).

We do not sustain the rejection of claims 1, 2, 4–7, 9–12, and 14–19 over Amana in view of Wong.

Rejection of claims 20–22 as obvious over Amano in view of Wong

Claim 20 is independent and is identical to claim 1 except that claim 20 requires the encapsulation—rather than the barrier layer—comprises a polymer material and an organic metal complexing agent covalently bound to the polymer material. *Compare* Appeal Br. 14 (Claims App.), *with id.* at 17. Claims 21 and 22 depend from claim 20.

The Examiner’s findings in relation to claims 20–22 are substantially the same as the findings in relation to claim 1. *Compare* Final Act. 2, *with id.* at 3.

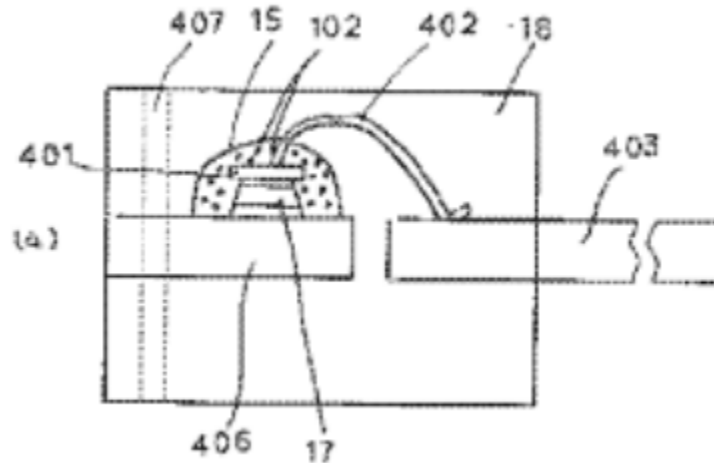
Importantly, Appellant fails to address the patentability of claims 20–22 over Amano in view of Wong in the Appeal Brief. *See generally* Appeal Br. Therefore, we summarily affirm the rejection of claims 20–22 over Amano in view of Wong. *See Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (cited with approval in *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011)) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the [E]xaminer’s rejections.”).

Rejection of claims 28–33 as obvious over Amano in view of Wong

Claim 28 recites, *inter alia*, “a barrier layer . . . having an opening or interruption which exposes a contact area at the first surface of the semiconductor chip.” Appeal Br. 18 (Claims App.). Unlike the other independent claims, claim 28 does not require both a barrier layer and an encapsulation.

Appellant argues for patentability of independent claim 28, but does not make separate arguments for its dependent claims 29–33. Appeal Br. 5–9. Claims 29–33 stand or fall with claim 28. 37 C.F.R. § 42.37(c)(1)(iv).

The Examiner relies on Amano’s Figure 5(a) to teach the “opening or interruption” limitation. *See* Ans. 4. Amano’s Figure 5 is reproduced below:



Amano’s Figure 5(a) is a cross sectional view of a semiconductor device disclosed in the reference. Amano ¶ 52. Amano states that mesa-type chip 17 is joined to leadframe 406 and to electrode plate 401 with solder. *Id.* Wire 402 is spot welded to cathode lead terminal 403 and electrode plate 401. *Id.* Surface protection film 15 of polyimide resin with ion-exchange resin 102 uniformly mixed in is formed and a resin seal is carried out by a transfer mold thereafter. *Id.*

The Examiner finds that Amano’s Figure 5 demonstrates the presence of a bond wire (402) that goes through a barrier layer (102) to contact a semiconductor (17). Ans. 4. The Examiner finds that an opening or interruption in the barrier layer must be present for the wire to be able to contact the semiconductor. *Id.* The Examiner finds that the wire would not

be able to contact the semiconductor chip if the barrier layer completely covered the semiconductor chip. *Id.* at 5.

Appellant’s argument for nonobviousness is limited to whether Amano discloses “an opening or interruption which exposes a contact area.” *See* Appeal Br. 5–9; Reply Br. 2–3. Appellant contends “Amano’s sealing resin layer 102 does not *expose* any ‘contact area.’” Reply Br. 2; *see also* Appeal Br. 8. According to Appellant, Amano’s wire contacts the surface of the semiconductor chip, and the sealing resin layer completely covers the surface of the semiconductor chip outside of the wire, thus the sealing resin layer seals the semiconductor chip. *Id.*; *see also* Appeal Br. 8 (“[T]he chip 17 and the electrode plate 102 are *completely encapsulated* by the sealing resin layer 102.”).

Appellant argues that the Examiner’s interpretation of “opening or interruption” misapplies the broadest reasonable interpretation standard for claim construction. Reply Br. 2. More specifically, Appellant argues that the Specification indicates that “the opening or interruption 326 can be configured to *provide a contact area* for the bond wire 310 to contact the semiconductor component 110. Specifically, the opening or interruption 326 *can expose a portion of the semiconductor component 110* to provide the contact area.” *Id.* at 3 (quoting Spec. ¶ 75).

Appellant’s argument is unpersuasive.

“During examination ‘claims . . . are to be given their broadest reasonable interpretation consistent with the specification, and . . . claim language should be read in light of the specification as it would be interpreted by one of ordinary skill in the art.’” *In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). Absent any special definitions, we give claim terms their ordinary and customary meaning, as would be

understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007); *see also TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016) (“Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history.”). Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Our review of the Specification reveals that it does not provide any special meaning for the claim term “opening or interruption.” The *Merriam-Webster Dictionary* defines “interruption” as “a break in the continuity of something.”⁷ Furthermore, the Specification supports that the opening or interruption merely allows a bond wire to be attached to the contact area. *See Spec.* ¶ 75. Thus, the Examiner’s interpretation of the hole in Amano’s resin 102 through which bond wire 402 passes when welded to electrode plate 401 and cathode lead terminal 403 as the claimed “opening or interruption” is entirely consistent with the broadest reasonable interpretation of the term.

Moreover, claim 28 is drawn to a semiconductor device, not a process for making a semiconductor device. Appellant’s argument essentially attempts to insert a stepwise process into the claim: *first* an opening exposing a contact area is formed in a barrier layer, *then* an electrical conductor is connected to the contact area. Even were such limitation present, it would not add a patentable distinction when the claimed product

⁷ *Merriam-Webster Dictionary* (2020) available at <https://www.merriam-webster.com/dictionary/interruption>.

is the same as the cited art's product. *See In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985).

The Examiner's finding supports a prima facie case of obviousness of claim 28 over Amano in view of Wong that Appellant does not successfully rebut. We affirm the rejection of claim 28 over Amano in view of Wong. For the same reasons, we also affirm the rejection of claims 29–33 which depend from claim 28.

Rejection of claims 1, 2, 4, 5, 7, 8, 12–17, and 19–21 as obvious over Krieger in view of Takahashi

The Examiner finds that Krieger teaches semiconductor memory devices with a layer that is disposed between two semiconductor chips wherein the layer comprises a claimed polymer with covalently bound ether groups, but fails to teach claimed encapsulation. Final Act. 4. The Examiner relies on Takahashi as teaching addition of a resin encapsulation to a semiconductor memory device. *Id.* The Examiner determines that it would have been obvious to one of ordinary skill in the art to add a resin encapsulation as taught by Takahashi to the semiconductor memory device of Krieger to improve the yield, electric reliability, operation and speed, and heat resistance. *Id.* at 5. The Examiner specifically addresses claim 17 in the Answer. *See* Ans. 8. Claim 17 depends from claim 1 and further recites “wherein the semiconductor device is a power semiconductor device.” Appeal Br. 16 (Claims App.). The Examiner finds that “power semiconductor device” is merely a recitation of intended use and does not provide additional structural requirements. Ans. 8.

As with the similar rejection over Amano in view of Wong, the Examiner states that Appellant has not provided any specific arguments against the rejection, thus the Board should maintain the rejection. *Id.* at 7.

For all claims in the rejection except claim 8, Appellant argues that the rejection is an improper group rejection that ignores the numerous, unique features of the dependent claims. Appeal Br. 13. Appellant makes a separate argument for patentability of claim 8 over Krieger in view of Takahashi. *Id.* at 11–12.

A *prima facie* case of obviousness may be shown where structural similarities exist between the claimed and prior art compositions and reason or motivation exists to make the claimed composition. *In re Dillon*, 919 F.2d 688, 692 (Fed. Cir. 1990) (en banc) (“[T]he structural similarity between claimed and prior art subject matter, proved by combining references or otherwise, where the prior art gives reason or motivation to make the claimed compositions, creates a *prima facie* case of obviousness.”); *In re Best*, 562 F.2d 1252, 1255–56 (Fed. Cir. 1977); *In re Wilder*, 429 F.2d 447, 450 (CCPA 1970).

Here, the Examiner’s findings support a *prima facie* case of obviousness of claims 1 and 17 over Krieger in view of Takahashi. Appellant’s argument fails to rebut such finding. *In re Crish*, 393 F.3d 1253, 1259 (Fed. Cir. 2004) (quoting *In re Spada*, 911 F.2d 705, 708 n.3 (Fed. Cir. 1990)) (“[W]hen the prior art evidence reasonably allows the PTO to conclude that a claimed feature is present in the prior art, the evidence ‘compels such a conclusion if the applicant produces no evidence or argument to rebut it.’”).

The Examiner’s findings are insufficient to demonstrate *prima facie* obviousness of claims dependent on claim 1 (claims 2, 4, 5, 7, 8, and 12–

17), independent claims 19 and 20, and dependent claim 21—all of which recite limitations not addressed by the Examiner in the Final Office Action or Answer. *See generally* Final Act., Ans.

We sustain the rejection of claims 1 and 17 as obvious over Krieger in view of Takahashi, but do not sustain the rejection of claims 2, 4, 5, 7, 8, 12–17, and 19–21 over the same references.

DECISION SUMMARY

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 2, 4–7, 9–12, 14–22, 28–33	103	Amano, Wong	20–22, 28–33	1, 2, 4–7, 9–12, 14–19
1, 2, 4, 5, 7, 8, 12–17, 19–21	103	Krieger, Takahashi	1, 17	2, 4, 5, 7, 8, 12–16, 19–21
Overall Outcome			1, 17, 20–22, 28–33	2, 4–16, 18, 19

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED IN PART