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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JUN KOYAMA and SHUNPEI YAMAZAKI

Appeal 2019-003568
Application 14/016,264
Technology Center 2600

Before JAMES R. HUGHES, LINZY T. McCARTNEY, and
JOYCE CRAIG, *Administrative Patent Judges*.

CRAIG, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant appeals from the Examiner’s Final decision to reject claims 21 and 27–37.¹ *See* Final Act. 1. We have jurisdiction under 35 U.S.C. § 6(b). An Oral hearing was held on June 11, 2020.

We reverse.

¹ We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies Semiconductor Energy Laboratory Co., Ltd., as the real party in interest. Appeal Br. 3.

CLAIMED SUBJECT MATTER

The claims are directed to a liquid crystal display device, a method for driving the same, and an electronic device including the same. Spec. ¶ 1.

Claim 21, reproduced below, is illustrative of the claimed subject matter:

21. A display device comprising:
a plurality of pixels each comprising a transistor comprising an oxide semiconductor in a channel formation region,
wherein the oxide semiconductor comprises In, Ga and Zn,
wherein the display device is configured to display a still image with a refresh rate less than 60Hz, and
wherein an off-current of the transistor is less than or equal to 1×10^{-12} A when voltage between a drain and a source of the transistor is 10V.

REJECTION

Claims 21, 27, 30, 31, 34, and 35 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Kimura (US 2006/0267889 A1, published Nov. 30, 2006), Itoh et al. (US 5,844,535, issued Dec. 1, 1998) (“Itoh”), and Nishimura et al. (US 5,514,880, issued May 7, 1996) (“Nishimura”). Final Act. 4–9.

Claims 28, 32, and 36 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Kimura, Itoh, Nishimura, and Darius et al. (US 2002/0084444 A1, published July 4, 2002) (“Darius”). Final Act. 9–10.

Claims 29, 33, and 37 stand rejected under 35 U.S.C. § 103(a) as unpatentable over the combination of Kimura, Itoh, Nishimura, and Aiba et

al. (US 2009/0272970 A1, published Nov. 5, 2009) (“Aiba”). Final Act. 10–11.

ANALYSIS

Appellant’s Specification describes that, by drastically removing hydrogen contained in an oxide semiconductor in a thin film transistor which includes a highly purified oxide semiconductor in a channel formation region, the amount of off-state current can be significantly reduced. Spec. ¶ 65. The Specification also describes that a thin film transistor including low-temperature polysilicon is designed on the assumption that off-state current is about 10,000 times as high as that of a thin film transistor including an oxide semiconductor. *Id.* ¶ 66.

The Examiner found that the combination of Kimuru, Itoh, and Nishimura teaches or suggests the limitation “wherein an off-current of the transistor is less than or equal to 1×10^{-12} A when voltage between a drain and a source of the transistor is 10V,” as recited in claim 21. Final Act. 4–5. The Examiner found that “Kimura as modified by Itoh and Nishimura, discloses using an oxide semiconductor [thin film transistor] at a higher source to drain off-current at 3 volts.” *Id.* at 5. The Examiner found that Figure 2 of Nishimura teaches off-currents that progressively increase as voltage increases. Ans. 4. The Examiner further found that the data depicted in Nishimura Figure 2 “could ultimately be extrapolated to still be less than the claimed 1×10^{-12} at 10 volts.” *Id.*

The Examiner concluded that it would have been obvious to an artisan of ordinary skill to provide a thin film transistor with lower off-current, as Nishimura teaches the desirability of small off-current. *Id.* In so concluding, the Examiner relied on the holding in *In re Aller*, 220 F.2d 454 (CCPA

1955), which, according to the Examiner, held that “where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art.” Final Act. 5.

Appellant argues there is insufficient rationale for predictably combining the isolated disclosures of Kimura’s oxide semiconductor material, Itoh’s alleged still image refresh rate, and Nishimura’s different off-current to predictably achieve an operable device with specified “off-current” as recited in claim 21. Appeal Br. 13. Nishimura discloses a transistor using poly-silicon. *Id.* at 15; Nishimura col. 17:58–59. Appellant contends the Examiner erred in choosing an alleged property of the silicon transistor in Nishimura, which is “an entirely different material both chemically and electrically,” and applying it to Kimura’s oxide semiconductor transistor without adequate evidence in support of the predictability of such a combination. Appeal Br. 13–14.

Appellant also argues that Nishimura teaches a certain off-state current that is not within the claimed range. *Id.* Specifically, Appellant points to Nishimura’s teaching of a “minus” (negative) current between the source and drain regions to attain a value of “-15 fA” or less per channel width of 1 μm if a voltage of “-3V” is applied across source and drain and a voltage of “0V” is applied to the gate, which differs from the requirements of claim 21. Appeal Br. 15; Nishimura col. 9:28–38.

According to Appellant, one of ordinary skill in the art would readily understand that off-state current is a characteristic that would be changed not only dependent on its specific material, but also its manufacture, and there is no guidance as to how the non-overlapping range of off-current in Nishimura’s different material could somehow be relevant to the entirely different material of Kimura and further

manipulated down to the extremely low range of off-state current claimed.

Appeal Br. 14.

Appellant's arguments persuade us of error. The Examiner found that claim 21 recites the "structure" of an oxide semiconductor taught by Kimura, and Nishimura teaches the desirability of reducing off-current consumption, teaching a different value at a different voltage in a different material. *See* Ans. 4. We do not see, however, where the prior art teaches how to achieve optimal or working ranges to meet the claimed "off-current." The Examiner stated that the claimed range of the property "off-current" would be routine in the art, but has not provided evidence in support of that conclusion. Here, the Examiner's proffered combination of references is not merely "the predictable use of prior art elements according to their established functions," consistent with common sense. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

As set forth in *In re Aller*, relied on by the Examiner, the general rule is that discovery of an optimum value of a variable in a known process is normally obvious. *In re Aller*, 220 F.2d at 456 ("Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."). One exception to this rule is that the discovery of the optimum or workable range of a variable will not be deemed to have been obvious unless the variable was known to be "result-effective." *See In re Antonie*, 559 F.2d 618, 620 (CCPA 1977). Here, the Examiner provided no findings as to how Nishimura indicates that a particular parameter proposed to be optimized is a result-effective variable. *See* Ans. 4.

Thus, on the record before us, we conclude that an artisan of ordinary skill would not have reasonably combined the cited references in the manner proffered by the Examiner without having the benefit of Appellants' claims and/or Specification to use as a guide.

For these reasons, we are persuaded that the Examiner erred in concluding that claim 21 is obvious in view of Kimura, Itoh, and Nishimura. The Examiner did not find that either Darius or Aiba teaches or suggests the disputed limitation missing in Nishimura.

Accordingly, we reverse the Examiner's 35 U.S.C. § 103(a) rejection of independent claim 21, as well as the Examiner's 35 U.S.C. § 103(a) rejection of independent claims 30 and 34 for the same reasons. App. Br. 8, 17. Because we have reversed the rejection of each of the independent claims, we also reverse the Examiner's 35 U.S.C. § 103(a) rejection of dependent claims 27–29, 31–33, and 35–37. *Id.*

Because we find it dispositive that the Examiner lacked “articulated reasoning with some rational underpinning to support the legal conclusion of obviousness,” we do not address other issues raised by Appellant's arguments related to these claims. *See Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (Finding an administrative agency is at liberty to reach a decision based on “a single dispositive issue.”).

DECISION

We reverse the Examiner's decision rejecting claims 21 and 27–37.

DECISION SUMMARY

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
21, 27, 30, 31, 34, 35	103(a)	Kimura, Itoh, Nishimura		21, 27, 30, 31, 34, 35
28, 32, 36	103(a)	Kimura, Itoh, Nishimura, Darius		28, 32, 36
29, 33, 37	103(a)	Kimura, Itoh, Nishimura, Aiba		29, 33, 37
Overall Outcome:				21, 27-37

REVERSED