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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* NICOLAS DUPUIS, BENJAMIN G. LEE, ALEXANDER V.  
RYLYAKOV, and MEHMET SOYUER

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Appeal 2018-003900  
Application 14/746,573  
Technology Center 2600

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Before JEAN R. HOMERE, IRVIN E. BRANCH, and  
MICHAEL J. ENGLE, *Administrative Patent Judges*.

BRANCH, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE<sup>1</sup>

Pursuant to 35 U.S.C. § 134(a), Appellant<sup>2</sup> appeals from the Examiner’s decision to reject claims 1–10, which are all of the pending claims. *See* Final Act. 1. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

CLAIMED SUBJECT MATTER

The claims are directed to optical switching with low crosstalk between the outputs of a Mach-Zehnder switch. Spec. ¶¶ 3–4. Claim 1, reproduced below with disputed limitations emphasized in *italics*, is illustrative of the claimed subject matter:

1. A method for optical switching, comprising:  
    setting a phase shift in a first branch of an optical switch;  
    *measuring a loss incurred on the first branch;*  
    setting an attenuation in a second branch of the optical switch to match the measured loss;  
    measuring a crosstalk at an output of the optical switch; and  
    when the measured crosstalk exceeds a crosstalk threshold, activating a heater on one of the first or second branch to reduce the crosstalk.

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<sup>1</sup> We refer to the Specification, filed June 22, 2015 (“Spec.”); Final Office Action, mailed May 17, 2017 (“Final Act.”); Appeal Brief, filed October 11, 2017 (“Appeal Br.”); Examiner’s Answer, mailed January 23, 2018 (“Ans.”); and Reply Brief, filed March 1, 2018 (“Reply Br.”).

<sup>2</sup> 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 International Business Machines Corporation. Appeal Br. 4.

## REFERENCES

The prior art relied upon by the Examiner is:

<b>Name</b>	<b>Reference</b>	<b>Date</b>
Wang	Wanjun Wang et al., <i>Mach-Zehnder Based 2x2 Electro-Optical Switches on Silicon-On-Insulator with Lo Crosstalk</i> , IEEE 2012	
Shirasaki	US 6,317,526 B1	Nov. 13, 2001
Chiba	Akita Chiba, et al., <i>Low-Crosstalk Balanced Bridge Interferometric-Type optical switch for Optical Signal Routing</i> , IEEE Journal Of Selected Topics In Quantum Electronics, Vol. 19, No. 6, November/December 2013	
Okamoto	US 2014/0375999 A1	Dec. 25, 2014
Rylyakov	Alexander V. Rylyakov, et al., <i>Silicon photonic switches Hybrid-Integrated with CMOS Drivers</i> , IEEE Journal OF Solid-State Circuits, Vol. 47, No. 1, January 2012	

## REJECTIONS

Claims 1, 2, 3, 5, 6, 7, and 10 stand rejected under 35 U.S.C. § 103 as unpatentable over Wang, Chiba, and Shirasaki. Final Act. 3–8.

Claim 4 stands rejected under 35 U.S.C. § 103 as unpatentable over Wang, Chiba, Shirasaki, and Okamoto. Final Act. 9.

Claims 8 and 9 stand rejected under 35 U.S.C. § 103 as unpatentable over Wang, Chiba, Shirasaki, and Rylyakov. Final Act. 10–11.

## ANALYSIS

We have reviewed the Examiner’s rejections in light of Appellant’s arguments. We have considered in this Decision only those arguments Appellant actually raised in the Briefs. Any other arguments Appellant

could have made but chose not to make in the Briefs are deemed to be waived. *See* 37 C.F.R. § 41.37(c)(1)(iv).

To the extent consistent with our analysis herein, we adopt as our own the findings and reasons set forth by the Examiner in (1) the action from which this appeal is taken (Final Act. 3–11) and (2) the Examiner’s Answer in response to Appellant’s Appeal Brief (Ans. 2–11) and concur with the conclusions reached by the Examiner. We highlight the following for emphasis.

35 U.S.C. § 103

*Claim 1*

Claim 1 recites “measuring a loss incurred on the first branch” of an optical switch. The Examiner finds the combination of Wang, Chiba, and Shirasaki discloses the cited claim limitation. Final Act. 4 (citing Wang p. 300, ll. 11–12, Fig. 1); *see* Ans. 3–5.

Appellant argues error as follows:

Those having ordinary skill in the art will recognize that a Mach-Zehnder switch has three regions: an input, an output, and a coupled region where the input signals are mixed before being separated into output signals. This general structure is shown in FIG. 2 of the present specification. The switch operates by adjusting the phase of the signals in the two branches of the coupled region, such that the interference between the two signals results in only one output signal leaving the switch.

. . . It would be physically impossible to measure a loss incurred on the first branch based on the outputs, as the signals mix before reaching Wang’s optical monitors.

Thus, no matter which branch one selects as Wang’s “first branch,” the loss incurred on that branch cannot be measured at the output by the optical monitors. Any loss measured at the

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output will reflect a combination of losses in *both* of the coupled branches.

Appeal Br. 10.

We find Appellant’s arguments unpersuasive. First, the claim does not recite a Mach-Zehnder switch, which is the basis of Appellant’s arguments. Moreover, Appellant fails to direct our attention to—and we do not ascertain any support for—what one of ordinary skill in the art would have understood about such a switch, including whether measuring loss incurred on the first branch based on the outputs “would be physically impossible.” Arguments of counsel cannot take the place of factually supported objective evidence. *See, e.g., In re Huang*, 100 F.3d 135, 139–40 (Fed. Cir. 1996); *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984). Accordingly, we find Appellant’s arguments are unsupported by sufficient evidence or explanation to be persuasive. Thus, because Appellant’s have not persuasively rebutted the Examiner’s rejection, on this record, we sustain the rejection of claim 1.

*Claim 6*

Claim 6 depends from claim 1 and recites “activating a second heater on the other of the first or second branch if activating the first heater failed to reduce crosstalk.”

Appellant argues “Shirasaki uses the second heater to change between in-phase and out-of-phase more quickly, without any concern as to whether the activation of the heaters affects crosstalk.” Appeal Br. 11.

We find this argument unpersuasive for the reasons stated by the Examiner. Ans. 6–7. We additionally note that “if activating the first heater failed to reduce crosstalk” is a conditional limitation. We note that the first heater failing to reduce cross talk is a condition precedent to the step of

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activating the second heater, which need not be performed in the broadest reasonable construction of claim 6 if the condition is not triggered. *See, e.g., Applera Corp. v. Illumina, Inc.*, 375 F. App'x 12, 21 (Fed. Cir. 2010) (unpublished) (affirming a district court's interpretation of a method claim as including a step that need not be practiced if the condition for practicing the step is not met); *Cybersettle, Inc. v. Nat'l Arbitration Forum, Inc.*, 243 F. App'x 603, 607 (Fed. Cir. 2007) (unpublished) ("It is of course true that method steps may be contingent. If the condition for performing a contingent step is not satisfied, the performance recited by the step need not be carried out in order for the claimed method to be performed."). Here, the Examiner has explained instances of the prior art teaching or suggesting both (A) the condition precedent and the conditional step being met (e.g., turning on one heater causes the temperatures of the two branches to differ and create crosstalk, so Shirasaki teaches turning on both heaters to match the temperatures and reduce crosstalk) and (B) the condition precedent not being met (e.g., when both branches start at different temperatures, turning on only one heater to match temperatures, which reduces crosstalk). Ans. 6–7 (citing Shirasaki 13:39–48, 10:3–13, Fig. 14).

Therefore, on this record, we sustain the Examiner's rejection of claim 6.

#### *Claim 10*

Claim 10 depends from claim 1 and recites "adjusting the crosstalk threshold after activating the heater."

Appellant contends "there is no mention in Shirasaki of *adjusting* this number, nor of doing so *after* activating the heater." Appeal Br. 12.

The Examiner responds as follows:

Shirasaki et al disclose that the crosstalk of the switch 78 as shown in figure 11 is maintained at 0.01 % ( $10^{-4}$ ), see column 11, lines 5–10. The optical switch 78 of figure 11 discloses a heater 40 on the path P1, the heater 40 on the path P1 is heated to make the lights in the path P1 and P2 in-phase, see column 10, lines 36–41. Furthermore, when the light travelling through the paths P1 and P2 is in phase, the crosstalk is minimized, see column 10, lines 3–13. Therefore since the crosstalk of the switch 78 is maintained at 0.01 % ( $10^{-4}$ ), the heater 40 on the path P1 on the optical switch 78 adjusts and hence maintains the cross talk of optical switch 78 by maintaining the lights in the path P1 and P2 in-phase.

Ans. 7.

Appellant argues “[t]he Examiner does not point to any time at which the purported threshold of 0.01% is in any way adjusted” and “[e]ven if, *arguendo*, such an adjustment were discussed, there is clearly nothing in the cited art to address the recited temporal relationship of adjusting the threshold *after* activating the heater.” Reply Br. 5.

We are persuaded of error. Appellant does not dispute that Shirasaki discloses “maintaining” the crosstalk at a specific value. *See generally id.* Moreover, Appellant does not dispute that Shirasaki discloses a heater. *Id.* So we find no basis to assume that Shirasaki precludes maintenance of the crosstalk during specific time periods, i.e., “after activating the heater.”

We do, however, agree with Appellant that “[t]he Examiner does not point to any time at which the purported *threshold* of 0.01% is in any way adjusted.” *Id.* (emphasis added). The Examiner’s finding that Shirasaki’s maintenance of the crosstalk in the switch *is* the threshold (Final Act. 8) is not supported by substantial evidence.

Accordingly, on this record, we do not sustain the rejection of claim 10.

*Claim 4*

Appellant argues claim 4 only on the basis that Okamoto does not cure the deficiencies of claim 1, from which claim 4 depends. Because, we are unpersuaded of deficiencies with respect to the rejection of claim 1, we see no error in the rejection of claim 4.

*Claim 8–9*

Appellant first argues claims 8 and 9 on the basis that Rylyakov does not cure the deficiencies of claim 1, from which claims 8 and 9 depend. Because we are unpersuaded of deficiencies with respect to the rejection of claim 1, we see no error in the rejection of claims 8 and 9 on this basis.

Appellant additionally argues claim 8. Claim 8 depends from claim 1 and recites “the tunable attenuator comprises a forward biased *pin* diode.” Appellant argues claim 8 on the additional basis that Rylyakov does not disclose “wherein the tunable attenuator comprises a forward biased *pin* diode,” as recited in claim 8, because “the *pin* diode of Rylyakov is clearly labeled as being a *phase shifter*” and “[s]uch a phase shifter cannot be fairly interpreted as reading on the tunable attenuator of the *second branch* when the phase shifter is explicitly recited in claim 1 as being in the first branch.” Appeal Br. 16–17.

The Examiner responds that “Rylyakov discloses an optical switch with a forward biased pin diode providing a voltage dependent change in the optical phase, see section IIIA, lines 4–6 and figure 4A. Therefore the forward biased pin diode resulting in change (variation) voltage dependen[t] change can be interpreted as variable optical attenuator.” Ans. 11.

Appellant responds as follows:

It is worth noting that claim 1 recites that the attenuation is set in the second branch (i.e., not the first branch, which has the phase

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shift). Thus, the Examiner has failed to show or suggest how the phase shifter in Rylyakov can be fairly interpreted as a tunable attenuator disposed on a branch other than that of the phase shifter.

Reply Br. 7.

We find Appellant's argument unpersuasive of error for failing to persuasively rebut the Examiner's rejection. "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981); *see also In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983) ("[I]t is not necessary that the inventions of the references be physically combinable to render obvious the invention under review."); *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973) ("Combining the *teachings* of references does not involve an ability to combine their specific structures."). Here, Appellant's argument is unpersuasive because whether "attenuation is set in the second branch" does not undermine the Examiner's finding that Rylyakov's "forward biased pin diode . . . can be interpreted as variable optical attenuator." Ans. 11.

Moreover, claim 8 depends from claim 7 and Appellant does not separately argue claim 7, for which the Examiner found that Wang discloses a "variable optical attenuator (VOA) at the *second* arm." Final Act. 8 (emphasis added) (citing Wang Fig. 2).

Accordingly, we are unpersuaded of error in the Examiner's rejection of claim 8.

*Remaining Claims*

Because Appellant does not argue the rejections of the remaining claim separately with particularity, we sustain the rejections of those claims.

CONCLUSION

In view of the foregoing, we affirm the Examiner's decision to reject claims 1–10.

DECISION SUMMARY

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1, 2, 3, 5, 6, 7, 10	103	Wang, Chiba, Shirasaki	1, 2, 3, 5, 6, 7	10
4	103	Wang, Chiba, Shirasaki, Okamoto	4	
8, 9	103	Wang, Chiba, Shirasaki, Rylyakov	8, 9	
<b>Overall Outcome:</b>			1–9	10

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). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED-IN-PART