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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TOR ERIK JEREMIASSEN and JOSEPH RAYMOND ZBICIAK

Appeal 2010-009165
Application 11/381,614
Technology Center 2100

Before KRISTEN L. DROESCH, HUNG H. BUI, and GEORGIANNA W. BRADEN, *Administrative Patent Judges*.

BUI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants¹ seek our review under 35 U.S.C. § 134(a) of the Examiner's final rejections of claims 1-7. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.²

¹ Real Party in Interest is Texas Instruments Incorporated.

² Our decision refers to Appellants' Appeal Brief filed November 13, 2009 ("App. Br."); Reply Brief filed April 1, 2010 ("Reply Br."); Examiner's Answer mailed February 2, 2010 ("Ans."); Final Office Action mailed January 5, 2009 ("FOA"); and the original Specification filed May 4, 2006 ("Spec").

STATEMENT OF THE CASE

Appellants' Invention

According to Appellants, their invention relates to branch prediction in pipelined digital signal processors with a very long instruction word (VLIW) architecture. *Spec.* 2:4-10, 6:1-5, and Abstract.

Claims on Appeal

Claim 1 is independent and is representative of the invention, as reproduced below with disputed limitations emphasized:

1. A method of branch prediction in a data processor with pipelined operation including plural pipeline phases having at least one conditional branch instruction that branches conditional on the state of a corresponding general purpose register serving as a predicate register comprising the steps of:

directly reading a corresponding predicate register state for a conditional branch instruction without intervention of a branch target buffer during a pipeline phase before said state is guaranteed correct;

performing a first comparison of said early read of said predicate register state with a branch condition;

predicting a conditional branch instruction taken/not taken based on said comparison;

speculatively executing a branch target instruction if said conditional branch instruction is predicted taken;

speculatively executing an instruction following conditional branch instruction if said conditional instruction is predicted not taken;

reading said predicate register state corresponding to said conditional branch instruction during a pipeline phase when said state is guaranteed correct;

performing a second comparison of said predicate register state with said branch condition; and

confirming or disaffirming said branch prediction based on said second comparison.

Evidence Considered

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Gschwind	U.S. 6,513,109 B1	Jan. 28, 2003
Park	U.S. 2003/0023959 A1	Jan. 30, 2003

David I. August et al., *Architectural Support for Compiler-Synthesized Dynamic Branch Prediction Strategies: Rationale and Initial Results*, pp. 84-93, IEEE 1997.

Examiner's Rejection

(1) Claims 1-3, 6, and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Examiner's combination of August, Park, and Gschwind. Ans. 4-9.

(2) Claims 4 and 5 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Examiner's combination of August, Park, Gschwind, and Appellants' Admitted Prior Art (AAPA). Ans. 10-11.

§ 103(a) Rejection of Claims 1-3, 6, and 7 over August, Park and Gschwind

Regarding independent claim 1, the Examiner finds that August discloses or suggests all of the limitations of claim 1, except for a disclosure

of: (1) a general purpose register that serves as a predicate register and (2) reading a predicate register state without intervention of a branch target buffer. Ans. 4-6. The Examiner finds, however, that: (1) Park discloses a general purpose register serving as a predicate register (Ans. 6 citing Park, ¶¶[0065] and ¶¶[0132]) and (2) Gschwind discloses reading the predicate register state without intervention of a branch target buffer (Ans. 7 citing Gschwind, col. 11, l. 63 – col. 12, l. 12).

The Examiner then concludes that it would have been obvious to (1) combine the branch prediction scheme using predicate values in predicate registers as disclosed by August with the general purpose registers serving as predicate registers as disclosed by Park and (2) replace the reading of the predicate register, via the branch target buffer (BTB), as disclosed by August with the direct reading of the predicate register as disclosed by Gschwind. *Id.* 7-8. The Examiner also concludes that a person of ordinary skill in the relevant art would have had a reason to combine teachings of August, Park, and Gschwind to “increase the speed of the predicate register read.” *Id.* 7.

ISSUES

Based on Appellants’ arguments, the dispositive issue is whether the Examiner has erred in rejecting claims 1-3, 6 and 7 under 35 U.S.C. § 103(a) over the combination of August, Park, and Gschwind. In particular, the issue turns on:

(1) Whether the combination of August, Park, and Gschwind discloses or suggests the limitation of “directly reading a corresponding predicate register state for a conditional branch instruction without intervention of a branch target buffer during a pipeline phase before said

state is guaranteed correct,” as recited in independent claim 1 (App. Br. 8-9; Reply Br. 1-3); and

(2) Whether the combination of August, Park, and Gschwind discloses or suggests the limitation of “said step of reading a predicate register state for said conditional branch instruction during said pipeline phase before said state is guaranteed correct comprises reading said predicate register state during a same pipeline phase as instruction decoding of said conditional instruction,” as recited in claim 6 (App. Br. 9-10; Reply Br. 4-6).

ANALYSIS

We have reviewed the Examiner’s rejections in light of Appellants’ arguments that the Examiner has erred.

We disagree with Appellants’ contentions as to all rejections. We adopt as our own (1) the findings and reasons set forth by the Examiner in the action from which this appeal is taken, and (2) the reasons set forth in the Examiner’s Answer in response to Appellants’ Appeal Brief. We also concur with the conclusions reached by the Examiner. We further highlight and address specific findings and arguments for emphasis as follows.

Independent Claim 1

Appellants contend that the combination of August, Park, and Gschwind does not disclose or suggest the limitation of “directly reading a corresponding predicate register state for a conditional branch instruction without intervention of a branch target buffer during a pipeline phase before

said state is guaranteed correct,” as recited in independent claim 1. App. Br. 8-9; Reply Br. 1-3. In particular, Appellants argue:

(1) Gschwind et al. [only] teaches *predicated execution* [which is] *related but not identical to the branch prediction using a predicate* [register], recited in claim 1; and

(2) [t]eaching reading a predicate register in predicated execution [as disclosed by Gschwind] fails to make obvious reading a predicated register in predicated conditional branch [as disclosed by Appellants].

App. Br. 8 (emphasis added).

At the outset, we note that the Examiner has made extensive specific fact findings with respect to independent claim 1. *See* FOA. 3-7; Ans. 4-9. In response thereto, Appellants simply assert that these references do not disclose the disputed limitation of Appellants’ independent claim 1. App. Br. 8-9. Appellants do not contest the Examiner’s factual findings regarding August, Park, and Gschwind relative to other limitations of claim 1. Nor do Appellants present any arguments to explain why the Examiner’s factual findings are in error. As such, we will not review those uncontested aspects of the rejection. *See* App. Br. *passim*; *see also Ex Parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (the BPAI “reviews the obviousness rejection[s] for error based upon the issues identified by appellant, and in light of the arguments and evidence produced thereon,” and treats arguments not made as waived); *Ex parte Cabral*, No. 2010-001572, 2012 WL 683718, at *3 (BPAI 2012) (non-precedential); and *In re Lovin*, 652 F.3d 1349, 1357 (Fed. Cir. 2011) (“[T]he Board reasonably interpreted Rule 41.37 to require more substantive arguments in an appeal brief than a mere recitation of the

claim elements and a naked assertion that the corresponding elements were not found in the prior art.”).

Regarding the disputed limitation of Appellants’ independent claim 1, we do not find Appellants’ arguments persuasive to demonstrate reversible error in the Examiner’s position. *See In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011). First, August discloses branch prediction in a pipelined processor in which predicate registers are used to control branch prediction. Ans. 4-6. Second, and contrary to Appellants’ contention, Gschwind discloses not only predicated execution but also branch prediction, as correctly noted by the Examiner. Ans. 12; *also see* Gschwind, col. 8, ll. 43-56. Separate predictors may be used for predicate execution and branch prediction. *Id.* In addition, like Park, Gschwind also discloses that predicated registers used for branch prediction are general purpose registers, as recited in Appellants’ claim 1. *See* Gschwind, col. 7, ll. 64-65 and col. 11, ll. 64-65.

In considering August and Gschwind, it is proper to take into account not only specific teachings of August and Gschwind, but also the inferences that one skilled in the art would reasonably be expected to draw therefrom. *In re Preda*, 401 F.2d 825 (1968). In this regard, an inference can be drawn from August and Gschwind that a corresponding predicate register state is read for branch prediction, and, absence of any evidence to the contrary, such a reading is performed without intervention of a branch target buffer during a pipeline phase before said state is guaranteed correct. FOA 5; Ans. 7; *also see* Gschwind, col. 11, ll. 63-67 and col. 12, ll. 1-14. As such, we agree with the Examiner’s findings that the disputed limitation of Appellants’ claim 1 is disclosed or suggested by August and Gschwind.

We also note that:

[T]he 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 the 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”). The August-Gschwind combination discloses the disputed limitation of Appellants’ claim 1.

For the reasons set forth above, Appellants have not persuaded us of error in the Examiner’s rejection of independent claim 1 under 35 U.S.C. § 103(a) as being unpatentable over August, Park, and Gschwind.

Dependent Claim 6

Appellants contend that the combination of August, Park, and Gschwind does not disclose or suggest the limitation of “said step of reading a predicate register state for said conditional branch instruction during said pipeline phase before said state is guaranteed correct comprises reading said predicate register state during a same pipeline phase as instruction decoding of said conditional instruction,” as recited in claim 6. App. Br. 9-10; Reply Br. 4-6. In particular, Appellants argue that claim 6 recites:

unconditional recall of data from the predicate register at a fixed time related to the predicated instructions, “during a same pipeline phase as instruction decoding of said conditional instruction.”

App. Br. 10. In addition, Appellants further argue that relevant portions of Gschwind only disclose storing an indication that the predicate register is unavailable rather than Appellants' claimed "unconditional read" as recited in claim 6. *Id.*

However, we are not persuaded since Appellants' arguments are not commensurate with the scope of claim 6. Neither "unconditional recall of data" nor "unconditional read" is recited in Appellants' claim 6, and we decline to read the argued limitations into claim 6. Moreover, we agree with the Examiner's findings that the read is performed during the instruction decode phase of the pipeline in the manner recited in Appellants' claim 6. Ans. 14-15. Therefore, in view of these reasons, we also sustain the Examiner's rejection of claim 6 under 35 U.S.C. § 103(a) over August, Park, and Gschwind.

Dependent Claims 2-5 and 7

Appellants present no arguments for patentability of these claims separately from claim 1. App. Br. 11. As such, claims 2-5 and 7 stand or fall together with independent claim 1. *See* 37 C.F.R. § 41.37(c)(1)(vii) (stating that "the failure of Appellant to separately argue claims which Appellant has grouped together shall constitute a waiver of any argument that the Board must consider the patentability of any grouped claim separately"). Therefore, we also sustain the Examiner's rejection of claims 2-5 and 7 under 35 U.S.C. § 103(a) over August, Park, and Gschwind.

CONCLUSION

On the record before us, we conclude that the Examiner has not erred in rejecting claims 1-7 under 35 U.S.C. § 103(a).³

DECISION

As such, we affirm the Examiner's final rejection of claims 1-7.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2011).

AFFIRMED

ELD

³ In the event of further prosecution, we leave it to the Examiner to evaluate claims 1-7 for compliance with 35 U.S.C. § 101 in view of recent Supreme Court decision in *Bilski v. Kappos*, 130 S.Ct. 3218, 3221 (2010), MPEP revised § 2106.01 (August 2012), and post-Bilski application under § 101, including *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366, 1371 (Fed. Cir. 2011) (holding that a method for verifying the validity of a credit card transaction over the Internet to be nonstatutory as an abstract idea capable of being performed in the human mind or by a human using a pen and paper) and *Dealertrack, Inc. v. Huber*, 674 F.3d 1315, 1333-34 (Fed. Cir. 2012) (“Simply adding a ‘computer aided’ limitation to a claim covering an abstract concept, without more, is insufficient to render [a] claim patent eligible.” (citation omitted)).