

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte WEI C. HSU and MANUEL BENITEZ

Appeal 2007-1247
Application 10/222,014
Technology Center 2100

Decided: October 29, 2007

Before LANCE LEONARD BARRY, HOWARD B. BLANKENSHIP, and
STEPHEN C. SIU, *Administrative Patent Judges*.

SIU, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's Final Rejection of claims 1-12. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

A. INVENTION

The invention at issue involves a run-time optimization system. In the prior art, run-time optimizations were guided using emulators and control loops. During emulation, control loops designate blocks of code as hot code based on a predetermined number of executions of the blocks of code in the emulators. (*Spec.* 1). Traces derived from the blocks of code include management of branch instructions. Optimized code is placed into a cache. (*Id.* 2). However, emulation can be time-consuming and such systems have often been complex and unreliable. (*Id.* 3).

In contrast, Appellants' invention provides for a run-time optimization system in which control loops are placed in hardware and translation or optimization components are placed in firmware (*Id.* 4).

B. ILLUSTRATIVE CLAIMS

Claims 1 and 6, which further illustrate the invention, follow.

1. A system for optimizing a portion of a program during run-time of the program, the system comprising:

a hardware portion for detecting which instructions of the program are more frequently executed and maintaining a history of targets chosen by branch instructions of the program;

a software portion for forming an optimized trace of instructions from the most frequently executed instructions and using the history in making branch predictions for branch instructions encountered in forming the trace; and

a trace memory portion that stores the optimized trace.

6. The system of claim 1, wherein

the hardware portion includes an instruction cache with a first portion that maintains a plurality of values, each indicating a number of executions of a particular instruction of the program, and a second portion that stores information detailing performance of branch instructions of the program; and

the software portion includes a trace selector that forms the trace and is invoked when the one value of the plurality of values reaches a predetermined number, and the trace selector begins the trace with the instruction associated with the one counter and ends the trace with an instruction selected by a predetermined criteria.

C. REJECTIONS

Claims 1-5 and 7-11 stand rejected under 35 U.S.C. § 102(e) as anticipated by U.S. Patent No. 6,205,545 ("Shah"). Claims 6 and 12 stand rejected under 35 U.S.C. § 103(a) as obvious over Shah.

II. CLAIMS 1-5 AND 7-11

"When multiple claims subject to the same ground of rejection are argued as a group by appellant, the Board may select a single claim from the group of claims that are argued together to decide the appeal with respect to the group of claims as to the ground of rejection on the basis of the selected claim alone. Notwithstanding any other provision of this paragraph, 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." 37 C.F.R. § 41.37(c)(1)(vii) (2006).¹

¹ We cite to the version of the Code of Federal Regulations in effect at the time of the Appeal Brief. The current version includes the same rules.

Here, Appellants argue claims 1-5 and 7-11, which are subject to the same ground of rejection, as a group. (App. Br. 5-7). We select claim 1 as the sole claim on which to decide the appeal of the group.²

"Rather than reiterate the positions of parties *in toto*, we focus on the issue therebetween." *Ex Parte Filatov*, No. 2006-1160, 2007 WL 1317144, at *2 (BPAI 2007). The Examiner indicated that claim 1 is deemed to be fully met by the disclosure of Shah. (Ans. 3-4). Appellants argue that Shah does not disclose a hardware portion but rather performs the claimed invention using software implementation constructs (App. Br. 5). Appellants further argue that "one of ordinary skill in the art would recognize that the 'hardware' [recited in claim 1] . . . is properly considered to be hardware logic configured to perform the recited functions without the use of software" (Reply Br. 6). As rationales in support of this contention, Appellants state that because of the "juxtaposition of the terms 'hardware' and 'software' in claim 1," one of ordinary skill in the art would understand that "Appellant intended for them to have different definitions," and that one of ordinary skill in the art reading the specification would understand that the claimed feature excludes software running on underlying hardware. (*Id.* 7)

The Examiner finds, on the other hand, that software-implemented components of Shah inherently run on underlying hardware and thus constitute a "hardware portion." (Ans. 8).

² Although Appellants place claims 7 through 11 in a different heading in the Appeal Brief, and repeat language from claim 7, Appellants rely on the same argument with respect to deficiencies in Shah as applied against claim 1.

We find insufficient evidence in the record before us that the term “hardware” as recited in claim 1 refers solely to “hardware logic configured to perform functions without the use of software” (Reply Br. 7) as asserted by Appellants. Appellants rely, for support of the argument, on paragraphs 11 and 28 of the specification. (*Id.*). The specification discloses, however, a control loop “in hardware” (spec. 4), a “run-time optimization system (RTOS) embedded into the hardware” (*id.* 5), and distributing “the different aspects of the RTOS work to the mechanism, i.e., hardware or firmware, best suited to handle the work.” (*Id.* 7). We do not find any limiting definition for the word “hardware” in the specification’s description of the embodiments. Nor has any extrinsic evidence been presented supporting the contention of how one of ordinary skill in the art would have interpreted the term “hardware” in claim 1.

Further, while instant claim 1 requires a “hardware portion” and a “software portion,” the claim does not preclude the “hardware portion” being aided by software in performing the associated functions. Nor, for that matter, does the claim preclude the “software portion” being aided by hardware.

Appellants do not contest the Examiner’s assertion that “software must be run on some form of hardware” (Reply Br. 6), but instead argue that one of ordinary skill in the art would understand that the hardware as recited in claim 1 “perform[s] functions without the use of software.” (*Id.* 7). However, in the absence of extrinsic support of this contention and upon review of the record before us, we agree with the Examiner that it is reasonable to conclude that, given that “software must be run on some form of hardware,” one of ordinary skill in the art would have understood that the

“hardware portion” as recited in claim 1 may also include software that runs on the hardware.

We find that Appellants’ arguments are not commensurate with the scope of instant claim 1. “An essential purpose of patent examination is to fashion claims that are precise, clear, correct, and unambiguous. Only in this way can uncertainties of claim scope be removed, as much as possible, during the administrative process.” *In re Zletz*, 893 F.2d 319, 322 (Fed. Cir. 1989). Moreover, our reviewing court has repeatedly warned against confining the claims to specific embodiments described in the specification. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc).

It therefore follows that the Examiner has not been shown to err in rejecting claim 1 as being anticipated by Shah. We therefore affirm the Examiner’s rejection of claim 1, and that of claims 2-5 and 7-11, which fall with claim 1.

As an additional matter, even assuming the term “hardware” would be interpreted by one of ordinary skill in the art as asserted by Appellants, claim 1 must satisfy other criteria for patentability, including non-obviousness. *See Diamond v. Diehr*, 450 U.S. 175, 191 (1980). In the present case, the system of claim 1 would merely perform known functions through the sole use of hardware rather than through the use of software or a combination of hardware and software. The routine application of hardware to the performance of known processes performed with the use of software has typically been found to be obvious. *See Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1161 (Fed. Cir. 2007)(“Accommodating … prior art … to modern electronics would have been reasonably obvious to one of ordinary skill in [the art]” because applying modern electronics to known

prior art teachings “has been commonplace for recent years.”). Thus, it may be that claim 1 is unpatentable under 35 U.S.C. 103(a), even if one were to assume its scope is limited to Appellants’ unduly narrow interpretation.³ However, we do not now decide this issue.

III. CLAIMS 6 AND 12

Appellants argue claims 6 and 12, which are subject to the same ground of rejection, as a group. (App. Br. 7). We select claim 6 as the sole claim on which to decide the appeal of the group.

The Examiner asserts that Shah discloses the recited features of claim 1 from which claim 6 depends. The Examiner further asserts that:

Strategies for identifying a trace are well known in the prior art, including maintaining a plurality of values, each indicating the number of executions of a particular instruction, and performing a trace when one value of the plurality of values reaches a predetermined number. (For example, Bala (US 6,351,844), col. 3, lines 2-12, 35-39.) (Ans. 6).

Appellants assert that Shah “fails to show all limitations of claims 6 and 12. For instance, claims 6 and 12 recite a hardware portion that includes certain features and a software portion that includes other features.” (App.

³ We further note that U.S. Patent No. 6,164,841 (“Mattson”) also discloses a method and apparatus for software optimization. Mattson explicitly discloses that “[i]t will be understood by those skilled in that art that ... an optimization tool, may be implemented in software, firmware, hardware, or any combination thereof.” Col. 7, ll. 37-40. Mattson further discloses that “references are made to various functional modules of the present invention that may be implemented either in software, hardware, firmware, or any combination thereof.” Col. 12, ll. 4-7. Thus, it may have been obvious to perform Shah’s method of software optimization using software, firmware, hardware, or any combination thereof, as demonstrated by Mattson.

Br. 8). Appellants do not specify which “other features” are supposedly not disclosed by Shah. Appellants also fail to comment on the Bala reference cited by the Examiner and do not contest the Examiner’s assertion that Bala demonstrates “well known” features in the prior art as recited in claim 6. Therefore, based on the record before us, we cannot conclude that specific features of claim 6 are not well known in the art or that Shah, Bala, or a combination thereof does not teach or suggest the features of claim 6.

Appellants also argue that the cited references do not “address the division of features between software and hardware portions.” (App. Br. 8). This issue was addressed above.

It follows that Appellants have failed to demonstrate that the Examiner erred in rejecting claim 6. Therefore, we affirm the obviousness rejection of claim 6 and of claim 12, which falls therewith.

IV. ADDITIONAL OBSERVATIONS

We note a possible issue with claims 6 and 12 under 35 U.S.C. 112, second paragraph. Claims 6 and 12 recite “the one counter” and “the one value of the plurality of values” which lack antecedent basis. It appears that “the one counter” and “the one value of the plurality of values” refer to the earlier recitation of “a plurality of values.”

V. ORDER

In summary, the rejection of claims 1-5 and 7-11 under § 102(e) and the rejection of claims 6 and 12 under § 103(a) are affirmed.

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

AFFIRMED

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