

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YEN-KUANG CHEN and HONG JIANG

Appeal 2007-0557
Application 09/717,500¹
Technology Center 2600

Decided: May 17, 2007

Before: ADRIENE LEPIANE HANLON, SALLY C. MEDLEY, and
JAMES T. MOORE, *Administrative Patent Judges*.

MEDLEY, *Administrative Patent Judge*.

DECISION ON APPEAL

1 **A. Statement of the Case**

2 Applicants appeal under 35 U.S.C. § 134 from a final rejection of
3 claims 1, 2, 4, 5, 7-14, 16, 18-24, and 26-34. We have jurisdiction under 35
4 U.S.C. § 6(b).

1 Application for patent filed 20 November 2000. The real party in interest is Intel Corporation.

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

3

4	Weiss	US 5,557,341	Sep. 17, 1996
5	Maturi	US 5,731,850	Mar. 24, 1998
6	Iizuka	US 6,167,090	Dec. 26, 2000
7	Rackett	US 6,567,469	May 20, 2003

8

9 Claims 1, 4, 5, and 11-13 stand rejected under 35 U.S.C. § 102(e) as
10 being anticipated by Rackett (Final Rejection 2 and Answer 3).

11 Claim 2 stands rejected under 35 U.S.C. § 103(a) as being
12 unpatentable over Rackett in view of Weiss (Final Rejection 4 and Answer
13 5).

14 Claim 7 stands rejected under 35 U.S.C. § 103(a) as being
15 unpatentable over Rackett in view of Maturi (Final Rejection 5 and Answer
16 5).

17 Claims 8-10, 14-16, and 19-22 stand rejected under 35 U.S.C. §
18 103(a) as being unpatentable over Rackett in view of Iizuka (Final Rejection
19 5 and Answer 6).

20 Claims 18, 23, 24, and 26-34 stand rejected under 35 U.S.C. § 103(a)
21 as being unpatentable over Rackett and Iizuka and further in view of Maturi
22 (Final Rejection 7 and Answer 8).

23 The invention is related to motion estimation for video encoding. The
24 motion estimation method performs multi-level rhombus searches for

1 matching blocks of pixels within two frames of video data being compressed
2 ('500 Specification 3, para. 13). The rhombus search is centered at the point
3 where the chosen block was located in a previous frame. At each point of
4 the rhombus, the block encompassing the point is tested to see if the block
5 matches the chosen block. The point with the best match becomes the center
6 of the rhombus pattern. Once the center block is the best match for the
7 chosen block, the rhombus pattern is narrowed, e.g., made smaller and the
8 search is repeated at a lower level ('500 Specification 4-5, paras. 19-20).

9 **B. Issue**

10 The issue before us is whether the Examiner has failed to sufficiently
11 demonstrate that Rackett teaches "the repositioning includes *narrowing the*
12 *search pattern* in response to a minimal residue vector being centered within
13 the search pattern" as required by all of the independent claims.

14 For the reasons that follow, we conclude that the Examiner has failed
15 to show that Rackett teaches "the repositioning includes *narrowing the*
16 *search pattern* in response to a minimal residue vector being centered within
17 the search pattern."

18 **C. Findings of fact ("FF")**

19 The record supports the following findings of fact as well as any other
20 findings of fact set forth in this opinion by at least a preponderance of the
21 evidence.

22 1. Applicants' claims 1, 2, 4, 5, 7-14, 16, 18-24, and 26-34 are the
23 subject of this appeal.

1 2. The Examiner finally rejected independent claim 1 as being
2 anticipated by Rackett.

3 3. The Examiner finally rejected independent claim 14 based on
4 the combination of Rackett in view of Iizuka.

5 4. The Examiner finally rejected independent claims 23 and 29
6 based on the combination of Rackett in combination with Iizuka and Maturi.

7

8 5. There are four independent claims involved in the appeal.

9 6. Claim 1, representative of the four independent claims, is
10 reproduced below with the language at issue italicized:

11 1. A method comprising:

12 positioning a search pattern relative to a first pixel block of a
13 first frame of video based on a motion vector;

14 comparing, based on a first predetermined criteria, a second
15 pixel block in a second frame of video with a set of pixel blocks from
16 the first frame at separate search points of the search pattern and the
17 first pixel block; and

18 repositioning the search pattern and repeating the comparing
19 and repositioning until a second predetermined criteria is achieved,
20 wherein the second predetermined criteria is related to a threshold
21 level of the first predetermined criteria, *the repositioning includes*
22 *narrowing the search pattern in response to a minimal residue vector*
23 *being centered within the search pattern.*

1 7. In the final rejection, the Examiner relied on Rackett to teach
2 "the repositioning includes narrowing the search pattern in response to a
3 minimal residue vector being centered within the search pattern" that is
4 recited in each of the four independent claims.

5 8. Specifically, the Examiner relied on the description found at
6 column 9, lines 22-37 of Rackett to teach narrowing the search pattern in
7 response to a minimal residue vector being centered within the search
8 pattern, which description is as follows:

9 In accordance with a fifth novel aspect of the present invention,
10 for each set of evaluations, the search range or scope is reduced,
11 e.g., only the motion vector candidates within a specified pixel
12 offset (search range), e.g., +/-four pixels, from the location of
13 the most recently identified "best" motion vector candidate, are
14 evaluated. This technique is based upon the observation that
15 since the overwhelming majority of optimal motion vectors will
16 have small vector values, it is extremely wasteful of processor
17 resources to evaluate six very remote candidates at the start of
18 every search sequence. Although a broader search range is very
19 effective in quickly identifying motion vectors with large vector
20 values, its speed in these infrequent cases comes at too high a
21 price. The reduced search range technique still results in
22 identification of the optimum motion vectors, in the majority of
23 the cases.

24
25 9. In response to the final rejection, Applicants argued that
26 Rackett reduces its search range based on a new set of evaluations, but does
27 not narrow a search pattern in response to a minimal residue vector being
28 centered within the search pattern (Appeal Brief at 8-9).

1 10. Applicants further argued that the Examiner incorrectly equated
2 the search range of Rackett with the claimed search pattern (Appeal Brief at
3 8).

4 11. The Examiner argued that:

5 In regards to the second part of the Appellant's argument,
6 the Appellant's application discloses the reducing of the search
7 range as an example of narrowing of the search pattern (Page 5
8 Paragraph [0020], Figures 1A-1D). As shown in the Figures,
9 the search pattern is narrowed by reducing the search range.
10 Rackett teaches the same narrowing of the search pattern in
11 order to obtain the optimum motion vectors (Col 9 Lines 22-27
12 and Lines 35-37). Therefore, the reducing of the search range
13 in order to narrow the search pattern as taught by Rackett has
14 been correctly interpreted as being equivalent to that taught by
15 the Appellant's application. (Examiner's Answer at 10-11).

16
17 12. Applicants responded and argued that paragraph 20 of its
18 specification does not disclose that a search pattern is narrowed by reducing
19 the search range (Reply Brief at 3).

20 13. Applicants also responded by discussing Applicants'
21 specification and arguing that:

22 [I]n Figs. 1(b) and 1(c), there are nine search points before the
23 narrowing and there are nine search points after the search
24 pattern is narrowed. Rackett does not disclose its search range
25 is reduced in this matter. Rather, the Rackett search pattern
26 remains unchanged and the Rackett search range loses its search
27 points after it is reduced. This is explained in Rackett, at col. 9,
28 lines 22-35, where only a specified pixel (search range) +/-
29 from the "best" motion vector, is evaluated. If the pixels or
30 search points fall out side of the specified pixel search range,
31 the search points are not evaluated. Therefore, Rackett loses its

1 search points after its search range is reduced. Because the
2 Rackett search range merely excludes search points from a
3 pattern from consideration, Rackett does not alter its search
4 pattern and thus does not narrow its search pattern as claimed in
5 Claim 1. (Reply Brief at 4).

6
7 14. Although the Examiner noted the Reply Brief, the Examiner did
8 not respond to the Applicants' arguments regarding the narrowing of the
9 search pattern.

10 **D. Analysis**

11 The examiner finally rejected: (1) independent claim 1 as being
12 anticipated under 35 U.S.C. § 102(e) by Rackett; (2) independent claim 14
13 as being unpatentable under 35 U.S.C. § 103 over Rackett in view of Iizuka;
14 and (3) independent claims 23 and 29 as being unpatentable under 35 U.S.C.
15 § 103 over Rackett and Iizuka further in view of Maturi. In both the
16 anticipation and the obviousness rejections, the examiner relied on Rackett
17 to teach "*narrowing the search pattern* in response to a minimal residue
18 vector being centered within the search pattern."

19 At issue is whether Rackett describes narrowing its search pattern.
20 Thus, if the Examiner has failed to sufficiently establish that Rackett
21 describes narrowing a search pattern, the rejections of all of the claims 1, 2,
22 4, 5, 7-14, 16, 18-24, and 26-34 must be reversed.

23 Each of the independent claims includes "narrowing the search
24 pattern" in response to a minimal residue vector being centered within the
25 search pattern. Applicants' search pattern is, for example, a rhombus having
26 nine points at its highest search level. The chosen block from a previous

1 frame is the rhombus center point ('500 Specification 4, para. 19). Each
2 point of the rhombus is tested to see if any point best matches the chosen
3 block. If so, the center of the rhombus is moved to the matching block.
4 Once the center block is the block that is the best match for the chosen
5 block, the search pattern is narrowed, e.g., the rhombus becomes smaller.

6 The limitation "narrowing the search pattern" is interpreted to mean
7 that the search pattern is made smaller. The narrowing of the search pattern
8 does not necessarily affect the number of points to be searched.

9 Based on the record, and as argued by Applicants (FFs 10, 12 and 13),
10 Rackett's search pattern is not narrowed, made smaller, or otherwise
11 changed. The search pattern remains the same, even though the search range
12 is reduced within the same search pattern. Rackett reduces its search range
13 by evaluating only those motion vector candidates within a specified pixel
14 offset, e.g., +/- four pixels, from the location of the most recently identified
15 "best" motion vector candidate (FF 8). In other words, Rackett reduces its
16 search range by evaluating fewer points within the same pattern, not by
17 *narrowing its search pattern* and evaluating points within the narrowed
18 search pattern.

19 The Examiner fails to provide a contrary explanation, and therefore
20 we cannot sustain the rejection of the claims 1, 2, 4, 5, 7-14, 16, 18-24, and
21 26-34. As applied by the Examiner, neither Iizuka nor Maturi make up for
22 the deficiencies of Rackett.

23 **E. Decision**

1 Upon consideration of the record, and for the reasons given, the
2 Examiner's rejections are reversed.

3 The Examiner's rejection of claims 1, 4, 5, and 11-13 under 35 U.S.C.
4 § 102(e) as being anticipated by Rackett is reversed.

5 The Examiner's rejection of claim 2 under 35 U.S.C. § 103(a) as
6 being unpatentable over Rackett in view of Weiss is reversed.

7 The Examiner's rejection of claim 7 under 35 U.S.C. § 103(a) as
8 being unpatentable over Rackett in view of Maturi is reversed.

9 The Examiner's rejection of claims 8-10, 14-16, and 19-22 under 35
10 U.S.C. § 103(a) as being unpatentable over Rackett in view of Iizuka is
11 reversed.

12 The Examiner's rejection of claims 18, 23, 24, and 26-34 under 35
13 U.S.C. § 103(a) as being unpatentable over Rackett and Iizuka and further in
14 view of Maturi is reversed.

REVERSED

Appeal 2007-0557
Application 09/717,500

JAMES T. MOORE, concurring

I agree with my colleagues that the rejections cannot be sustained, as Rackett, US 6,567,469 B1, has not been shown to describe “*narrowing the search pattern* in response to a minimal residue vector being centered within the search pattern.” However, to me, the record has not been made out sufficiently to determine whether such narrowing is nonetheless obvious within the meaning of 35 U.S.C. §103(a), especially in view of *KSR Int'l v. Teleflex Inc.*, 127 S. Ct. 1727, 82 USPQ2d 1385 (2007). Rackett seems to teach the desirability of reducing the search range or scope; the question is whether one of ordinary skill in the art would have known how to do it in the way now claimed of narrowing the search pattern. Upon resumption of prosecution, it would be desirable for the Examiner to address this issue.

cc (U.S. MAIL):

Thomas M. Coester
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, LLP
12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025

js