

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today  
(1) was not written for publication in a law journal and  
(2) is not binding precedent of the Board.

Paper No. 22

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte JEHOASHUA S. ROTSTAIN

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Appeal No. 96-3767  
Application 07/970,260<sup>1</sup>

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ON BRIEF

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Before THOMAS, FLEMING, and TORCZON, Administrative Patent Judges.

THOMAS, Administrative Patent Judge.

DECISION ON APPEAL

Appellant has appealed to the Board from the examiner's final rejection of claims 1, 4, 5, and 10 to 32, which constitute all the claims remaining in the application.

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<sup>1</sup> Application for patent filed November 2, 1992.

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Representative claim 1 is reproduced below:

1. A method of performing division operations, including the following steps:

inputting a dividend and a divisor;

determining whether a first value is present in a cache memory, the first value representing the value of the divisor;

reading a second value from the cache memory as a reciprocal of the divisor, the second value corresponding to the first value and representing the reciprocal of the first value, and finding the quotient by multiplying the second value and the dividend, in the event that the first value is determined to be present in the cache memory; and

finding the quotient of the dividend and the divisor by determining a reciprocal of the divisor and multiplying the reciprocal and the dividend, in the event that the first value is determined to not be present in the cache memory.

The following references are relied on by the examiner:

Sierra	3,648,038	Mar. 7, 1972
Richardson	5,260,898	Nov. 9, 1993 (filing date Mar. 13, 1992)

All claims on appeal stand rejected under 35 U.S.C. § 103. As evidence of obviousness, the examiner relies upon Richardson alone as to claims 10 to 12 and 20 to 22. As to claims 1, 4, 5,

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13 to 19 and 23 to 32, the examiner relies upon the collective teachings of Richardson and Sierra.<sup>2</sup>

Rather than repeat the positions of the appellant and the examiner, reference is made to the Briefs and the Answer for the respective details thereof.

#### OPINION

Both rejections under 35 U.S.C. § 103 are reversed.

Turning initially to the rejection of claims 10 to 12 and 20 to 22 under 35 U.S.C. § 103 in light of Richardson alone, independent claim 10 sets forth various conditions. Upon a determination of whether a first value is present in a cache memory, a further determination is made whether a second value is present in the same memory. Again, upon a determination that this second value is present in the cache memory a read operation is performed with the final result of finding the remainder of a quotient. Corresponding operations are performed in apparatus independent claim 20.

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<sup>2</sup> Page 2 of the Examiner's Answer indicates that the examiner has withdrawn a rejection of certain claims under 35 U.S.C. § 101 set forth in the Final Rejection.

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As a result of our study of Richardson and consideration with appellant's arguments, the examiner's position and the subject matter of these claims in this rejection, we essentially agree with the appellant's statements set forth here:

Claim 10 recites separate steps for determining the presence of each of the input dividend and divisor in the cache memory, and the step of determining whether the dividend is present in the cache memory is conditional upon the divisor being present in the cache memory. If both the divisor and the dividend are present in the cache memory, the quotient of the dividend and the divisor is read out from the cache memory and is used to find the remainder. Thus, a single cache access occurs, but the presence of the dividend and divisor is determined separately. (Brief, page 13)

Richardson fails to disclose the performance of a remainder operation. Furthermore, result cache look-ups in Richardson are performed using a single representation of the input operand pair, and Richardson does not teach or suggest that each operand of an operand pair may be searched for separately, as required by the present claims. (Brief, page 14)

Since we have reversed the rejection of independent claims 10 and 20, we also reverse the rejection of their respective dependent claims 11, 12, 21, and 22.

Turning lastly to the rejection of the remaining claims under 35 U.S.C. § 103 in light of the collective teachings of Richardson in view of Sierra, we reverse the rejection of independent claims 14, 16, 24, and 26 essentially for the reasons

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set forth with our reversal as to independent claims 10 and 20. Claims 14, 16, 24, and 26 set forth remainder operations based upon the conditional determinations of the type set forth in independent claims 10 and 20 on appeal. Even if we were to agree with the examiner of the proper combinability of Richardson and Sierra, Sierra fails to cure these noted deficiencies with respect to Richardson's teachings.

We turn lastly to independent claims 1, 4, 5, 30, and 31, which all recite in some form method or apparatus versions of division operations by multiplying reciprocals of divisors to yield a quotient. Inasmuch as Richardson fails to disclose the specifics of the divider circuits 140, such as in Figure 2, but only generally discloses this element, we agree with the examiner's position that it would have been obvious for the artisan to have utilized the specific arithmetic circuit shown in Sierra for performing the representative division operations only generally disclosed in Richardson.

However, we do not agree with the examiner's view expressed at page 5 of the Answer that it would have been obvious for the artisan to have provided "the cache memory [of Richardson] with a reciprocal function in order to quickly obtain the reciprocal of the divisor without redundantly recomputing the reciprocal in the

event that the divisor is determined to be present in the cache memory but not the dividend." In accordance with the last paragraph of column 2 of Richardson and the beginning paragraph of column 3, there are essentially parallel operations taking place in Richardson's circuits such as in representative Figure 1 where the result cache 10 is accessed contemporaneously with the functioning of the arithmetic circuit 40. If a "hit" occurs in the result cache 10, the halt signal 60 is issued to stop the operation in the arithmetic circuit 40.

Thus, even if it would have been obvious to combine the structure of Sierra to embody an arithmetic circuit in Richardson, it appears that the feature of determining whether a first value is present in a cache memory before other operations are taking place as set forth in independent claim 1 on appeal would not have been performed. It appears that the combination would have yielded their contemporaneous access to the cache memory at the same time that the reciprocal is being determined according to Sierra's teachings embodying the arithmetic circuit as substituted in Richardson from Sierra. Claim 1 is conditional in that if the first value is found in the cache the truncated cache operation occurs, but at the same time, the claim requires that if the first value is not present in the cache memory, a

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conventional reciprocal determination is then made. The combination of teachings does not yield this function in a relationship of the conditions set forth in this representative claim. As such, we are in general agreement with appellant's observations reflected at the bottom of page 19 and the top of page 20 of the principal Brief on appeal that the combination would have necessitated a modification beyond the mere substitution of the divider of Sierra for the divider in Richardson.

We reach a similar result even when considering the Figure 5 embodiment of Richardson which details the use of a cache memory with a single operand arithmetic unit. This is so because the claims require the inputting of a dividend and a divisor rather than just a single input. We also reverse the rejection of claims 4, 5, 30, and 31 since the examiner has not detailed any reason of obviousness from the combination of references for all of the features in each of these claims.

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In view of the foregoing, we have reversed the outstanding rejections under 35 U.S.C. § 103 of claims 1, 4, 5, and 10 to 32.

REVERSED

James D. Thomas	)	
Administrative Patent Judge	)	
	)	
	)	
	)	BOARD OF PATENT
Michael R. Fleming	)	APPEALS AND
Administrative Patent Judge	)	INTERFERENCES
	)	
	)	
	)	
Richard Torczon	)	
Administrative Patent Judge	)	

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