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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte BRUCE D. BRYANT, KENNETH A. MARKO, JIMI S.-Y. TJONG and DAVID M. MATHIAS

Appeal No. 96-3895
Application 08/288,103[1]

ON BRIEF

Before FLEMING, LEE and TORCZON, Administrative Patent Judges.

LEE, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 103 from the examiner's final rejection of claims 1-6, 11-15 and 17-30. Claims 7-10 and 16 have been objected to as having allowable subject matter but depending from a rejected claim.

References relied on by the Examiner

Capps	4,643,023	Feb. 17, 1987

[1] Application for patent filed August 9, 1994.

Marko et al. (Marko) 5,361,628 Nov. 8, 1994
(Filed August 2, 1993)

The Rejections on Appeal

In the final Office action, the examiner rejected all claims 1-30 under 35 U.S.C. § 103 as being unpatentable over Marko and Capps. In the examiner's answer, the examiner re-stated the rejection as follows:

> Claims 1-6, 11, 14, 15 and 17-29 are rejected under 35 U.S.C. § 103 as being unpatentable over Marko et al. (5,361,628). (Answer at 4)
>
> Claims 12, 13 and 30 are rejected under 35 U.S.C. § 103 as being unpatentable over Marko et al. (5,361,628) in view of Capps (4,643,023). (Answer at 7)

In the examiner's answer, claims 7-10 and 16 are indicated as containing allowable subject matter but depending from a rejected claim. (Answer at 1)

We regard the rejections on appeal as those stated by the examiner in the examiner's answer.

The Invention

The invention is directed to a method and apparatus for processing measurements taken from an internal combustion engine

having a rotatable crankshaft wherein each measurement corresponds to an angular position of the crankshaft.

Claims 1, 22 and 30 are the only independent claims. Claim 1 is in method form. Claim 22 essentially recites the same steps of claim 1 but in means-plus-function language. Claim 30 is an apparatus claim which specifically recites a motor, at least one sensor for generating a signal indicative of the vibrational activity of the internal combustion engine. In that regard, note that the subject matter of claims 1 and 22 are not limited to measurements concerning the vibrational activity of the engine.

Representative claim 1 is reproduced below:

1. A method for processing measurements from an internal combustion engine having a rotatable crankshaft wherein each measurement corresponds to an angular position of the crankshaft, the method comprising:

filtering the measurements to produce a series of filtered measurements wherein each filtered measurement represents a predetermined number of neighboring measurements so as to examine local variation among contiguous measurements;

combining filtered measurements which correspond to a particular angular position of the crankshaft to produce combined measurements having reduced random noise; and

subtracting one of a series of predetermined values each representing systematic activity at a particular angular position of the crankshaft from each corresponding combined filtered measurement to reduce systematic variation present within the measurements so as to produce a diagnostic envelope which allows both detection and identification of engine operating anomalies.

Opinion

We do not sustain the rejection of claims 1-6, 11, 14, 15, and 17-29 under 35 U.S.C. § 103 as being unpatentable over Marko.

We also do not sustain the rejection of claims 12, 13 and 30 under 35 U.S.C. § 103 as being unpatentable over Marko and Capps.

The following two features, albeit written in different forms, are required by all of the independent claims 1, 22 and 30:

> (1) combining filtered measurements which correspond to a particular angular position of the crankshaft to produce combined measurements having reduced random noise; and
>
> (2) subtracting one of a series of predetermined values each representing systematic activity at a particular angular position of the crankshaft from each corresponding combined filtered measurement to reduce systematic variation present within the measurements so as to produce a diagnostic envelope which allows both detection and identification of engine operating anomolies.

We agree with the appellants that neither Marko nor Capps, either alone or in combination, discloses or reasonably suggests either one of the above-noted features of the claimed invention.

On page 4 of the answer, the examiner identifies column 5, lines 15-29 of Marko as disclosing the combining of filtered measurements which correspond to a particular angular position of

the crankshaft. Our reading of the same section of Marko reveals only a filtering operation which is required elsewhere in the claims. Indeed, lines 15-29 of column 5 of Marko provides a specific example of the filtering that is generally discussed in lines 9-14 of the same column. We do not see any combining operation in the portion of Marko cited by the examiner as disclosing the claimed combining operation.

On page 9 of the answer, the examiner clarified what he regarded as the combining purportedly disclosed in Marko. In lines 2-6 of that page, the examiner stated: "These separately filtered waveforms are then representative of a median filtered waveform (304; ie. ◊combining filtered measurements which correspond to a given crankangle to produce a combined measurement◊)." In Marko, lines 23-28 of column 5 describe that all five diagnostic waveforms (crankshaft torque, intake pressure, exhaust, oil pressure and dynamic oil pressure) are median filtered "separately to produce five 720-point vectors" representative of the filtered waveform 304. To the extent that the examiner has read that language as describing that the separate waveforms have been combined into a single waveform 304, that is unreasonable. The description reasonably suggests only that each of the five waveforms is separately median filtered to

produce a corresponding waveform 304. See also Figure 3 which illustrates waveform 304 as the result of median filtering a single raw measurement waveform 302. Our reading indicates that there would be five different median filtered waveforms 304.

As for the subtracting operation, the examiner simply concludes that it would have been obvious to one with ordinary skill in the art to perform a subtraction of a given value from a measured value. In that regard, the examiner stated (answer at 6, lines 3-8):

> The motivation being that Marko et al. teach the filtering of a measurement a plurality of times (col. 6, lines 31-34), and repeated filtering (ie. filtering a measurement after it has already be filtered) is a functional equivalent of just subtracting a value since both lead to the same end result (ie. reducing systematic variation).

We disagree with the above-quoted position of the examiner. The claims do not simply recite subtracting any arbitrary value. The value subtracted must be predetermined and representative of systematic activity at a particular angular position of the crankshaft. Repetitive filtering of the same measured signal waveform, such as by subsampling or median filtering, is not the same as subtracting a value which is representative of systematic activity at corresponding angular positions, even if systematic variation would be reduced. Nothing in Marko reasonably suggests

first coming up with values representative of normal systematic activity and then subtracting them from the combined filtered measurements. Capps, on the other hand, does not make up for the deficiencies discussed above with respect to Marko. Capps is relied on by the examiner only for satisfying the more specific features relating to sensing engine vibrations.

For the foregoing reasons, we do not sustain the rejection of claims 1-6, 11-15, and 17-30.

Conclusion

The rejection of claims 1-6, 11, 14, 15, and 17-29 under 35 U.S.C. § 103 as being unpatentable over Marko is reversed.

The rejection of claims 12, 13 and 30 under 35 U.S.C. § 103 as being unpatentable over Marko and Capps is reversed.

REVERSED

MICHAEL R. FLEMING)
Administrative Patent Judge)
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) BOARD OF PATENT

JAMESON LEE	)	
Administrative Patent Judge	)	APPEALS AND
	)	
	)	INTERFERENCES
	)	
RICHARD TORCZON	)	
Administrative Patent Judge	)	

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