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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CHRISTOPHER THORNE and RICHARD S. COLE

Appeal 2010-004159
Application 10/537,618
Technology Center 2800

Before JOSEPH F. RUGGIERO, DENISE M. POTHIER, and JEREMY J. CURCURI, *Administrative Patent Judges*.

POTHIER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-25. Claims 26-29 have been canceled. Br. 5.[1] We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

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[1] Throughout this opinion, we refer to (1) the Appeal Brief (Br.) filed September 26, 2007 and supplemented April 27, 2009 and (2) the Examiner's Answer (Ans.) mailed November 20, 2007 and supplemented January 4, 2010.

Invention

Appellants' invention relates to a process of determining the musical key from an audio signal. *See* Abstract. Claim 1 is reproduced below with the key disputed limitations emphasized:

> 1. A method for determining the key of an audio signal, the method comprising the steps of:
> receiving an audio signal;
> for each of a plurality of signal portions of the audio signal, analyzing the signal portion to identify a musical note,
> and where at least one musical note is identified:
> determining a strength associated with the or each musical note; and
> generating a data record containing the identity of the or each musical note, the strength associated with the or each musical note and the identity of the portion;
> for each of the plurality of data records, ignoring the strength associated with an identified musical note where said strength is less than a predetermined fraction of the maximum strength associated with any identified musical note contained within the data records;
> *determining a first note from the identified musical notes in the plurality of data records as a function of their respective strengths;*
> *selecting at least a second and a third note from the identified musical notes in the plurality of data records as a function of the first note*;
> *determining the key by comparing the respective strengths of the at least second and third notes*; and
> outputting a signal representing the determined key.

The Rejection

The Examiner relies on the following as evidence of unpatentability:

Aoki	US 5,424,486	June 13, 1995
Fujishima	US 6,057,502	May 2, 2000

Claims 1-25 are rejected under 35 U.S.C. § 103(a) as unpatentable over Aoki and Fujishima. Ans. 4-12.[2]

THE CONTENTIONS

Regarding illustrative claim 1, the Examiner finds Aoki teaches determining a key of an audio signal based on chord information by receiving a signal and outputting a signal representing the key (Ans. 4 (citing Abstract)) and turns to Fujishima to teach a known technique for determining chord information, including analyzing and identifying musical notes as recited (*see* Ans. 4-7, 12-14). The Examiner concludes that an ordinary skilled artisan would have recognized including Fujishima's technique within Aoki to determine chord information, which in turn is used to determine the key of an audio signal as disclosed in Aoki. *See* Ans. 7, 15.

Appellants argue that Aoki and Fujishima fail to teach or suggest: (1) determining a first note from the identified notes in data records as a function of their strengths (Br. 16); (2) selecting second and third notes from the identified musical notes as a function of the first note (Br. 16-17); or (3) determining the key by comparing the respective strengths of the second and third notes (Br. 15, 17-18). In Appellants' view, the combination teaches finding a chord from location peaks in an octave spectrum using pattern comparison with reference frequency components patterns and establishing a key by both detecting a dominant section related to a chord progression and examining scale notes. *See* Br. 15.

[2] The § 101 rejection has been withdrawn. Ans. 3.

ISSUES

Under § 103, has the Examiner erred in rejecting claim 1 by finding that Aoki and Fujishima collectively would have taught or suggested:

(1) determining a first note from the identified musical notes in the data records as a function of their respective strengths;

(2) selecting at least a second and a third note from the identified musical notes in the data records as a function of the first note;

(3) determining the key by comparing the respective strengths of the second and third notes?

ANALYSIS

Based on the record before us, we find no error in the Examiner's rejection of illustrative claim 1. As discussed by the Examiner, Aoki and Fujishima collectively teach the disputed limitation of determining the key by comparing the respective strengths of the second and third notes. *See* Ans. 4, 7, 15. Aoki teaches determining a musical key based on determining the dominant motion in a chord progression. *See* Abstract. Aoki further discusses that the dominant motion in a chord progression is determined by detecting the chord sets at steps S2 and S3. *See* col. 3, ll. 33-49; Fig. 3. The Examiner then proposes combining Fujishima's "chord-determining method" to generate "the chords necessary for determining the key in [Aoki] . . . ." Ans. 7. We therefore agree with the Examiner that attacking Fujishima individually (Br. 17-18) does not show nonobviousness where, as is here, the rejection is based on combinations of references. *See In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986).

Moreover, the proposed combination of Aoki and Fujishima (Ans. 4-7) does more than find a chord from peak locations. *See* Br. 15. Fujishima determines a chord by enhancing profile peaks (at SM5) of a sound wave to generate a profile PF. *See* col. 7, ll. 27-53; Fig. 2. The chord pattern of the profile PF is then used with recorded patterns to select an appropriate chord. *See* col. 14, ll. 18-49, col. 15, ll. 1-4; Figs. 15(b)-15(c). Appellants admit (*see* Br. 15) that the Fujishima finds a chord by comparing the peaks' locations in the profile PF with reference patterns of chord types to detect the key. *See* col. 2, ll. 52-56. Underlying Fujishima's process for detecting the chord, however, is a process involving examining peak values within the profile PF, and these peaks, as explained below, correspond to notes within the chord.

Fujishima, for example, teaches that the position of every note along a circle in Figure 15(a) has a frequency position at the center of the semitone zone (e.g., 65.4 Hz for the note C). *See* col. 14, ll. 6-9; Fig. 15(a). Fujishima teaches and shows twelve notch lines (i.e., twelve semi-tones within an octave) with a first semitone zone (e.g., note C) labeled to the right of the circle. *See* col. 14, ll. 1-12; Fig. 15(a). Three prominent peaks are also within Fuijishima's profile PFs shown in Figure 15(a). Each peak in Figure 15(a) corresponds to semi-tones or notes indicated by the notch lines in the circle (e.g., around C and C# zones, around E and F zones, around A zone). We thus agree with the Examiner (Ans. 5, 12) that Fujishima's peaks correspond to musical notes.

We also find (Ans. 12-13) that the peaks are detected based on their strength within a given semitone zone (e.g., a frequency range). That is, Fujishima teaches that the amplitude levels of the frequency components

which correspond to musical notes pitches are naturally larger than other frequency components and are positioned at semitone intervals (col. 10, ll. 39-42). Fujishima also teaches that the amplitude levels at the frequency positions corresponding to notes will be increasingly prominent as compared to the other positions. *See* col. 10, ll. 44-47. Thus, Figure 15(a) shows three prominent musical notes within its profile PF based on their strength.

Additionally, when Fujishima teaches a process for detecting a chord set by analyzing a profile PF to other patterns (*see* col. 2, ll. 52-56; Figs. 15(b)-15(c)), Fujishima is also comparing the three major peaks representing three notes with chord patterns having similar peaks at the same semitone zones. In one example, a component of the chord comparison in Fujishima involves multiplying the amplitudes of the profile, including each peak area (e.g., the C note in Fig. 15(a)), with the weighting patterns including peaks (e.g., patterns in Fig. 15(b)) to determine the chord that has the greatest earned point, yielding a product (e.g., profile shown in Fig. 15(c)) having three distinct peaks at given semitone zones. Col. 14, ll. 18-55.

Also, Fujishima teaches the chord can be selected "only if the feature of the peak values and positions are taken into consideration for comparison with the features of the chord." Col. 15, ll. 1-4. In this technique, Fujishima teaches a direct comparison of peaks (e.g., notes) with each other in order to select or determine the proper peaks (e.g., notes) corresponding to a chord. We therefore find that Fujishima's process includes comparing profiles with identified chords by comparing the strengths of multiple notes. *See* Ans. 12-13. Thus, Fujishima teaches or suggests determining three notes, including a first note, from identified notes in data records as a function of their strength as recited in claim 1.

Also, as discussed above, the resulting chord in Fujishima is based in part on profile PF that includes two more semitones (e.g., a second and third peaks or notes in Fig. 15(a)) and weighting patterns which also include two more semi-tones (e.g., second and third peaks or notes in Fig. 15(b)). *See* col. 14, ll. 1-58; Figs. 15(a)-(c). These weighting patterns in Fujishima, representing C and C# major/minor patterns, demonstrate that chords can have three peaks (e.g., notes) spaced apart in a distinct pattern and that each note in a given chord has a relationship with other notes (e.g., peaks). *See* Fig. 15(b); *see also* Ans. 12 (stating peaks are analyzed "to identify chords, which are combinations of 3 or more notes.") For example, the C major weighting pattern has peaks locations at the C, E, and G notes. *See* Fig. 15(b). Thus, given this interrelationship between notes in a chord, the resulting chord selected in Fujishima's process includes two more peaks (e.g., a second and third note) identified from data records which are a function of each other, including a function of the first note. *See* Ans. 14. We therefore find that, as broadly as recited, Fujishima teaches or suggests selecting second and third notes from identified musical notes in data records as a function of the first note as recited.

Notably, given its broadest reasonably construction, claim 1 does not require determining the key directly by comparing the strengths of a second and third note. Thus, although the combined Aoki/Fujishima process determines the key indirectly, as explained above, by comparing the strengths of the second and third notes, claim 1 does not exclude such an indirect comparison to determine the key. *See* Br. 15, 17-18. Also, claim 1 does not recite that the strengths of the second and third notes are compared

to each other but rather only that the strengths are compared, including compared to some other entity such as the weighting patterns.

Finally, we find Appellants' argument that Fujishima performs steps SM2-SM7 on a single segment, while the claim requires the notes to be selected from data records that correspond to multiple signal portions, unavailing. Br. 15-16. As the Examiner notes (Ans. 13 (citing col. 6, l. 43– col. 7, l. 9)), Fujishima teaches the musical segment is part of multiple segments that form the waveform and is divided into slices for processing. Ans. 13-14. That is, the time slice analyzed in Figure 2 includes a time and frequency range of an audio signal. Col. 6, l. 60 – col. 7, l. 26; Fig. 2. We fail to see how this time or frequency range, as broadly as claimed and as explained above, cannot be construed as corresponding to a plurality of signal portions of an audio signal, such that the segment consisting of a signal range in Fujishima is analyzed to generate records and detect three notes from the records as recited in claim 1.

For the foregoing reasons, Appellants have not persuaded us of error in the rejection of: (1) independent claim 1; (2) independent claim 15 which recites commensurate limitations; and (3) dependent claims 2-14 and 16-25 for similar reasons.

CONCLUSION

The Examiner did not err in rejecting claims 1-25 under § 103.

DECISION

The Examiner's decision rejecting claims 1-25 is affirmed.

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).

AFFIRMED

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