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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRUCE ALLEN MAXWELL and
RICHARD MARK FRIEDHOFF

Appeal 2010-012000
Application 11/341,751
Technology Center 2600

Before CARLA M. KRIVAK, CAROLYN D. THOMAS, and
CARL W. WHITEHEAD, JR., *Administrative Patent Judges*.

KRIVAK, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from a final rejection of claims 1, 3-23, 25, and 29-31 (App. Br. 2). An oral hearing was held January 10, 2013. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

STATEMENT OF THE CASE

Appellants' claimed invention is directed to a bi-illuminant dichromatic reflection (BIDR) model as a representation of an image for facilitating color correct image manipulation (Spec. ¶ [0007]).

Independent claim 1, reproduced below, is representative of the subject matter on appeal.

> 1. An automated, computerized method for manipulating an image, comprising the steps of:
>
> a computer executing the following steps:
>
> providing an image file depicting an image;
>
> deriving a bi-illuminant dichromatic reflection model representation of correct color of material depicted in the image, to represent correct color values for the image, across multiple materials of the image, within a range extending from fully shaded color value to fully lit color value, the bi-illuminant dichromatic reflection model representation of correct color being expressed by a characteristic spectral ratio consistent across multiple materials of the image; and
>
> utilizing the bi-illuminant dichromatic reflection model representation to manipulate the image of the image file to generate a manipulated image having correct color of material depicted in the image, the correct color being set at any selected degree of adjustment within the range extending from fully shaded color value to fully lit color value and determined as a function of the correct color values represented by the bi-illuminant dichromatic reflection model.

REFERENCES and REJECTIONS

The Examiner rejected claims 1, 10, 11, 14, 15, 18-20, 29, and 30 under 35 U.S.C. § 103(a) based upon the teachings of Baba (Masashi Baba et al., *Shadow Removal from a Real Image Based on Shadow Density*, ACM SIGGRAPH Posters, page 60 (2004) (hereinafter "Baba")) in view of Wells (U.S. Patent No.7,305,127 B2, issued Dec. 4, 2007, filed Nov. 9, 2005), and Ebner (Marc Ebner and Christian Herrnann, *On Determining the Color of the Illuminant Using the Dichromatic Reflection Model*, pp. 1-8, Sep. 14, 2005, http://www.springerlink.com/content/6r7teb3tmfpq8wce/fulltext.pdf (hereinafter "Ebner")).

The Examiner rejected claims 3, 4, 12, 13, 16, 17, 21, and 22 under 35 U.S.C. § 103(a) based upon the teachings of Baba in view of Wells, Ebner, and Sato (U.S. Pat. App. Pub. No. 2006/0018539 A1, published Jan. 26, 2006).

The Examiner rejected claims 5, 6, 8, and 9 under 35 U.S.C. § 103(a) based upon the teachings of Baba in view of Wells, Ebner, and Kobayashi (U.S. Patent No. 6,272,249 B1, issued Aug. 7, 2001).

The Examiner rejected claim 7 under 35 U.S.C. § 103(a) based upon the teachings of Baba in view of Wells, Ebner, Kobayashi, and Baba (Masashi Baba and Naoki Asada, *Shadow Removal from A Real Picture*, ACM SIGGRAPH 2003, page 1 (hereinafter "Baba II")).

The Examiner rejected claims 23, 25, and 31 under 35 U.S.C. § 103(a) based upon the teachings of Baba in view of Wells, Ebner, and Hofflinger (U.S. Pat. App. Pub. No. 2002/0176023 A1, published Nov. 28, 2002).

ANALYSIS

The Examiner relies on at least Baba, Ebner, and Wells in each of the rejections. The Examiner finds Baba discloses everything except that a "correct color can be set at any selected degree of adjustment within the fully shaded-fully lit range, instead forcing colors to the fully-lit value after correction" (Ans. 5). The Examiner then finds that Wells discloses after ratios of color in a shadowed area versus a non-shadowed area are calculated, a degree of shadowing can be adjusted to any percentage within a range using a slider (*id.*). The Examiner further finds neither Baba nor Wells discloses a BIDR model representing correct color "by a characteristic spectral ratio" consistent across *multiple materials* of an image, as Baba discloses a representation of a single texture/material. The Examiner relies on Ebner for teaching determining a spectral ratio consistent across multiple materials in addition to Baba's statement that Baba will improve their method so it can be applied to images having multiple textures (Ans. 5-6). Thus, the Examiner reasons, it would have been obvious to a skilled artisan "to modify Baba and Wells to determine a spectral ratio consistent across multiple materials in order to compute a color corrected image as taught by Ebner" (Ans. 6).

Appellants contend Ebner relies on an assumption of a single, uniform illumination, applied in an analysis based upon the known, single illuminant, dichromatic reflection model, and the predictions of the model relevant to specular reflection to determine the spectral makeup of the uniform illuminant (App. Br. 15-16). In contrast, Appellants assert, the claims are based on an analysis relative to body reflections, thus, Ebner in combination with Baba and Wells does not render the claimed invention obvious as these

references do not teach or suggest using an analysis based on body reflection as it varies from fully shaded color value to fully lit color value, under varying intensities between an incident illuminant and an ambient illuminant, as claimed (*id*.).

Appellants also contend the Examiner is incorrect in finding Baba teaches BIDR (Ans. 5, 26) (*see* Reply Br. 2-3). Appellants assert although Baba recognizes the presence of ambient and incident illuminants and pixel intensity transitions from full shadow to full sunshine through a penumbra as a function of an attenuation factor k (Section 2), Baba recognizes image surfaces have varying reflectance and calculates a shadow density rather than an attenuation factor k (Reply Br. 3). Thus, the resulting shadow model shown in Figure 1 of Baba plots pixel position versus an s factor representing shadow density through a range for the value s between 0 and 1 (Reply Br. 3-4). Further, Baba relies on grey-scale depictions for a single texture and not color information for multiple materials as claimed (*id*.).

We first note Appellants' claims are broadly written. We also agree with the Examiner that Baba discloses a BIDR model where color is corrected, and that this model can/will be improved to apply to multiple textures (Ans. 26, *citing* Baba, Section 4, Conclusion). The fact that Baba teaches BIDR was also acknowledged by Appellants (Reply Br. 3).

We also agree with the Examiner's reliance on Ebner for calculating a spectral ratio across multiple materials and finding and removing an illuminant from a scene using a "'scaling factor s'" (Ans. 26). For example, Ebner discloses accurately determining the color of objects (i.e., multiple materials) irrespective of the spectral power distribution used to illuminate the scene (Abstract), and a line in chromaticity space with two points that

define the line for some scaling factor s (p.2-3). Appellants assert the scaling factor s, in Ebner, is a scalar for parameterizing a line and not a ratio of two numbers as claimed (Reply Br, 7). However, Appellants define the term "spectral ratio" in the Specification as "a ratio based upon a difference in color or intensities between two areas of a scene depicted in an image, which may be caused by different materials, an illumination change or both" (Spec. ¶ [0032]). We find Ebner's steps for segmenting the input image into regions of uniform color and estimating an illuminant based thereon (*see* Fig. 1) is consistent with Appellants' spectral ratio determination. Thus, we agree with the Examiner that Ebner's disclosure of a "scaling factor s" is a spectral ratio when repeated for multiple surfaces (Ans. 26).

Further, Appellants' assertion that the "spectral ratio underlying multiple material solution of the rejected claims, is an RGB vector (i.e., a three valued number) characterizing the ratio between two color measurements" (Reply Br. 7) (citation omitted) does not have support in the claims, which are broad and recite only a "spectral ratio consistent across multiple materials of the image" (claim 1). It should also be noted this recited limitation is not found in independent claims 10, 18, 29, or 30. Ebner discloses a dichromatic model that is applied to multiple textures. Since a BIDR model is an extension of a dichromatic reflection model (*see* Spec. ¶ [0034]), it would be an obvious extension, in light of Baba's statement, to apply BIDR to multiple materials.

For the above reasons, we find the weight of the evidence supports the Examiner's ultimate legal conclusion of obviousness, and we sustain the obviousness rejection of claims 1, 10, 11, 14, 15, 18-20, 29, and 30.

With respect to claims 3, 4, 12, 13, 16, 17, 21, and 22, the Examiner finds Sato discloses the spectral ratio as claimed (Ans. 10). Appellants have merely recited limitations of the independent claims and state Sato does not cure the deficiencies of Baba, Wells, and Ebner (App. Br. 19-20). Appellants then assert there is no motivation to combine Sato with these references (App. Br. 20). Appellants appear to be arguing the references separately and do not take into account what the *collective teachings* of the prior art would have *suggested* to one of ordinary skill in the art. Therefore, these arguments and assertions are ineffective to rebut the Examiner's prima facie case of obviousness. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981)("The test for obviousness is not whether the features of a secondary reference may be *bodily incorporated* into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." (Citations omitted) (emphasis added)). In addition, the Examiner has found actual teachings in the prior art and has provided a rationale for the combination (Ans. 10). Further, the teachings suggest that the combination involves the predictable use of prior art elements according to their established functions. Accordingly, we find that the Examiner has provided sufficient motivation for modifying Baba and Wells with the teachings of Sato.

Appellants provide the same arguments with respect to claims 5-9 and the Kobayashi reference: Kobayashi cannot cure the deficiencies of Baba, Wells, and Ebner and Kobayashi cannot be combined with these references

(App. Br. 20-22).[1] Again, Appellants appear to be arguing the references separately and not taking into account the collective teachings of the references. (*See In re Keller* at 425).

With respect to the remaining rejections of claim 23, 25, and 31, the Examiner relies on Hofflinger to disclose the limitation "BIDR cylinder/γ/spectral ratio" (Ans. 23-24). Appellants assert there is no motivation to combine Hofflinger with the cited combination of Baba, Wells, and Ebner as the cylinders in Hofflinger are not relevant to a BIDR cylinder (App. Br. 22-23). Further, Appellants assert Hofflinger does not cure the deficiencies of Baba, Wells, and Ebner (Reply Br. 12). We do not agree and adopt the Examiner's findings regarding Hofflinger as our own (Ans. 28-29).

We therefore sustain, for the reasons set forth above, the Examiner's obviousness rejections of claims 1, 3-23, 25, and 29-31.

DECISION

The Examiner's decision rejecting claims 1, 3-23, 25, and 29-31 under 35 U.S.C. § 103 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

Vsh/llw

[1] Appellants argue claim 7 separately (App. Br. 21-22). However, Appellants note claim 7 is similar in scope and subject matter to claims 5, 6, 8, and 9 and state Kobayashi cannot cure the deficiencies of Baba, Wells, and Ebner (Reply Br. 11). Thus, we include claim 7 in this grouping.