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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte DANIEL KURZ

Appeal 2018-004740
Application 15/274,968
Technology Center 2600

Before JUSTIN BUSCH, BETH Z. SHAW, and JASON M. REPKO,
Administrative Patent Judges.

BUSCH, *Administrative Patent Judge.*

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant¹ appeals from the Examiner’s decision to reject claims 31–35 and 37–50, which constitute all the claims pending. Claims 1–30 and 36 were canceled previously. We have jurisdiction over the pending claims under 35 U.S.C. § 6(b).

We affirm.

CLAIMED SUBJECT MATTER

Appellant’s invention generally relates to touch detection between two objects using thermal images. Spec. ¶¶ 2, 15, Abstract. More specifically,

¹ We use the word “Appellant” to refer to “applicant” as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Apple Inc. Appeal Br. 3.

the claimed invention relates to obtaining a thermal image of an object, determining a pattern of either a value or range of temperatures or temperature change, and using the variance of temperature measurements in the image to determine another object touched the imaged object. Spec. ¶¶ 2, 15–13. Claims 31, 49, and 50 are independent claims. Claim 31 is reproduced below:

31. A method of detecting a touch between at least part of a first object and at least part of a second object, wherein the at least part of the first object has a different temperature than the at least part of the second object, comprising the steps of:

receiving a thermal image of a portion of the second object;

determining temperature measurements based on different locations in the thermal image; and

in response to determining that a variance of the temperature measurements associated with the thermal image satisfies a criterion, determining a touch between the at least part of the first object and the at least part of the second object.

REJECTIONS²

Claims 31–35, 37–39, 44–46, 49, and 50 stand rejected under 35 U.S.C. § 103 as obvious in view of Elliot N. Saba et al., *Dante Vision: In-Air and Touch Gesture Sensing for Natural Surface Interaction with Combined Depth and Thermal Cameras*, ESPA 2012 (2012) and Eric Larson et al., *HeatWave: Thermal Imaging for Surface User Interaction*, CHI 2011 (May 7, 2011). Final Act. 7–16.

² Claim 49 was rejected under 35 U.S.C. § 101 as being directed to non-statutory subject matter, and claim 40 was rejected under 35 U.S.C. § 112(b) as indefinite, Final Act. 4–7, but were withdrawn in an Advisory Action mailed October 16, 2017, and, therefore, are not before us.

Claims 40–43 stand rejected under 35 U.S.C. § 103 as obvious in view of Saba, Larson, and Linda G. Shapiro & George Stockman, *COMPUTER VISION 1 –61* (2000). Final Act. 16–18.

Claims 47 and 48 stand rejected under 35 U.S.C. § 103 as obvious in view of Saba, Larson, and Stafford (US 2013/0257751 A1; Oct. 3, 2013). Final Act. 19–20.

ANALYSIS

The Examiner finds the combination of Saba and Larson teaches or suggests every limitation recited in independent claims 31, 49, and 50. Final Act. 7–10, 16. More specifically, the Examiner finds Saba teaches or suggests every limitation recited in claims 31, 49, and 50, except “Saba does not appear to expressly disclose determining a touch from a single thermal image.” Final Act. 7–9. However, the Examiner finds “Larson teaches determining user interaction with a surface based on single image frame using detected heat trails.” Final Act. 9–10 (citing Larson Fig. 3 and Larson’s section titled “Advantages of Thermal Imaging”).

Appellant argues the rejection of claims 31–35, 37–39, 44–46, 49, and 50 as a group. Appeal Br. 5–6 (“Claims 32-35, 37-39, and 44-46 are allowable, at least by virtue of depending from an allowable claim. Claims 49 and 50 include elements analogous to the elements of claim 31 not disclosed by Saba and Larson. Hence, Claims 49 and 50 are allowable.”). We select independent claim 31 as representative. *See* 37 C.F.R. § 41.37(c)(1)(iv).

Appellant notes the Examiner’s acknowledgment that Saba fails to disclose “determining a touch based on a variance of temperature measurements in a single image” (the “disputed limitation”) and contends

Larson also fails to disclose this limitation. Appeal Br. 5–6; Reply Br. 3.³ More specifically, Appellant argues that, although Larson’s Figure 3 depicts detected heat trails using a real-time algorithm, Larson’s algorithm calculates a “smoothed temperature” and a “temporal derivative” over five frames. Appeal Br. 6. Appellant argues Larson’s heat traces, therefore, are “based on a variance of temperature values from five frames” and Larson does not teach the disputed limitation because Larson “does not describe determining a touch based on a variance of temperature measurements in a single image.” Appeal Br. 6.

The Examiner finds that determining a touch between, for example, a hand and a surface may involve analyzing residual heat trails in a single image as long as the objects in the system and their properties are known. Ans. 2–3. The Examiner responds to Appellant’s arguments by noting that, although claim 31 recites the “determining a touch” step is “in response to determining that a variance of the temperature measurements *associated with the thermal image* satisfies a criterion,” claim 31 does not require the recited “thermal image” to be the *only* data used to determine a touch. Ans. 3. The Examiner then finds Larson’s Figure 3 depicts a single thermal image including residual heat trails (heat traces), and Larson’s residual heat trails are determined based on a variance of temperature measurements associated with the (single) thermal image. Ans. 3.

Appellant argues prosecution history—i.e., having previously amended claim 31 to recite “the” thermal image instead of “at least one” thermal image—and prior arguments—i.e., prior assertions that Larson does

³ Appellant’s Reply Brief is not numbered, but we refer to the brief using page numbers 1 through 4, with the cover page being page 1.

not teach detecting a touch based on measurements from one image—
narrow claim 31 to exclude embodiments in which the detecting a touch step
is based on more than one thermal image. Reply Br. 2. Appellant asserts the
Specification supports two different techniques in which touch detection is
based on a single thermal image. Reply Br. 3 (citing Spec. ¶¶ 87, 94).

Initially, we note, and Appellant does not appear to contest, that
Appellant’s Specification discloses embodiments in which touch detection is
based on more than one thermal image, or based on a thermal image in
addition to other images. *See, e.g.*, Spec. ¶¶ 97–106, Figs. 5–7. When
construing claim terminology during prosecution before the Office, claims
are to be given their broadest reasonable interpretation consistent with the
Specification, reading claim language in light of the Specification as it
would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of
Sci. Tech Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). We are mindful,
however, that limitations are not to be read into the claims from the
Specification. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).
Because “applicants may amend claims to narrow their scope, a broad
construction during prosecution creates no unfairness to the applicant or
patentee.” *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed.
Cir. 2007) (citation omitted).

We are not persuaded by Appellant’s arguments. Even accepting
Appellant’s argument that the recited thermal image does not encompass
more than one thermal image, such a restriction limits only the following
clauses recited in claim 31: (1) “determining temperature measurements
based on different locations in the [single] thermal image”; and
(2) “determining that a variance of the temperature measurements associated

with the [single] thermal image satisfied a criterion.” In other words, as the Examiner notes, Ans. 3, the recited method requires determining a touch between two objects “in response to determining that a variance of the temperature measurements associated with the thermal image satisfies a criterion,” but claim 31 does not preclude considering other *additional* factors, as long as the determination is in response to the variance of the temperature measurements associated with the single thermal image satisfying a criterion.

Appellant does not dispute the Examiner’s findings regarding Saba’s teachings or the Examiner’s rationale for combining Saba and Larson. Therefore, we need only address whether the combination of Saba and Larson teaches or suggests “in response to determining that a variance of the temperature measurements associated with the thermal image satisfies a criterion, determining a touch between” two objects. As the Examiner finds, Larson’s Figure 3 depicts “[d]etected heat trails . . . shown in blue from our real-time algorithm from a *single frame* of video.” Larson Fig. 3 (emphasis added).

Appellant is correct that Larson’s algorithm calculates a smoothed temperature and a temporal derivative over five frames. *See* Larson’s section titled “Uncalibrated Heat Trace Detection.” However, even to the extent Larson uses five frames to create heat traces, Larson at least suggests determining a variance of temperatures measurements in one frame as compared to other temperature measurements in that frame as well as other temperature measurements in the other four frames because the different colors in a single image represent different temperatures. *See* Larson Fig. 3. Furthermore, claim 31 requires the variance of temperature measurements

associated with the thermal image satisfies a criterion. The broadest reasonable interpretation of this limitation encompasses determining that temperature measurements in the (single) thermal image vary from temperature measurements in a different image by an amount that satisfies the criterion because each of Larson's other four frames used in its algorithm are associated with the first frame at least with respect to calculating the smoothed temperature and temporal derivative for a particular heat trace.

Larson therefore discloses a single image showing residual heat traces on a surface after another object touched the surface. Larson's heat trails show variances in temperatures across the image. Accordingly, combining Larson's teachings with Saba's uncontested disclosures, we agree with the Examiner that the combination of Saba and Larson teaches or suggests "in response to determining that a variance of the temperature measurements associated with the thermal image satisfy a criterion, determining a touch between" two objects.

For the reasons discussed above, we sustain the Examiner's rejection of independent claims 31, 49, and 50 as obvious in view of Saba and Larson. We also sustain the Examiner's rejection of dependent claims 31-35, 37-39, 44-46, 49, and 50, which Appellant did not argue separately with particularity. Appellant argues claims 47 and 48 are allowable because they depend from claim 31 and Stafford, additionally recited in the rejection of claims 47 and 48, does not cure the alleged deficiencies in Saba and Larson with respect to the disputed limitation. Appeal Br. 7, 9. Because we find no deficiency in the rejection of claim 31, we also sustain the Examiner's rejection of dependent claims 47 and 48 in view of Saba, Larson, and Stafford.

In addition to arguing claims 40–43 are patentable due to their dependency from claim 31, Appellant separately argues the patentability of claim 40, and claims 41–43 depending therefrom, asserting none of Saba, Larson, and Shapiro teach claim 40’s additionally recited step of “determining a derivative of temperature with respect to position in the thermal image based on the temperature measurements, the temperature measurements corresponding to a temperature distribution of a sample line in the thermal image.” Appeal Br. 7–8. Appellant notes the Examiner acknowledges that neither Saba nor Larson disclose this determining limitation, and Appellant argues Shapiro cannot teach this determining limitation because Shapiro does not relate to thermal images and, therefore, cannot “disclose determining a derivative with respect to a position in a thermal image.” Appeal Br. 7. Appellant contends that, because none of Saba, Larson, and Shapiro individually disclose this limitation, the combination cannot disclose this limitation. Appeal Br. 8. Appellant also argues the Examiner’s proposed combination is deficient because the Examiner failed to explicitly and clearly articulate why determining a touch, as recited in claim 40, would have been obvious in view of the proposed combination even though Shapiro’s teachings relate to detecting boundaries between objects. Appeal Br. 8.

The Examiner notes the rejection relies on a finding that the combination of Saba and Larson teaches or suggests each limitation recited in independent claim 1, from which claim 40 depends. Ans. 4. In other words, the Examiner finds Saba and Larson, not Shapiro, disclose determining a touch based on temperature variance measurements in thermal images. Ans. 4. The Examiner finds Larson teaches gesture and touch

detection systems that use edge detection and Shapiro teaches edge detection using derivatives. Final Act. 17 (citing Shapiro § 5.6, Fig. 5.18; Ans. 4). The Examiner concludes claim 40 would have been obvious because a person of ordinary skill in the art would have applied Shapiro's derivative calculations to detect edges in the Saba-Larson thermal image touch-detection system to identify boundaries between the objects represented by heat traces. Final Act. 17. The Examiner further explains Shapiro's teachings "would be applicable to image intensity values including thermal image intensity values." Ans. 5. The Examiner determines combining Shapiro's known image analysis techniques with Saba and Larson's known thermal image touch detection systems and methods would have yielded predictable results. Final Act. 17.

Claim 40's recitation of determining temperature derivatives with respect to position merely requires calculating a derivative of temperatures with respect to positions in the thermal image. The Examiner proposes applying Shapiro's teaching that derivatives can be used to calculate edges between two objects based on "intensity differences," Shapiro 12–16, to the "edges" between two objects represented by Saba-Larson's varying thermal image intensity values. Appellant presents no persuasive argument why applying Shapiro's teaching of using derivatives, which are simply mathematical functions performed on numbers, on image intensity values in Saba-Larson's thermal image would have been beyond the abilities of an ordinarily skilled artisan or yielded unpredictable results. Therefore, we are not persuaded the Examiner erred in rejecting claim 40, or claims 41–43, which Appellant does not argue separately with particularity.

CONCLUSION

In summary:

Claims Rejected	Basis	Affirmed	Reversed
31–35, 37–39, 44–46, 49, and 50	§ 103 Saba, Larson	31–35, 37–39, 44–46, 49, and 50	
40–43	§ 103 Saba, Larson, Shapiro	40–43	
47, 48	§ 103 Saba, Larson, Stafford	47, 48	
Overall Outcome		31–35, 37–50	

AFFIRMED