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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RONALD BRUCE COLEMAN, RICHARD JAMES MULLEN, and JEFFREY MAZUREK

Appeal 2019-006817
Application 14/885,289
Technology Center 2800

Before ROMULO H. DELMENDO, N. WHITNEY WILSON, and MONTÉ T. SQUIRE, *Administrative Patent Judges*.

DELMENDO, *Administrative Patent Judge*.

DECISION ON APPEAL

The Appellant[1] appeals under 35 U.S.C. § 134(a) from the Primary Examiner's final decision to reject claims 1–3, 5–10, and 12–14.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42—i.e., "Raytheon BBN Technologies Corp." (Application Data Sheet filed October 16, 2015 at 5), which is also identified as the real party in interest (Appeal Brief filed April 15, 2019 ("Appeal Br.") at 3).

[2] *See* Appeal Br. 5–14; Final Office Action entered April 16, 2018 ("Final Act.") at 4–11; Examiner's Answer entered July 11, 2019 ("Ans.") at 3–5.

I. BACKGROUND

The subject matter on appeal relates to infrared (IR) sensor systems for vehicle-based counter-shooter applications and associated methods (Specification filed October 16, 2015 ("Spec.") at 1, ll. 5–6; Abstract). According to the Inventors, "[t]he operation of these vehicles produces local vibrations at the IR sensor mounting locations" and "[t]hese vibrations add noise to the IR sensor response signal, which can severely degrade the ability to detect signals of interest, such as the IR flash from a weapon discharge event" (*id.* at 1, ll. 6–9). The invention is designed to minimize the effects of these vibrations, thereby improving performance in detecting IR signatures from short-duration events such as gunshots (*id.* at 1, ll. 12–18).

Representative claim 1 is reproduced from the Claims Appendix to the Appeal Brief, as follows:

> 1. An infrared (IR) sensing system for vehicle-based counter-shooter applications comprising:
>
> an IR sensor configured to produce an IR sensor output signal representative of a response of the IR sensor to an IR signature of a muzzle flash of a gunshot event and *a local vehicle motion-induced vibration excitation that substantially overlaps in frequency with the IR signature of the muzzle flash of the gunshot event*;
>
> *a reference sensor coupled to a housing of the IR sensor and configured to provide a reference signal responsive to the local vehicle motion-induced vibration excitation*; and
>
> a controller, including an adaptive digital filter, coupled to the IR sensor and to the reference sensor, and configured to receive the reference signal and to adjust coefficients of the adaptive digital filter so as to minimize coherence between a residual signal and the reference signal to remove the local vehicle motion-induced vibration excitation from the IR sensor output signal, and thereby preserve the IR signature of the

> muzzle flash of the gunshot event, the residual signal being a difference between the IR sensor output signal and a filter output signal from the adaptive digital filter.

(Appeal Br. 15 (emphasis added)). The two other independent claims on appeal (i.e., claims 8 and 12) also recite limitations similar to those highlighted in reproduced claim 1 above (*id.* at 16, 17).

II. REJECTION ON APPEAL

Claims 1–3, 5–10, and 12–14 stand rejected under 35 U.S.C. § 103 as unpatentable over Moroz et al.[3] ("Moroz") in view of Tamura et al.[4] ("Tamura"), and further in view of Han et al.[5] ("Han") (Ans. 3–5; Final Act. 4–11).[6]

III. DISCUSSION

1. The Examiner's Position

The Examiner finds that Moroz describes an IR sensor system having many of the limitations recited in claim 1, including "an IR sensor configured to produce an IR sensor output signal representative of a response of the IR sensor to an IR signature of a muzzle flash of a gunshot

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[3] US 2006/0021498 A1, published February 2, 2006.

[4] Toshiyo Tamura et al., *Wearable Photoplethysmographic Sensors—Past and Present*, 3 ELECTRONICS 282–302 (2014).

[5] Hyonyoung Han et al., *Development of Real-Time Motion Artifact Reduction Algorithm for a Wearable Photoplethysmography*, PROCEEDINGS OF THE 29TH ANNUAL INT'L CONFERENCE OF THE IEEE EMBS 1538–41 (2007).

[6] Although the Examiner indicates that claims 4 and 11 stand rejected (Ans. 3; Final Act. 4), these claims were previously canceled in the Amendment filed December 20, 2017.

event and a local vehicle motion-induced vibration excitation that substantially overlaps in frequency with the IR signature of the muzzle flash of the gunshot event," wherein the system further includes "a reference sensor coupled to a housing of the IR sensor and configured to provide a reference signal responsive to the local vehicle motion-induced vibration excitation," as recited in the claim (Final Act. 4 (citing Moroz ¶¶ 1, 5, 50, 55, 82)). At the same time, in a somewhat contradictory fashion, the Examiner also finds:

> **Moroz et al.** *are silent about: a vehicle motion-induced vibration excitation that substantially overlaps in frequency with the IR signature of the muzzle flash of the gunshot event*; and *a controller, including, coupled to the IR sensor and to the reference sensor, and configured to receive the reference signal* and to adjust coefficients of the adaptive digital filter so as *to minimize coherence between a residual signal and the reference signal*, the residual signal being a difference between the IR sensor output signal and a filter output signal from the adaptive digital filter.

(*Id.* (italics added for emphasis)).

To account for these differences, the Examiner relies on Tamura (Final Act. 5). Specifically, the Examiner finds that Tamura discloses an accelerometer used for active noise cancellation of a signal from body motion in combination with an IR sensor and concludes that "it would have been obvious to one of ordinary skills [sic] in the art . . . to add the accelerometer of **Tamura et al.** to the apparatus of **Moroz et al.** for detecting the vibrational signal" (*id.*). For the controller limitations in claim 1, the Examiner relies further on Han and concludes that "[i]n light of the benefits for noise cancellation using data from the accelerometer as provided by the teachings of **Han et al.**, it would have been obvious to one of

ordinary skills [sic] in the art . . . to modify the apparatus of **Tamura et al.** and **Moroz et al.** with the teachings of **Han et al.**" (*id.*).

2. The Appellant's Principal Contentions

The Appellant contends that Tamura and Han are non-analogous art and therefore cannot be used as references in the rejection (Appeal Br. 5–7). The Appellant argues that even if a person having ordinary skill in the art were to combine the references as proposed by the Examiner, the combined teachings of the references do not disclose or suggest various limitations including those highlighted in reproduced claim 1 above with respect to compensating for "local vehicle motion-induced vibration excitation" (*id.* at 7–8). The Appellant specifically disputes the Examiner's finding that Moroz discloses an IR sensor configured to produce an IR sensor output signal representative of a response of the IR sensor to an IR signature of a muzzle flash of a gunshot event *and a vehicle motion-induced vibration excitation* (*id.* at 8–9). According to the Appellant, "Moroz merely states that 'camera vibration' can cause a false alarm, but does not provide any detail, and certainly does not disclose or suggest the specific features noted above and recited in Appellant's claims 1 and 8" and that this deficiency in Moroz relative to the claims is not cured by Tamura and Han (*id.* at 9, 12). The Appellant relies on similar arguments in support of claim 12 (*id.* at 13–14).

3. Opinion

We disagree with the Appellant that Tamura and Han are non-analogous art. We concur with the Appellant, however, that the Examiner's rejection fails to establish a prima facie case of obviousness because, contrary to the Examiner's findings, Moroz has not been shown to disclose or suggest the limitations highlighted in reproduced claim 1 above.

The non-analogous art test considers the threshold question whether a prior art reference is "'too remote to be treated as prior art.'" *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992) (quoting *In re Sovish*, 769 F.2d 738, 741 (Fed. Cir. 1985)).

The two separate tests for determining whether a prior art reference is analogous are as follows: (i) whether the art is from the same field of endeavor, regardless of the problem addressed; and (ii) if the reference is not within the inventor's field of endeavor, whether the reference is reasonably pertinent to the particular problem with which the inventor is involved. *Clay*, 966 F.2d at 658–59. The same field of endeavor test "for analogous art requires the PTO to determine the appropriate field of endeavor by reference to explanations of the invention's subject matter in the patent application, including the embodiments, function, and structure of the claimed invention." *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (reference describing a toothbrush found to be in the same field of endeavor as a claim to a hairbrush based on findings regarding function and structural similarity). With respect to the second test, a reference is reasonably pertinent to the particular problem with which the inventor is involved if it addresses the same or similar problem. *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1380–81 (Fed. Cir. 2007) (prior art disclosing springs as part of a counterbalancing mechanism in a folding bed is reasonably pertinent to an application describing a gas spring used as part of a lift assist assembly in a claimed treadmill).

Applying the same field of endeavor test, we find that the IR sensor systems disclosed in Tamura and Han, which relate to compensating for body or finger motion in wearables with sensors designed to monitor blood

pressure or pulse signals, respectively (Tamura 282–83; Han 1538), are not in the same field of endeavor because they relate to products having no structural or functional similarity to the claimed sensor systems designed for use in vehicles to detect IR signals representative of a muzzle flash from a gunshot (Spec. 1, ll. 5–9).

But, applying the reasonably pertinent to the problem addressed test, we find that both Tamura and Han address the same or similar problem—i.e., compensating for motion artifacts that corrupt the IR signal of interest (Tamura 285; Han 1538 (Abstract), 1539). *ICON Health*, 496 F.3d at 1380–81 (problem addressed for a prior art folding bed is reasonably pertinent to a lift assist assembly in a claimed treadmill).

Therefore, Tamura and Han are analogous art that a person having ordinary skill in the art would have included within the realm of prior art to be considered. As such, we discern no persuasive merit in the Appellant's argument based on non-analogous art.

Nevertheless, we agree with the Appellant that the Examiner's factual findings as to the limitations pertaining to the compensation for "local vehicle motion-induced vibration excitation" are flawed. Moroz describes "an optical muzzle blast detection and counterfire targeting system for remotely detecting the location of muzzle blasts produced by rifles, artillery and other weapons and similar explosive events, especially sniper fire . . . and . . . a system for directing counterfire weapons on to this location" (Moroz ¶ 1). According to Moroz, "[c]ounterfire weapons contemplate rifles, machine guns, mortars, artillery, missiles, bombs, and rockets" (*id.* ¶ 5). Although Moroz mentions that "[s]ome of the physical phenomena that cause false alarms are edge effects, thermal effects such as convection,

camera vibration, and moving objects" (*id.* ¶ 55 (emphasis added)) and that the IR detection camera may be mounted on a plate along with a gimbal (*id.* ¶ 82), the Examiner does not offer sufficient factual findings that establish that a person having ordinary skill in the art would have been prompted to mount Moroz's camera on a moving vehicle and the sensors and controller are configured to compensate for vibrations caused by the vehicle. In response to the Appellant's argument that Moroz does not disclose or suggest removing local vehicle-motion-induced vibration excitation that substantially overlaps with the IR signature of the muzzle flash caused by the gunshot, the Examiner refers to Moroz's teaching regarding the IR camera being mounted on the gimbal with other sensors (Ans. 4–5). But that teaching regarding the mounting on a gimbal falls short of establishing that the camera would be mounted on a vehicle or that the gimbal is part of the counterfire system that includes a vehicle and that the sensors and controller would be configured to compensate for camera vibrations caused by the vehicle.

For these reasons, we do not sustain the Examiner's rejection.

IV. CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1–3, 5–10, 12–14	103	Moroz, Tamura, Han		1–3, 5–10, 12–14

REVERSED