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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte KUI YAO,
CHIN YAW TAN, YING JIANG, YI FAN CHEN,
SZE YU TAN, and LEI ZHANG

Appeal 2019-006156
Application 15/103,477
Technology Center 1700

Before MICHAEL P. COLAIANNI, GEORGE C. BEST, and DEBRA L. DENNETT, *Administrative Patent Judges*.

BEST, *Administrative Patent Judge.*

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1, 3–6, 12–14, 16, and 19 of Application 15/103,477. Final Act. (May 31, 2018).[2] We have jurisdiction under 35 U.S.C. § 6.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the Agency for Science, Technology and Research (A*STAR) as the real party in interest. Appeal Br. 3.

[2] Claims 20–22, 24, and 28–32 are withdrawn from consideration and, thus, are not subject to the appealed rejections. Final Act. 1; Appeal Br. 5.

For the reasons set forth below, we ***affirm***.

I. BACKGROUND

The '477 Application describes an influenza detector for detecting a targeted influenza virus. *See* Spec., Abstract. The '477 Application describes that the influenza detector includes a liquid environment, a surface acoustic wave (SAW) sensor, and an antibody for Influenza A virus detection in liquid. *Id.*

Claim 1 is representative of the '477 Application's claims and is reproduced below from the Claims Appendix of the Brief.

> 1. A portable influenza detector for detecting a targeted influenza virus, the portable influenza detector comprising:
>
> an electrical circuit including a battery driven regulated power supply for providing power to the portable influenza detector;
>
> a liquid environment;
>
> a surface acoustic wave (SAW) sensor in contact with the liquid environment; and
>
> a targeted bioactive influenza antibody immobilized on a surface of the SAW sensor for selectively capturing an analyte for the targeted influenza virus,
>
> wherein the SAW sensor comprises:
>
> a substrate comprising a piezoelectric material for producing a surface acoustic wave signal in response to an applied electric field; and
>
> an insulative layer formed on top of the substrate and having a functionalized surface formed thereon for selectively immobilizing the targeted bioactive influenza antibody, the functionalized surface being in contact with the liquid environment, and

> wherein the electrical circuit is coupled to the SAW sensor for applying the electric field to the piezoelectric material of the substrate, and wherein the surface acoustic wave signal produced by the SAW sensor changes in response to the analyte for the targeted influenza virus being present in the liquid environment and being captured by the targeted bioactive influenza antibody immobilized on the functionalized surface of the insulative layer of the SAW sensor, and wherein the electrical circuit further comprises a phase shift measurement circuit for measuring changes in the surface acoustic wave signal produced by the SAW sensor to detect presence of the targeted influenza virus in the liquid environment.

Appeal Br. 23 (Claims App.).

II. REJECTIONS

On appeal, the Examiner maintains the following rejections:

1. Claims 1, 14, 16, and 19 are rejected under 35 U.S.C. § 103 as unpatentable over Larson.[3] Final Act. 2–5.
2. Claim 3 is rejected under 35 U.S.C. § 103 as unpatentable over the combination of Larson and Rocha-Gaso,[4] as evidenced by Xu.[5] Final Act. 5–6; Ans. 7.
3. Claims 4–6 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Larson and Branch.[6] Final Act. 6–8.

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[3] US 2011/0053139 A1, published Mar. 3, 2011.

[4] Maria-Isabel Rocha-Gaso et al., *Surface Generated Acoustic Wave Biosensors for the Detection of Pathogens: A Review*, 9 Sensors 5740–69 (2009) (hereinafter "Rocha-Gaso").

[5] Yuhuan Xu, *Ferroelectric Materials and their Applications, 5—Lithium niobate and lithium tantalate*, Elsevier 217 (1991) (hereinafter "Xu").

[6] US 8,436,509 B1, issued May 7, 2013.

4. Claims 12 and 13 are rejected under 35 U.S.C. § 103 as unpatentable over the combination of Larson and Yamamichi.[7] Final Act. 8–9.

Appellant argues for the reversal of the rejections of claims 1, 4–6, 12, and 13 on the basis of limitations present in independent claim 1. Appeal Br. 11–16; 20–21. We select claim 1 as representative. 37 C.F.R. § 41.37(c)(1)(iv). Accordingly, claims 4–6, 12, and 13 will stand or fall with claim 1. Appellant provides separate arguments for the reversal of the rejections of claims 3, 14, 16, and 19. *Id.* at 16–20. Claims 3, 14, 16, and 19 will be discussed separately.

III. DISCUSSION

A. Rejection of claims 1, 14, 16, and 19 as unpatentable over Larson.

a. Claim 1.

According to Appellant, Larson does not describe or suggest the following elements of claim 1: "[a] portable influenza detector for detecting a targeted influenza . . . comprising: an electrical circuit including a battery driven regulated power supply for providing power to the portable influenza detector." Appeal Br. 11–14.

In the Final Office Action, the Examiner found, *inter alia*, that Larson's portable influenza detector comprises the requisite power supply. Final Act. 2 (citing, *e.g.*, citing Larson ¶¶ 155, 179).

Appellant argues that Larson teach away from battery powering a portable influenza detector. Appeal Br. 11, 14–15 (citing Larson, *e.g.*,

[7] US 2009/0117669 A1, published May 7, 2009.

¶¶ 155, 179). According to Appellant, Larson discloses that "such a device would require further inventive effort to be reduced to practice." Appeal Br. 15.

These arguments are not persuasive.

The teachings of a reference that arguably teaches away from a claimed feature must be weighed alongside the teachings of a cited reference that teaches the propriety of employing that feature. *Para-Ordnance Mfg., Inc. v. SGS Imps. Int'l, Inc.*, 73 F.3d 1085, 1090 (Fed. Cir. 1995). For a reference to "teach away," it must criticize, discredit, or otherwise discourage the claimed solution. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004).

In this case, Appellant directs us to Larson's paragraph 179, which discloses that the

> data, and the results which are presented in Table 1 . . . indicate that the sensor of the present invention may be used under field conditions and warrant further efforts into the development of inexpensive portable devices for field operation. This includes a hand-held battery operated and self-contained version of the present invention.

Larson ¶ 179; *see* Appeal Br. 15. Appellant, however, does not direct our attention to any teaching in Larson that criticizes, discredits, or discourages powering the described bioagent detector with a battery. We, therefore, view Larson's paragraph 179 as providing a teaching or suggestion to "includ[e] a battery driven regulated power supply" with "the portable influenza detector," as recited in claim 1. We, furthermore, agree with the Examiner that "Larson does not state that further experimentation is needed to reduce to practice a battery-powered design." Answer 4.

On this record, Larson's alleged teaching away is outweighed by Larson's teachings regarding the propriety of powering portable influenza detectors with batteries.

In view of the foregoing, we determine that the Examiner did not reversibly err in rejecting claim 1 as unpatentable over Larson.

b. Claim 16.

Claim 16 is reproduced below from the Claims Appendix of the Brief.

> 16. The portable influenza detector in accordance with Claim 1 wherein the electrical circuit comprises an electromechanical transducer which physically contacts the SAW sensor for applying mechanical energy to the SAW sensor, the mechanical energy also provided to the liquid environment to mechanically rupture nonspecific bonds with the functionalized surface thereby improving sensor selectivity of the SAW sensor.

Appeal Br. 25 (Claims App.).

In the Final Office Action, the Examiner found Larson discloses a SAW sensor formed by piezoelectric transducer 102. Final Act. 4 (citing Larson ¶¶ 7, 155, 160–61). The Examiner found that Larson's electric circuit further comprises transducer 104, which is in physical contact with substrate 108. Final Act. 4 (citing Larson ¶ 155). The Examiner found that Larson's substrate comprises a piezoelectric material for producing a surface acoustic wave signal in response to an applied electric field. Final Act. 3 (citing Larson ¶ 2–6, 154–57).

Appellant argues Larson describes that transducers 102, 104, 106 are connected to respective delay lines 116, 118, 120, which in turn are connected to phase difference detectors 122, 124, 126. Appeal Br. 17; *see also* Larson, Fig. 1D. Appellant concludes that Larson's "transducers are not 'physically contacted' to the SAW sensor to mechanically rupture bonds," as required by claim 16. Appeal Br. 17

Claims directed to an article or apparatus—such as claim 16—must be distinguished from the prior art in terms of structure. *See In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997) and cases cited therein; *see also In re Danly*, 263 F.2d 844, 848 (CCPA 1959) ("Claims drawn to an apparatus must distinguish from the prior art in terms of structure rather than function"); *In re Gardiner*, 171 F.2d 313, 315–16 (CCPA 1948) ("It is trite to state that the patentability of apparatus claims must be shown in the structure claimed and not merely upon a use, function, or result thereof.").

In this case, the Examiner did not err in concluding that Larson describes or suggests each of claim 16's positively recited structural limitations of the electromechanical transducer in contact with the SAW sensor. Larson discloses that a "SAW device typically has a planar electrode structure consisting of a piezoelectric substrate containing interdigital transducers (IDTs)" 102, 104, and 106. Larson ¶ 4; *see also id.* ¶ 155. As Larson's piezoelectric material forms the SAW sensor and transducer 104 is in physical contact with the piezoelectric substrate (*see* Answer 4 (citing Larson ¶¶ 7, 155, 160–61)), we agree with the Examiner that Larson's additional transducer 104 "is structurally capable of applying mechanical energy to mechanically rupture nonspecific bonds with the surface." Answer 5.

Appellant has the burden of demonstrating that such an arrangement of transducers 102, 104, and substrate 108 would not have been capable of performing the recited function. *See In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990) ("However, when the PTO shows sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not."). Appellant has not met this burden.

In view of the foregoing, we determine that the Examiner did not reversibly err in rejecting claim 16 as unpatentable over Larson.

c. Claim 14.

Claim 14 is reproduced below from the Claims Appendix of the Brief.

> 14. The portable influenza detector in accordance with Claim 1 wherein the electrical circuit applies the electric field to the SAW sensor to excite the surface acoustic wave signal to apply mechanical energy to the functionalized surface to mechanically rupture nonspecific bonds with the functionalized surface thereby improving sensor selectivity of the SAW sensor.

Appeal Br. 25 (Claims App.).

Appellant argues that "claim 14 presents additional patentable limitations." Appeal Br. 18.

Appellant, however, does not substantively argue for reversal of this rejection based on any particular limitation recited in claim 14. *See* Appeal Br. 18–19. For example, Appellant contends that the "electrical circuit claimed in claim 14 is limited by the limitations to the electrical circuit in claim l which, as discussed [*supra* therein], is not obviated by Larson." *Id.* at 19.

For the reasons set forth above, we have affirmed the rejection of independent claim 1 as unpatentable over Larson. We, therefore, also affirm the rejection of claim 14 as unpatentable over Larson. 37 C.F.R. § 41.37(c)(1)(iv).

d. Claim 19.

Claim 19 is reproduced below from the Claims Appendix of the Brief.

> 19. The portable influenza detector in accordance with Claim 1 wherein the phase shift measurement circuit comprises an additional reference line for thermal compensation.

Appeal Br. 25 (Claims App.).

In the Final Office Action, the Examiner found that Larson discloses that the biosensor device comprises additional reference line 114, which is "fully capable of being for thermal compensation, as it shares a common power source with the piezoelectric sensor material." Final Act. 5 (citing Larson ¶ 155; Fig. 1D).

Larson's Figure 1D, reproduced below, is a block diagram of a SAW measurement assembly for making SAW measurements:

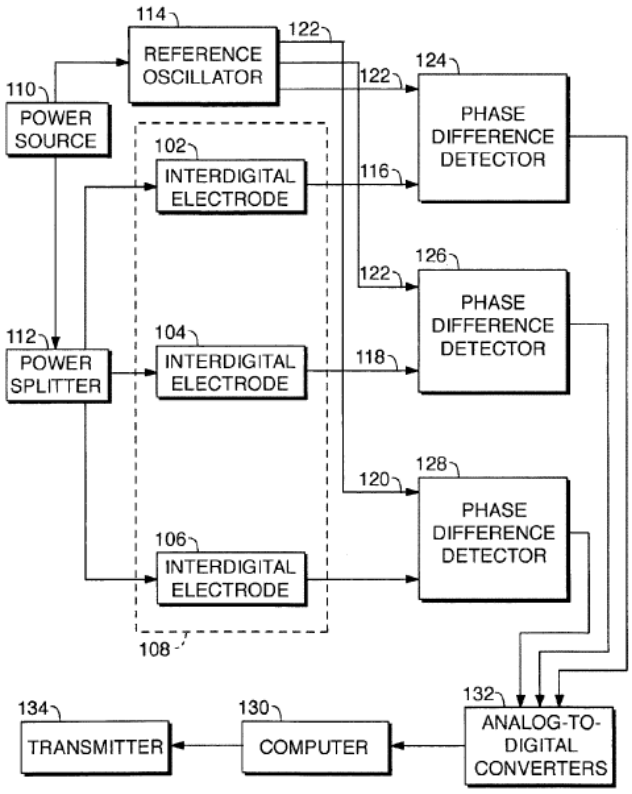

FIG. 1D

Figure 1D of Larson illustrates the components of a SAW detector including, *inter alia*, power source 110 connected to reference oscillator 114 and three transducer elements 102, 104, 106, via power splitter 112. Larson ¶ 155. Reference oscillator 114 may generate SAW waves in the fluidic housing and is disposed on the same substrate as IDT electrodes 102, 104, 106. *Id.*

According to Appellant, the Examiner "merely stating that 'the additional reference line is fully capable of being for thermal compensation' is not a finding that Larson teaches, suggest or discloses thermal compensation using the additional reference line." Appeal Br. 19.

We are not persuaded by this argument because additional reference line 114 "shares a common power source with the piezoelectric sensor material." Answer 5 (citing Larson ¶ 155; Fig. 1D). We, therefore agree with the Examiner that Larson's known structure is fully capable of providing thermal compensation. Answer 5. *See Schreiber*, 128 F.3d at 1478.

Appellant has the burden of demonstrating that such an arrangement of power source 110 connected to additional reference oscillator 114 would not have been capable of performing the recited function. *See Spada*, 911 F.2d at 708. Appellant has not met this burden.

In view of the foregoing, we determine that the Examiner did not reversibly err in rejecting claim 19 as unpatentable over Larson.

B. Rejection of claim 3 as unpatentable over the combination of Larson and Rocha-Gaso, as evidenced by Xu.

Claim 3 is reproduced below from the Claims Appendix of the Brief.

> 3. The portable influenza detector in accordance with Claim l wherein the piezoelectric material is a ferroelectric material with a dielectric constant greater than fifty at a working frequency of the surface acoustic wave signal.

Appeal Br. 24 (Claims App.).

There is no dispute that: (i) Larson teaches a lithium tantalate piezoelectric material and (ii) Rocha-Gaso's teachings render the claimed the piezoelectric material's dielectric constant range obvious. *See* Final Act. 5–6; Appeal Br. 20.

Appellant "disagrees that [Larson's] lithium tantalate is a ferroelectric material." Appeal Br. 20.

In the Answer, the Examiner found Xu provides evidence that one of ordinary skill in the art would have recognized that lithium tantalate is a ferroelectric material. Answer 7 (citing Xu 217; ¶¶ 1–2 (disclosing that, "in view of their excellent piezoelectric, pyroelectric and optical properties, [[l]ithium niobate ($LiNbO_3$) and lithium tantalate ($LiTaO_3$)] are well-known ferroelectric crystals.")).

Appellant does not contest or rebut the Examiner's findings with respect to Xu's disclosure.

In view of the foregoing, we determine that the Examiner did not reversibly err in rejecting claim 3 as unpatentable over the combination of Larson and Rocha-Gaso, as evidenced by Xu.

C. Rejection of claims 4–6 as unpatentable over the combination of Larson and Branch.

Appellant argues that the rejection of claims 4–6 as unpatentable over the combination of Larson and Branch should be reversed for the reasons set forth in arguing for reversal of the rejection over Larson alone. *See* Appeal Br. 20 ("Claims 4 to 6 depend from claim l and are patentable over the combination of Larson in view of Branch based upon their dependency from claim 1.").

For the reasons set forth above, we have affirmed the rejection of independent claim 1 as unpatentable over Larson. We, therefore, also affirm the rejection of claims 4–6 as unpatentable over the combination of the combination of Larson and Branch. 37 C.F.R. § 41.37(c)(1)(iv).

D. Rejection of claims 12 and 13 as unpatentable over the combination of Larson and Yamamichi.

Appellant argues that the rejection of claims 12 and 13 as unpatentable over the combination of Larson and Yamamichi should be reversed for the reasons set forth in arguing for reversal of the rejection over Larson alone. *See* Appeal Br. 21 ("Claims 12 and 13 depend from claim l and are patentable over the combination of Larson in view of Yamamichi based upon their dependency from claim 1.").

For the reasons set forth above, we have affirmed the rejection of independent claim 1 as unpatentable over Larson. We, therefore, also affirm the rejection of claims 12 and 13 as unpatentable over the combination of the combination of Larson and Yamamichi. 37 C.F.R. § 41.37(c)(1)(iv).

IV. CONCLUSION

In summary:

Claims Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
1, 14, 16, 19	103	Larson	1, 14, 16, 19	
3	103	Larson, Rocha-Gaso, Xu	3	
4–6	103	Larson, Branch	4–6	
12, 13	103	Larson, Yamamichi	12, 13	
Overall Outcome			1, 3–6, 12–14, 16, 19	

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