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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* BIN ZHANG and CHI-HUA TUNG

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Appeal 2018-002984  
Application 14/909,747  
Technology Center 2800

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Before DONNA M. PRAISS, AVELYN M. ROSS, and  
JENNIFER R. GUPTA, *Administrative Patent Judges*.

ROSS, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

Appellant<sup>2</sup> appeals under 35 U.S.C. § 134(a) from the Examiner's decision to finally reject claims 1–21. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

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<sup>1</sup> In our Decision we refer to the Specification filed February 3, 2016 as amended (“Spec.”), the Final Office Action appealed from dated May 3, 2017 (“Final Act.”), the Appeal Brief filed September 19, 2017 (“Appeal Br.”), the Examiner’s Answer dated December 1, 2017 (“Ans.”) and the Reply Brief filed January 26, 2018 (“Reply Br.”).

<sup>2</sup> 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 Koninklijke Philips N.V. Appeal Br. 1.

## STATEMENT OF THE CASE

The subject matter on appeal relates to diagnostic imaging systems and methods, and in particular, positron emission tomography (“PET”). Spec. 1. “In a PET scan, a patient receives a dose of a radiopharmaceutical” which is carried through the body and concentrates in target organs or regions. *Id.* Then the emitted radiation from the radiopharmaceutical is detected and reconstructed into an image. *Id.* The PET detectors are made of scintillator crystals which is the largest portion of the hardware costs however, the field of view (“FOV”) of the system is related to the number of crystals used in the detector. *Id.* Therefore, the present application purports to “address these problems by reducing the number of crystal[s] without reducing the FOV or, alternatively, enlarging the FOV without adding crystals, all while maintaining uniform sampling without reducing resolution.” *Id.* Claims 1 and 12, reproduced below, are illustrative of the claimed subject matter:

1. A PET scanner comprising:
  - an annular support structure which surrounds an examination region, the examination region extending axially parallel to an axis of the annular support structure;
  - a plurality of radiation detector units mounted on the annular support structure, each radiation detector unit comprising a plurality of scintillator crystals, and
  - wherein the scintillator crystals of the plurality of radiation detector units are arranged in annular ranks that surround the examination region; and wherein at least some of the annular ranks are spaced by annular gaps within each of the plurality of radiation detector units.

Appeal Br. 18 (Claims App.).

12. A PET device comprising:
  - a first annular support structure surrounding an examination region, and including a plurality of ranks of detector units;
    - each detector unit including a plurality of scintillator crystals, and wherein the ranks of detector units are separated by gaps, and the gaps are smaller adjacent a center of first annular support structure and progressively larger toward axially opposite ends of the first annular support structure; and
    - a patient support configured to move a patient in the PET device during a scan.

Appeal Br. 19–20 (Claims App.).

### REJECTIONS

The Examiner maintains<sup>3</sup> the following rejections:

- A. Claims 1, 2, 6, and 14–16 stand rejected under 35 U.S.C. § 102(a)(1) as anticipated by Yamaya.<sup>4</sup> Final Act. 4.
- B. Claims 3–5, 7, 8, 10–13, and 17–21 stand rejected under 35 U.S.C. § 103 as unpatentable over Yamaya in view of Yamaya '956.<sup>5</sup> *Id.* at 7.
- C. Claim 9 stands rejected under 35 U.S.C. § 103 as unpatentable over Yamaya in view of Wieczorek.<sup>6</sup> *Id.* at 16.

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<sup>3</sup> The Examiner withdraws the rejection of claims 12 and 13 (Final Act. 2) under 35 U.S.C. § 112 as failing to comply with the written description requirement. Ans. 2.

<sup>4</sup> Yamaya et al., US 2011/0031407 A1, published February 10, 2011 (“Yamaya”).

<sup>5</sup> Yamaya et al., US 2010/0128956 A1, published May 27, 2010 (“Yamaya '956”).

<sup>6</sup> Herfried Wieczorek, US 2010/0294940 A1, published November 25, 2010 (“Wieczorek”).

Appellant seeks our review of Rejections A–C. *See generally* Appeal Br. Appellant argues the rejections together, presenting separate arguments for claims 1 (and claim 14) and 12.<sup>7</sup> *Id.* Therefore, consistent with the provisions of 37 C.F.R. § 41.37(c)(1)(iv) (2013), we limit our discussion to claims 1 and 12, and each of the other claims stand or fall together with the claim from which it depends.

#### OPINION

We review the appealed rejections for error based upon the issues identified by Appellant and in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (*cited with approval* in *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections . . . .”). After considering the evidence presented in this Appeal and each of Appellant’s arguments, we are persuaded that Appellant identifies reversible error except where otherwise explained below. Thus, we affirm the Examiner’s rejection of claims 12 and 13—for the reasons expressed in the Final Office Action and the Answer—and reverse the Examiner’s rejection of claims 1, 2–11, and 14–21. We add the following.

##### *A. Rejections based on Yamaya*

Regarding claim 1, the Examiner finds that Yamaya teaches: (1) an annular support structure, corresponding to gantry 100; (2) a plurality of radiation detector units, or detector rings 11, 12; and (3) where each unit is

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<sup>7</sup> Appellant’s arguments for claims 2–11 and 14–21 mirror the argument advanced for claim 1, i.e., that Yamaya does not suggest a radiation detector unit with annular gaps *within* the radiation detector unit. *See generally* Appeal Br. 8–10, 12–13.

comprised of a plurality of scintillator crystals. Final Act. 4–5. According to the Examiner, the scintillator crystals are arranged in and form annular ranks that “are spaced by annular gaps within each of the plurality of radiation units.” *Id.* at 5 (referring to Yamaya, Figs. 13–14 and movable detector rings 21, 24 and 32, 35 which are housed within gantry 100); *see also* Ans. 5 (same).

Appellant argues that Yamaya “does not suggest a radiation detector unit with annular gaps within the radiation detector unit.” Appeal Br. 7. Appellant stresses that claim 1 is directed to “gaps within each of the detector rings” and not between detector rings 11, 12, i.e., “arranged apart laterally,” as Yamaya suggests. *Id.* Therefore, according to Appellant, because an element is entirely missing from Yamaya, Yamaya cannot anticipate claim 1. *Id.* at 8.

On this record, Appellant has the better position. The Specification describes three different spacing embodiments. “The spacing may be accomplished by [1] spacing the individual crystals 52, [2] by spacing the detector units 14, or [3] by spacing the rings 12 to which the detector units 14 are affixed, or any combination thereof.” Spec. 7. Different claims similarly correspond to each of the three spacing embodiments described in the Specification—claims 1–11 and 14–21 relate to gaps between the crystals, i.e., within the detector units, claim 11 depends from claim 1 and further relates to spacing between the detector units on the ring, and claims 12 and 13 relate to spacing between the annular rings. Appeal Br. 18–21 (Claims App.). The first embodiment, relevant for claim 1, is depicted in Figures 2 and 3 below, which illustrate detector unit 14 formed as a module 40 (Figure 2) or mounted on a tile 62 (Figure 3).

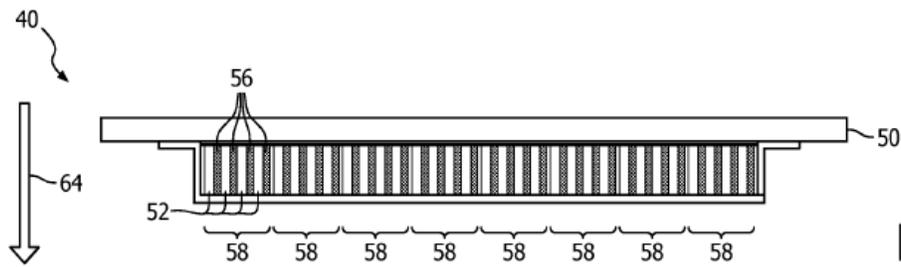


FIG. 2

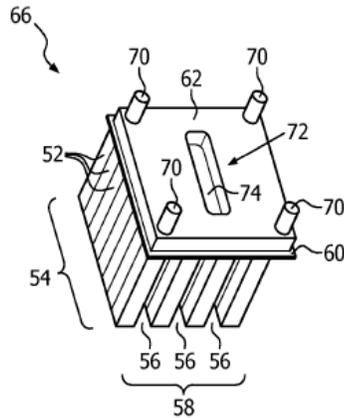
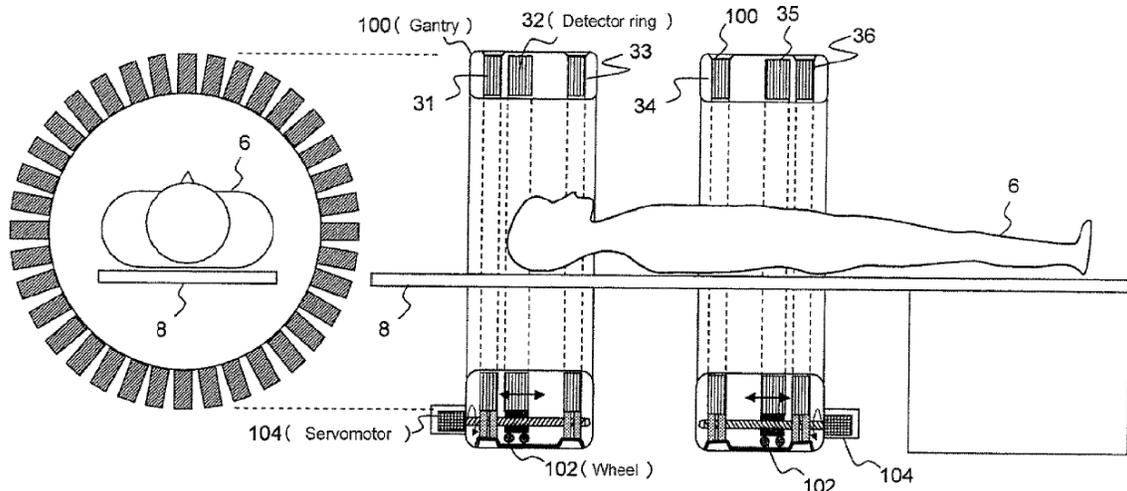


FIG. 3

Figures 2 and 3 illustrate “an individual PET detector module with the scintillation crystals in a spaced configuration” and “a tile with its attached photodetector and scintillation crystals in a spaced configuration,” respectively. Spec. 2. Each of Figures 2 and 3 depict an array of scintillation crystals 58, mounted on either assembly 50 or tile mount 62, where the crystal array includes spaces 56 which are alternately placed between crystals. *Id.* at 5. The modules or tiles are then combined with other identical modules and tiles and placed on annular support ring 12. *Id.*

The Examiner’s rejection relies on Yamaya’s Figures 13 and 14, and states “the annular ranks are spaced by annular gaps within each of the plurality of radiation detector units.” Final Act. 5. The Examiner identifies gantry 100 as the annular support structure and detector rings 11, 12 (as well as 21, 24 and 32, 35) as the plurality of radiation detector units. *Id.* Figure 14 is reproduced below for discussion purposes.

Fig. 14



Yamaya's Figure 14 "covers drawings showing Embodiment 2 of the present invention." Yamaya ¶ 41. According to Yamaya, each gantry 100 includes detector rings 31, 32, 33 or 34, 35, 36 with detector rings 32, 35 being movable within gantry 100. *Id.* at ¶ 56. Each detector ring is comprised of detecting element rings that have scintillators on the circumference. *Id.* at ¶ 43. Consistent with the teachings of Yamaya, the Examiner explains that the movable detector rings 21, 24 and 32, 35 can move inside the gantry and adjust the size of the annular gaps. Final Act. 5. But, Yamaya and the Examiner's explanation describe spacing *between* each of the individual detector units and not *within* the detector unit as claimed. Therefore, Appellant has identified a reversible error in the Examiner's rejection of claim 1 and we do not sustain that rejection.

Furthermore, Appellant has identified error in the Examiner's rejection of claims 2–11 and 14–21—each requiring "annular gaps *within*

each of the plurality of radiation detector units,” by independent recitation or through dependency—for the same reason discussed above.<sup>8</sup>

*B. Rejection based on Yamaya in combination with Yamaya '956*

We focus our discussion of Rejection B on independent claim 12. The Examiner rejects claim 12 over the combination of Yamaya and Yamaya '956. Final Act. 11. In relevant part, claim 12 differs from claim 1 in that claim 12 requires that “the *ranks of detector units are separated by gaps*” and that “the gaps are smaller adjacent a center of first annular support structure and progressively larger toward axially opposite ends.” Appeal Br. 19–20 (emphasis added).

In addition to the findings detailed above for claim 1, the Examiner finds that Yamaya describes a patient support, or bed 8, to move the patient in the PET device during a scan. Final Act. 11 (citing Yamaya ¶¶ 2, 23, 24). The Examiner acknowledges that Yamaya “lacks an explicit description that the gaps are smaller adjacent a center of the first annular support structure and progressively larger toward axially opposite ends of the first annular support structure,” but additionally finds that Yamaya '956 describes using a number of detector rings and adjusting the distances between the rings. *Id.* at 12 (citing Yamaya '956 ¶¶ 94, 101 and Fig. 24). The Examiner reasons that it would have been obvious to one skilled in the art to adjust the gaps between the annular support structures such that the gaps become

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<sup>8</sup> Neither of the secondary references are relied on by the Examiner to cure the above-identified defect in the rejection or to provide support for the presence of “annular gaps within each of the plurality of radiation detector units.” *See, e.g.*, Final Act. 7 (introducing Yamaya '956 to describe clearance or gaps *between* rings), 16 (relying on Wiczorek to describe shields).

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progressively larger moving away from the center “in order to obtain D values that are greater than an examination target region to be imaged.” *Id.*

Appellant contends that Yamaya '956 does not disclose a “spacing between detector units on a first annular support structure.” Appeal Br. 12. Appellant asserts that “even if any of Yamaya '956's detector rings 12a, 12b, and 12c are taken to correspond to the claimed first annular support structure, there is no disclosure in these passages of the spacing of detector units on any of the detector rings 12a, 12b, 12c.” *Id.*

We are not persuaded by Appellant's arguments. Appellant's argument is based on its position that claim 12 requires spacing between each detector unit on the annular support structure as opposed to between the detector units on separate annular support structures. However, Appellant describes the gaps of claim 12 with relation to Figure 6. Appeal Br. 5. Specifically, in its Appeal Brief, Appellant states that “the ranks of detector units are separated by gaps, and the gaps are smaller adjacent a center of first annular support structure (12, 134) and progressively larger toward axially opposite ends of the first annular support structure (12, 134); (figure 6; page 7, lines 11–27).” *Id.* Figure 6 is reproduced below for reference.

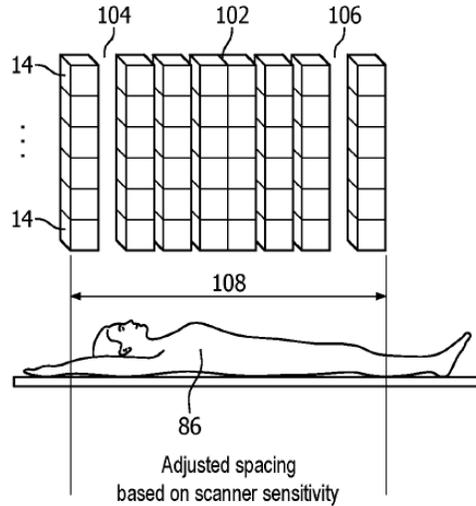


FIG. 6

Figure 6 “illustrates a spread arrangement of *rings of detector units* having increased sensitivity in the center of the imaging region.” Spec. 2 (emphasis added). The Specification expands on this description and states

FIGURE 6 shows an arrangement having the detector units **14** spaced by non-constant width annular spaces, the spacing varying from the center at **102** where there is minimal spacing to larger spaces **104, 106** adjacent the ends of the FOY **108**. This scheme is used when high 15 resolution is wanted in a small examination area, and reduced resolution in the surrounding areas is acceptable.

*Id.* at 7. Therefore, claim 12, as described by Appellant in both its Appeal Brief and its Specification, is directed to variable spacing between *ranks* of the plurality of detector units and not *between* each individual detector unit 14 as alleged. Thus, the Examiner’s reliance on Yamaya ’956 to show variable spacing between each gantry 100 (of Yamaya) and the plurality of detector units 21, 24, 32, 35 within the movable gantries (of Yamaya ’956) to establish variable spacing between the ranks of detector units has not been

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shown to be in error. Accordingly, we affirm the Examiner's rejection of claim 12. Appellant does not provide separate argument in support of claim 13. Therefore, for the same reasons discussed for claim 12, we affirm the Examiner's rejection of claim 13.

### CONCLUSION

For the above reasons, the Examiner's rejection of claims 12 and 13 is *affirmed* and the Examiner's rejection of claims 1, 2-11, and 14-21 is *reversed*.

### DECISION

In summary:

<b>Claims Rejected</b>	<b>35 U.S.C. §</b>	<b>Reference(s)/Basis</b>	<b>Affirmed</b>	<b>Reversed</b>
1, 2, 6, 14-16	102(a)(1)	Yamaya		1, 2, 6, 14-16
3-5, 7, 8, 10-13, 17-21	103	Yamaya, Yamaya '956	12, 13	3-5, 7, 8, 10, 11, 17-21
9	103	Yamaya, Yamaya '956, Wiczorek		9
<b>Overall Outcome</b>			12, 13	1-11, 14-21

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).

AFFIRMED-IN-PART