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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte THEODORE J. VORNBROCK, AARON M. FOULK, NELSON A. GOMEZ, JESSEE L. KOPCZYNSKI, MARK OLENDER, and RICHARD PITRE

Appeal 2017-011787
Application 13/688,628
Technology Center 3600

Before BIBHU R. MOHANTY, NINA L. MEDLOCK, and BART A. GERSTENBLITH, *Administrative Patent Judges*.

GERSTENBLITH, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–5, 7–11, and 13–19. We have jurisdiction under 35 U.S.C. § 6(b).

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42 (2012). Appellant identifies Raytheon Company as the real party in interest. Appeal Br. 2.

The invention relates to detecting subterranean voids (e.g., tunnels or pipes) using acoustic or seismic sensors, which sense vibratory or acoustic emissions from the voids. Spec. ¶ 2.

Claimed Subject Matter

There are four independent claims on appeal. Claim 1 is illustrative and reproduced below:

> 1. A system for detecting subterranean voids, the system comprising:
>
> a sensor array comprising a plurality of sensors that are each disposed in respective subterranean locations defined along a substantially horizontal bore hole;
>
> energy emitting devices respectively disposed on positions on a surface of terrain, each of the energy emitting devices being operative to emit wave patterns that propagate in a subterranean region proximate to the energy emitting devices; and
>
> a control system communicatively connected to the sensor array, the control system operative to receive signals from each sensor of the sensor array indicative of the direction and intensity of wave patterns emitted from each of the energy emitting devices and output an indication to a user indicative of the location of a subterranean void,
>
> wherein the indication to the user includes a plurality of graphical representations of sensed refraction of each of the wave patterns respectively associated with each of the energy emitting devices by the subterranean void.

Appeal Br. 11 (Claims App'x).

Rejections

The Examiner made the following three rejections under 35 U.S.C. § 103(a):

I. Claims 1, 4, 5, 7, 9, 11, 13–15, and 17 over Stolarczyk et al. (US 2014/0043183 A1, pub. Feb. 13, 2014) ("Stolarczyk '183"),

Stolarczykz[2] (US 5,185,578, issued Feb. 9, 1993) ("Stolarczykz '578"), and Khan (US 6,175,536 B1, issued Jan. 16, 2001) ("Khan")[3];

II. Claims 8 and 16 over Stolarczyk '183 and Khan; and

III. Claims 2, 3, 10, 18, and 19 over Stolarczyk '183, Stolarczykz '578, Khan, and Kisner et al. (US 2013/0286778 A1, pub. Oct. 31, 2013) ("Kisner").

Summary of Decision

We AFFIRM.

ANALYSIS

Rejection I

The Examiner finds that Stolarczyk '183 discloses most of the limitations of claim 1, but "does not explicitly teach a sensor array comprising a plurality of sensors that are each disposed in respective subterranean locations defined along a substantially horizontal bore hole." Final Act. 3.[4] The Examiner, however, finds that Khan "teaches a sensor

[2] The Examiner and Appellant refer to this reference as "Stolarczyk," omitting the "z" at the end of the inventor's last name as listed on the face of U.S. Patent No. 5,185,578.

[3] The Examiner's heading for this rejection only lists independent claims 1 and 11. Final Act. 2 (mailed Oct. 10, 2016). The rejection, however, also addresses dependent claims 4, 5, 7, 9, 13–15, and 17. *See id.* at 5–7. These dependent claims are not subject to the Examiner's other rejections. Appellant recognizes that these dependent claims were rejected. *See* Appeal Br. 10 (referring to the rejections of claims 1–5, 7–11, and 13–19). Accordingly, Appellant understood that dependent claims 4, 5, 7, 9, 13–15, and 17 are subject to this rejection and we treat them as such.

[4] The Examiner finds that Stolarczyk '183 "implicitly teaches a sensor array comprising a plurality of sensors that are each disposed in respective subterranean locations." Final Act. 3 (citing Stolarczyk '183 ¶ 22).

array comprising a plurality of sensors disposed in respective subterranean locations." *Id.* (citing Khan, 3:20–35, Fig. 1). The Examiner also finds that Stolarczykz '578 teaches "a plurality of sensors (36) that are each disposed in respective . . . subterranean locations defined along a substantially horizontal bore hole." *Id.* (citing Stolarczykz '578, Fig. 10, 16:3–5, 16:22–25) (identifying reference numeral 120 from Stolarczykz '578 as teaching a substantially horizontal bore hole). The Examiner determines

> it would be obvious to one of ordinary skill in the art at the time of the invention to modify the sensor array of Stolarczyk [']183 with a plurality of sensors disposed in a subterranean location, as taught by Stolarczyk [']183 and Khan, the subterranean location defined along a substantially horizontal bore hole, as taught by Stolarczyk[z ']578, for the purpose of having multiple components to receive signals in multiple directions.

Id. at 3–4.

Appellant contends that the rejection is based on "the apparently faulty notion that the plural subterranean sensors disclosed by Khan and implicitly (Examiner's wording) disclosed by Stolarczyk [']183 can be provided in a horizontal well bore as taught by the 'plurality of sensors' in

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Paragraph 22 of Stolarczyk '183 states: "A tool 102, represented at multiple locations 104-106, ... is variously located on the ground surface 110 or a nearby wellbore 112, serially at what can easily be a hundred different vantage points." Stolarczyk '183 ¶ 22. After reviewing the reference and the arguments made with respect thereto, it is unclear whether this disclosure teaches or suggests a plurality of sensors (i.e., a sensor array) or whether it teaches placing a single sensor in different locations, one location after the other. For the purposes of this decision, we need not decide which is the case because the Examiner also relied upon Khan as disclosing a sensor array. Therefore, we need not decide whether Stolarczyk '183 also discloses a sensor array.

the horizontal bore hole 120 of Stolarczyk[z ']578." Appeal Br. 7–8. Appellant asserts that Stolarczyk '183 only discloses a single subterranean sensor in a vertical bore hole.[5] *Id.* Appellant also argues that Khan discloses a plurality of sensors in a vertical bore hole so that their depth can be changed between measurements. *Id.* Appellant asserts that because Khan requires its sensors be placed in a vertical bore hole (to make depth changes), "Khan's disclosure actually teaches away from the suggested combination proposed by the Examiner." *Id.* Further, Appellant contends Stolarczykz '578 teaches only a single sensor 36 in a horizontal bore hole. *Id.* Thus, Appellant argues "the resulting combination clearly fails to teach or suggest anything corresponding to the claimed feature of 'a plurality of sensors that are each disposed in respective subterranean locations defined along a substantially horizontal bore hole.'" *Id.* (citing Claims App'x).

Additionally, Appellant contends that the references do not teach structure necessary to perform the modifications required by the Examiner's proposed combination or the structure necessary to use the teachings as combined. Appeal Br. 8–9.

Appellant's arguments are not persuasive to show reversible Examiner error. First, the Examiner does not rely upon a *single* reference as teaching a plurality of sensors "disposed in respective subterranean locations defined along a substantially horizontal bore hole," as recited in claim 1. Rather, the Examiner relies upon a combination of the teachings of several references—Khan (for a plurality of sensors in subterranean locations) and

[5] We need not decide whether Stolarczyk '183 discloses a single or a plurality of sensors for the reasons explained above.

Stolarczykz '578 (for a sensor[6] placed in a substantially horizontal bore hole). Final Act. 3.

Second, the Examiner provided a reason with rational underpinning (to have multiple components receive signals in multiple directions) as to why one of ordinary skill in the art would have been motivated to modify Stolarczyk '183 with a plurality of sensors (as taught by Khan) in a subterranean location defined along a substantially horizontal bore hole (as taught by Stolarczykz '578). *Id.* at 3–4. Appellant argues that Khan teaches away from the proposed combination, but Appellant fails to point to any disclosure in Khan that would discourage or otherwise lead one of ordinary skill in the art away from the combination/modification proposed by the Examiner. *See In re Haruna*, 249 F.3d 1327, 1335 (Fed. Cir. 2001) ("A reference may be said to teach away when a person of ordinary skill, upon reading the reference, . . . would be led in a direction divergent from the path that was taken by the applicant." (quoting *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999))). In other words, that Khan teaches a vertical bore hole, does not discourage or otherwise lead one of ordinary skill in the art away from a horizontal bore hole or from modifying Stolarczyk '183 as proposed by the Examiner.

[6] The Examiner finds that Stolarczykz '578 teaches a "plurality of sensors (36)" (Final Act. 3), but Stolarczykz '578 discloses a single "receiver 36′," not multiple receivers (i.e., sensors). *See* Stolarczykz '578, 16:3–5 (describing "[a] plurality of horizontal drillholes 120"), 16:22–23 (describing a single receiver that is "inserted into at least one of the drillholes 120"). The Examiner's error is harmless because the Examiner also relies upon Khan as disclosing a plurality of sensors.

Third, Appellant's arguments regarding the alleged physical requirements of a combination that includes Khan's teachings are unpersuasive. *See* Appeal Br. 8–9. In particular, Appellant's arguments are akin to arguing bodily incorporation. *See In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012) ("It is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements." (citations omitted)). Additionally, Appellant does not contend that making the modifications proposed by the Examiner would have been beyond the level of ordinary skill in the art at the time of the invention or that one of ordinary skill would not have had a reasonable expectation of success.

In the Reply Brief, Appellant reiterates what each individual reference does and does not disclose, but Appellant does not raise any additional arguments directed to the Examiner's proposed combination or reason to combine. Reply Br. 1–2; *see In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) ("Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references." (citing *In re Keller*, 642 F.3d 413, 425 (CCPA 1981))).

Accordingly, we sustain the Examiner's rejection of claim 1. Appellant argues claims 1, 4, 5, 7, 9, 11, 13–15, and 17 as a group and does not raise any other argument in response to this rejection. Appeal Br. 7–9; Reply Br. 1–2. Accordingly, claims 4, 5, 7, 9, 11, 13–15, and 17 fall with claim 1 and we sustain Rejection I. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2012).

Rejection II

Independent claim 8 is similar to claim 1, but claim 8 does not recite a horizontal bore hole, and instead recites that "the subterranean void is disposed at a subterranean depth that is less than a subterranean depth of the sensor array." Appeal Br. 12 (Claims App'x). The Examiner finds that Stolarczyk '183 discloses most of the claim limitations, but "does not explicitly teach a sensor array comprising a plurality of sensors disposed in a subterranean location" and "does not explicitly teach the subterranean void is disposed at a subterranean depth that is less than a subterranean depth of the sensor array." Final Act. 7–8. The Examiner finds that Khan teaches "a sensor array comprising a plurality of sensors disposed in a subterranean location." *Id.* at 8 (citing Khan, 3:30–35, Fig. 1). The Examiner additionally finds that Stolarczyk '183 "implicitly teaches that having the sensor at a greater depth than the void is a possible arrangement (FIG 4, tool 406 is deeper than void 416, also implied in [0022][)]." *Id.* The Examiner also finds that Khan "implicitly teaches the subterranean void is disposed at a subterranean depth that is less than a subterranean depth of the sensor array." *Id.* (citing Khan, 3:5–20). The Examiner determines that

> it would be obvious to one of ordinary skill in the art at the time of the invention to modify the system of Stolarczyk [']183 wherein the subterranean void is disposed at a subterranean depth that is less than a subterranean depth of the sensor array, as taught by Khan, for the purpose of having the void located in direct acoustic line-of-sight from the source to the sensor array.

Id.

Appellant contends that Khan does not teach a subterranean void or a sensor or sensor array deeper than a subterranean void. Appeal Br. 9. Appellant also asserts that Stolarczyk '183 teaches a sensor, tool 406, but

not a sensor array and, thus, "it is impossible to state with any confidence or certainty that the voids 416 and 417 are less deep than a sensor array which doesn't exist." *Id.*

In the Answer, the Examiner responds by noting that "the issue in question is line of sight. Khan teaches this concept in the fact that it is measuring the depths of different layers, thus rendering it obvious to one of ordinary skill in the art that this would be required for the invention to function." Ans. 4. Additionally, the Examiner finds that Stolarczyk '183 "teaches this feature explicitly in FIG 4, which depicts voids 416 and 417 above tool 406." *Id.*

We agree with Appellant that neither Stolarczyk '183 nor Khan individually teaches a sensor *array* at a depth greater than a subterranean void. Khan shows a sensor array, but does not illustrate a void. *See* Khan, Fig. 1. Khan teaches raising and lowering the sensor array, but the Examiner has not identified any explicit disclosure of lowering the sensor array to a depth greater than a subterranean void. *See, e.g.*, Kahn, 3:5–20. Stolarczyk '183 fails to disclose a sensor array, but does disclose a sensor placed at a subterranean depth greater than a subterranean void. *See* Stolarczyk '183, Fig. 4 (illustrating tool 406 at a subterranean depth greater than voids 416 and 417).

Those findings, however, do not end the inquiry because the rejection is based on obviousness, not anticipation. As we understand, the Examiner proposes modifying Stolarczyk '183 such that it includes a sensor array disposed at a depth greater than a subterranean void. Final Act. 8. To accomplish this modification, however, the only change needed based on the Examiner's findings that are supported by a preponderance of evidence is to

use a sensor array instead of a single sensor (tool 406). The Examiner provided a reason as to why one would have located the sensor array at a depth greater than a subterranean void, but that was not required as Stolarczyk '183 already discloses a sensor in said position—the only modification needed was to use an array. Duplication of the sensor, such that it exists as an array, where there is no new or unexpected result, has "no patentable significance." *In re Harza*, 274 F.2d 669, 671 (CCPA 1960).

Accordingly, we sustain the Examiner's rejection of claim 8. Appellant argues claims 8 and 16 as a group and does not raise any other argument in response to this rejection. Appeal Br. 9; Reply Br. 2. Accordingly, claim 16 falls with claim 8 and we sustain Rejection II. *See* 37 C.F.R. § 41.37(c)(1)(iv) (2012).

Rejection III

The Examiner rejected claims 2, 3, 10, 18, and 19 based on the combined teachings of Stolarczyk '183, Stolarczykz '578, Khan, and Kisner. Final Act. 10–12. Appellant relies upon the previous arguments directed to independent claims 1 and 11, from which claims 2, 3, 10, 18, and 19 depend.[7] Because we sustain the rejection of claims 1 and 11, we sustain the rejection of dependent claims 2, 3, 10, 18, and 19 for the same reasons. Accordingly, we sustain Rejection III.

[7] Claims 2, 3, and 10 depend from claim 1; claims 18 and 19 depend from claim 11. Appeal Br. (Claims App'x).

CONCLUSION

In summary:

Claims Rejected	Basis	Affirmed	Reversed
1, 4, 5, 7, 9, 11, 13–15, 17	§ 103 Stolarczyk '183, Stolarczykz '578, Khan	1, 4, 5, 7, 9, 11, 13–15, 17	
8, 16	§ 103 Stolarczyk '183, Khan	8, 16	
2, 3, 10, 18, 19	§ 103 Stolarczyk '183, Stolarczykz '578, Khan, Kisner	2, 3, 10, 18, 19	
Overall Outcome		1–5, 7–11, 13–19	

DECISION

We AFFIRM the rejections of claims 1–5, 7–11, and 13–19 under 35 U.S.C. § 103(a).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED