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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RODERICK A. HYDE,
MURIEL Y. ISHIKAWA, NATHAN P. MYHRVOLD,
JOSHUA C. WALTER, THOMAS ALLAN WEAVER,
LOWELL L. WOOD, JR., and VICTORIA Y.H. WOOD

Appeal 2015-002182
Application 12/462,054
Technology Center 3600

Before JAMES P. CALVE, WILLIAM A. CAPP, and
BRANDON J. WARNER, *Administrative Patent Judges*.

CALVE, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134 from the final rejection of claims 1, 5, 13, 14, 18–24, 34, 36, 42, 43, 47, 48, 50, 53, 64, 65, 69–75, 85, 92, 93, and 96–99. Appeal Br. 2. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

CLAIMED SUBJECT MATTER

Claims 1 and 53 are independent. Claim 1 is reproduced below.

1. A system, comprising:
means for thermoelectrically converting heat generated with a gas cooled nuclear reactor system to electrical energy;
and
means for supplying the electrical energy to at least one operation system of the gas cooled nuclear reactor system.

REJECTIONS

Claims 1, 5, 13, 14, 18–24, 34, 36, 42, 43, 47, 48, 50, 53, 64, 65, 69–75, 85, 92, 93, and 96–99 are rejected under 35 U.S.C. §112, first paragraph, for lack of enablement.

Claims 24 and 75 are rejected under 35 U.S.C. §112, first paragraph, for lack of written description.

Claims 1, 5, 13, 14, 18–24, 34, 36, 42, 43, 47, 48, 50, 53, 64, 65, 69–75, 85, 92, 93, and 96–99 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

Claims 1, 5, 13, 14, 18–23, 34, 36, 42, 43, 53, 64, 65, 69–74, 85, 92, and 93 are rejected under 35 U.S.C. § 102(b) as anticipated by French (US 4,699,754, iss. Oct. 13, 1987).

Claims 24 and 75 are rejected under 35 U.S.C. § 103(a) as being unpatentable over French and Mitchell (US 3,601,887, iss. Aug. 31, 1971).

Claims 47, 48, and 96 are rejected under 35 U.S.C. § 103(a) as being unpatentable over French and Boncodin (US 7,493,974 B1, iss. Feb. 24, 2009).

Claims 50, 98, and 99 are rejected under 35 U.S.C. § 103(a) as being unpatentable over French and John (US 2008/0300660 A1, pub. Dec. 4, 2008).

Claim 97 is rejected under 35 U.S.C. § 103(a) as being unpatentable over French and Strnad (US 2005/0012204 A1, pub. Jan. 20, 2005).

ANALYSIS

Claims 1, 5, 13, 14, 18–24, 34, 36, 42, 43, 47, 48, 50, 53, 64, 65, 69–75, 85, 92, 93, and 96–99 for lack of enablement

The Examiner found that the claims contain subject matter that was not described in the Specification sufficient to enable a skilled artisan to make or use the invention. Final Act. 9. In particular, the Examiner found that “the system for thermoelectrically converting heat to electrical energy is essentially a black box with no description of the internals thereof,” and thus is “insufficient in failing to set forth in an adequate and sufficient fashion, a description of the internals of the system which would enable the device to perform all of the features (i.e., converting energy, supplying energy, etc.) that are disclosed and claimed.” *Id.* at 9–10; *see also* Ans. 4–5. In addition, the Examiner found that Appellants should submit copies of the prior art to describe the internals of the claimed thermoelectric system. Final Act. 9–10.

Appellants argue that the rejection is improper because the Examiner did not analyze a single *Wands* factor. Appeal Br. 19–20. Appellants also argue that thermoelectric devices are well-known in the art so that a skilled artisan would know how to convert heat to electrical energy using such a device as claimed. *Id.* at 21. As evidence of this understanding, Appellants cite the French reference that was cited by the Examiner to anticipate these claims and provide an enabling disclosure. *Id.* at 21–22. As a result of this alleged deficiency, Appellants argue that the Examiner has not met the burden of establishing that undue experimentation would have been needed to make and use the claimed invention, as required. *Id.* at 23. We agree.

“The enablement requirement is satisfied when one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation.” *AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1244 (Fed. Cir. 2003) (quoting *In re Wands*, 858 F.2d 731, 736–37 (Fed. Cir. 1988)); see *Auto. Techs. Int’l, Inc. v. BMW of N. Am., Inc.*, 501 F.3d 1274, 1282 (Fed. Cir. 2007); MANUAL OF PATENT EXAMINING PROCEDURE (“MPEP”) § 2164.08 (9th ed., rev. 7, Nov. 2015) (“The Federal Circuit has repeatedly held that ‘the specification must teach those skilled in the art how to make and use the full scope of the claimed invention without “undue experimentation;”’” “what is well-known is best omitted” (internal citations omitted)). Factors to consider in determining if undue experimentation is required are: (1) the quantity of experimentation needed, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the level of ordinary skill in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. See *Wands*, 858 F.2d at 737; see also MPEP § 2164.01(a), Undue Experimentation Factors. The PTO bears an initial burden of explaining why the claim scope is not enabled by the specification. *In re Wright*, 999 F.2d 1557, 1561–62 (1993).

“Whether undue experimentation is required ‘is not a single, simple factual determination, but rather is a conclusion reached by weighing many factual considerations.’” *Streck, Inc. v. Research & Diagnostic Sys., Inc.*, 665 F.3d 1269, 1288 (Fed. Cir. 2012) (citation omitted). Without such a factual inquiry, we cannot sustain this rejection. Moreover, the Specification provides examples of thermoelectric devices in more detail (Spec. ¶¶ 9, 21–28) than French (1:24–46, Fig. 2), which is cited to anticipate these claims.

Claims 24 and 75 for lack of written description

The Examiner found that Appellants' Specification does not disclose a "means for substantially increasing thermal conduction" between a portion of the reactor and a portion of the thermoelectric device as recited in claims 24 and 75, which depend from claims 1 and 53 respectively. Final Act. 10. The Examiner noted that paragraph 20 of the Specification describes "means for optimizing thermal conduction," but does not describe how conduction is optimized. Ans. 5.

Appellants argue that paragraphs 20 and 75 of their Specification and Figures 2 and 19 describe this feature. Appeal Br. 25; *see also* Reply Br. 9.

A skilled artisan would understand that Appellants were in possession of a "means for substantially increasing thermal conduction" in view of Appellants' disclosure of this feature in their Specification. Paragraph 20 of Appellants' Specification describes this feature as follows.

In another embodiment, the thermoelectric device 104 and a portion of the gas cooled nuclear reactor system 100 may both be in thermal communication with a means for optimizing thermal conduction 236 (e.g., thermal paste, thermal glue, thermal cement, or other highly thermally conductive materials) between the thermoelectric device 104 and the portion of the gas cooled nuclear reactor system 100. For example, the first portion 202 of the thermoelectric device 104 may be contacted to the first portion 204 of the gas cooled nuclear reactor system 100 using thermal cement. Further, the second portion 206 of the thermoelectric device 104 may be contacted to the first portion 208 of the gas cooled nuclear reactor system 100 using thermal cement.

Spec. ¶ 20, Fig. 2; *see also id.* ¶ 75.

Thus, we do not sustain this rejection.

Claims 1, 5, 13, 14, 18–24, 34, 36, 42, 43, 47, 48, 50, 53, 64, 65, 69–75, 85, 92, 93, and 96–99 as being indefinite

The Examiner found that claims 1, 5, 13, 14, 18–24, 34, 36, 42, 43, 47, 48, and 50 recite various “means for” limitations that are not disclosed in the Specification and only the examples of the structures that can be used are disclosed so that the metes and bounds of the claims cannot be determined. Final Act. 11. The Examiner found that the Specification does not disclose corresponding structure, material, or acts for the claimed function but only gives non-limiting examples of what the structure for these limitations might encompass and therefore the claims are indefinite. *Id.*; *see also* Ans. 5–6.

Appellants argue that the Examiner improperly rejected independent claim 53 and its dependent claims on this ground even though those claims are not means-plus-function claims. Appeal Br. 10. Appellants assert that the Examiner provides only a conclusory statement rather than any analysis of the Specification and particular claim limitations. *Id.* Appellants further argue that the Specification provides numerous illustrations of structure suitable for carrying out the claimed functions. *Id.* at 11–12. We agree.

The Examiner has not established that a skilled artisan would not understand the structure, material, or acts that are disclosed to perform the claimed means for functions in the rejected claims. For example, a skilled artisan would understand that the “means for thermoelectrically converting heat generated with a gas cooled nuclear reactor system to electrical energy” recited in claim 1 is disclosed in the Specification as thermoelectric devices 104 that comprise “a junction of two materials with different Seebeck coefficients” and various materials that may convert the heat produced by nuclear reactor 102 into electrical energy. *See* Spec. ¶¶ 9, 21–28, Figs. 1–5.

Appellants also disclose that electrical output 108 may be modified by power management circuitry 638 that includes a power converter, a voltage converter (e.g., DC-DC converter or DC-AC inverter), or voltage regulation circuitry 640 that includes a Zener diode, a series voltage regulator, a shunt regulator, a fixed voltage regulator, or an adjustable voltage regulator. Spec. ¶ 31, Fig. 6.

Thus, we do not sustain this rejection.

Claims 1, 5, 13, 14, 18–23, 34, 36, 42, 43, 53, 64, 65, 69–74, 85, 92, and 93 as anticipated by French

The Examiner found that French discloses a system and apparatus as recited in independent claims 1 and 53 including thermoelectric device 22 that provides a means for thermoelectrically converting nuclear reactor heat to electrical energy and a means for supplying electrical energy to a decay heat removal system of a reactor. Final Act. 13–16.

Appellants argue that French does not disclose a means for supplying electrical energy to an operation system of a gas cooled nuclear reactor as recited in independent claims 1 and 53, because French discloses a nuclear reactor that requires a liquid metal coolant that is pumped by thermoelectric electromagnetic pump (TEMP) 22. Appeal Br. 49, 53–54. We agree.

French's TEMP 22 produces electrical energy from, and then pumps, a hot liquid metal coolant through a liquid metal coolant circulation system 10. French, 1:34–36, 2:33–40. Coolants for such a reactor include sodium or potassium. *Id.* at 2:64–3:4. Because the hot metal coolant 82 is a good electrical conductor, TEMP 22 is able to move this electrically-conductive metal 28 with a magnetic field produced from thermoelectric elements and the heat of metal 28. *Id.* at 3:20–26.

The Examiner’s interpretation of “gas cooled nuclear reactor system” as an intended use that does not distinguish the claims over French (Ans. 7) is not supported by the claim language or Specification.¹ Claims 1 and 53 recite the thermoelectric generation or conversion of heat generated by a gas cooled nuclear reactor system to electrical energy and means for supplying the electrical energy to an operation system of the gas cooled nuclear reactor system. As Appellants argue, the electromagnetic pump of French’s TEMP 22 cannot be considered an operation system of a gas cooled nuclear reactor because it pumps electrically-conductive metal coolant 28 rather than a gas coolant of a gas cooled nuclear reactor. Reply Br. 21.

Thus, we do not sustain this rejection.

Obviousness of Claims 24, 47, 48, 50, 75, 96, 97, 98, 99 over French and Either Mitchell, Boncodin, John, or Strnad

The Examiner’s reliance on Mitchell, Boncodin, John, and Strnad to teach features of dependent claims 24, 47, 48, 50, 75, 96, 97, 98, 99 does not overcome deficiencies of French as to independent claims 1 and 53. Final Act. 17–19. Thus, we do not sustain these rejections.

DECISION

We reverse the rejections of claims 1, 5, 13, 14, 18–24, 34, 36, 42, 43, 47, 48, 50, 53, 64, 65, 69–75, 85, 92, 93, and 96–99 on all grounds.

REVERSED

¹ Appellants disclose their invention as thermoelectrically converting gas cooled nuclear reactor generated heat to electrical energy and supplying that electrical energy to at least one operation system of the gas cooled nuclear reactor system. Spec. ¶¶ 4, 6–7, 10–20, Figs. 1, 2.