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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* SASCHA SCHAEFER, JOHANNES LAUER,  
THOMAS WEISPFENNING, PETER WILLIMOWSKI,  
ROLF ISERMANN, and OLIVER MAIER

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Appeal 2011-013413  
Application 11/304,185  
Technology Center 1700

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Before BRADLEY R. GARRIS, TERRY J. OWENS, and  
LINDA M. GAUDETTE, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

### STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's rejection of claims 1-22, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6(b).

#### *The Invention*

The Appellants claim a method for determining a volume flow of fluid being pumped through a system and claim a fuel cell system which uses the method. Claims 1 and 9 are illustrative:

1. A method for determining a volume flow of a fluid being pumped by a pump through a system, said method comprising:

determining a motor efficiency value based on an input power value of the pump and a pump speed value of the speed of the pump;

determining a coefficient of power value based on the motor efficiency value, the input power value and the pump speed value;

converting the coefficient of power value to a coefficient of flow value; and

determining the volume flow of the fluid using the coefficient of flow value and the pump speed value.

9. A fuel cell system comprising:

a fuel cell stack;

a pump for pumping a cooling fluid through a coolant loop and the fuel cell stack; and

a controller for controlling the speed of the pump to control the volume flow of the cooling fluid through the coolant loop, said controller using pump characteristics to determine the speed of the pump, said controller calculating a motor efficiency value based on an input power value and a pump speed value of the speed of the pump that are used to determine the volume flow of the cooling fluid.

*The References*

Margiott	US 2003/0031899 A1	Feb. 13, 2003
Smith	US 2003/0139643 A1	Jul. 24, 2003
Hrovat	US 6,651,761 B1	Nov. 25, 2003

*The Rejections*

The claims stand rejected under 35 U.S.C. § 103 as follows: claims 1-6 over Smith, claim 7 over Smith in view of Margiott, claim 8 over Smith in view of Margiott and Hrovat, claims 9-15 and 17-22 over Margiott in view of Smith and claim 16 over Margiott in view of Smith and Hrovat.

OPINION

We affirm the rejections and enter a new rejection under 37 C.F.R. § 41.50(b).

The Appellants argue that “it is questionable whether a person of ordinary skill in the fuel cell art would look to the blood pump disclosed by Smith to come up with Appellant’s claimed system and method” (Reply Br. 2).

The Appellants appear to be arguing that Smith is nonanalogous art. The test of whether a reference is from an analogous art is first, whether it is within the field of the inventor’s endeavor, and second, if it is not, whether it is reasonably pertinent to the particular problem with which the inventor was

involved. *See In re Wood*, 599 F.2d 1032, 1036 (CCPA 1979). A reference is reasonably pertinent if, even though it may be in a different field of endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering the inventor's problem. *See In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992). Smith's disclosure of a system and method for controlling pump speed and power to hold a nearly constant flow without ever measuring flow or pressure directly (¶¶ 0041, 0044) logically would have commended itself to the Appellants' attention in considering the Appellants' problem of how to eliminate the need to measure fuel cell cooling fluid flow using large, heavy, costly unreliable flow sensors (Spec. ¶¶ 0009-10). Hence, Smith is analogous art.

The Appellants argue regarding claims 1, 3, 5-7, 9-12, 14, 15, 17, 19, 21 and 22 that Smith does not disclose or suggest a motor efficiency value even if Smith teaches some sort of look-up table (Br. 5-13, 15, 18, 19-22, 24).

As indicated by The Engineering ToolBox<sup>1</sup> relied upon by the Examiner (Ans. 15), Smith's motor's shaft power ( $P_s$ ) (¶¶ 0042-43) (i.e., output power) is the product of motor input power and motor efficiency. Hence, Smith would have led one of ordinary skill in the art, through no more than ordinary creativity, to obtain the motor's shaft or output power by multiplying the motor's input power by the motor's efficiency. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (In making an

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<sup>1</sup> *Electric Motor Efficiency*, THE ENGINEERING TOOLBOX (1 page), at [http://www.engineeringtoolbox.com/electrical-motor-efficiency-d\\_655.html](http://www.engineeringtoolbox.com/electrical-motor-efficiency-d_655.html) (undated). There is no dispute as to whether this reference is prior art.

obviousness determination one “can take account of the inferences and creative steps that a person of ordinary skill in the art would employ”). The Appellants do not provide a substantive argument that the Examiner’s determination that Smith would have fairly suggested, to one of ordinary skill in the art, determining the motor efficiency from a look-up table or a map (Ans. 6-7, 11-12) is in error.<sup>2</sup>

The Appellants argue with respect to claims 2, 11 and 18 that the Examiner has provided a mere conclusory statement (Ans. 5, 10, 16) that one of ordinary skill in the art would have determined Smith’s motor’s input power using the well-known relationship between power, voltage and current, i.e., power = voltage x current (Br. 12, 19, 23).

That argument is not well taken because the Appellants have provided no evidence or reasoning which shows that the Examiner erred.

The Appellants argue with respect to claims 3, 12 and 19 that Smith’s power coefficient is not determined using the Appellants’ recited equation (Br. 12-13, 19-20, 23-24).

In Smith’s equation 2 (¶ 0042) the shaft power ( $P_s$ ) is the same as the Appellants’  $UI\eta_{mot}$  (input power (i.e., voltage x current) x motor efficiency) (see The Engineering ToolBox), the pump radius ( $R$ ) is half the Appellants’ pump impeller outer diameter ( $D_2$ ), the fluid density ( $\rho$ ) and the pump speed ( $N$ ) are the same as those of the Appellants ( $\rho$ ,  $n$ ), and  $C_2$  is

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<sup>2</sup> The Appellants’ argument that Hrovat does not disclose determining a motor efficiency (Br. 16, 21) is not well taken because Hrovat is relied upon by the Examiner only for a suggestion to use in a vehicle (Appellants’ claims 8, 16) the fuel cell obtained by combining the disclosures of Smith and Margiott (Ans. 8, 12).

comparable to the Appellants'  $8/\pi^4$ . Thus, Smith's equation 2 is equivalent to the equation in the Appellants' claims 3, 12 and 19.

The Appellants argue that Smith's equation 4 (¶ 0042) is not a conversion of a coefficient of power value to a coefficient of flow value (Appellants' claims 1, 10, 17) and that Smith does not determine a volume flow of fluid using a coefficient of flow value and the pump speed (Appellants' claims 1, 4, 10, 13, 17, 20) (Br. 12-15, 18-19, 24).

The Appellants' coefficient of flow value is the reciprocal of the coefficient of power (Spec. ¶ 0024) which, as pointed out above, is equivalent to that of Smith. Like the Appellants' coefficient of flow, Smith's flow coefficient is a monotonic function of the power coefficient (¶ 0042, equation 3). The Appellants obtain the volume flow of fluid by multiplying the coefficient of flow by  $D_2^3 \pi^2 n/4$  (claims 4, 13, 20). Smith's equation 4 expresses the fluid flow as a function of the power coefficient (i.e., reciprocal of the Appellants' coefficient of flow) and  $NR^3 C_1$ . Smith's  $NR^3 C_1$  is equivalent to the Appellants'  $D_2^3 \pi^2 n/4$  because Smith's  $R$  (pump radius) is half the Appellants'  $D_2$  (motor impeller outer diameter), Smith's  $N$  (pump speed) is the Appellants'  $n$  (pump speed), and Smith's  $C_1$  is comparable to the Appellants'  $\pi^2/4$  (Smith ¶ 0043; Spec. ¶ 0019). Thus, Smith determines the volume flow of fluid using the pump speed ( $N$  in  $NR^3 C_1$ ) and a coefficient of flow (reciprocal of the power coefficient) as required by the Appellants' claims 1, 10 and 17. As for claims 4, 13 and 20, Smith does not disclose that the functional relationship in equation 4 (¶ 0042) involves multiplication of the reciprocal of the power coefficient by  $NR^3 C_1$ . However, because Smith's functional relationship provides the same

result (i.e., volume flow of fluid) as the Appellants' multiplication of the reciprocal of the power coefficient by  $D_2^3 \pi^2 n/4$  and, as pointed out above, Smith's power coefficient and  $NR^3 C_1$  are equivalent, respectively, to the Appellants' power coefficient and  $D_2^3 \pi^2 n/4$ , it appears that from Smith's equation 4 one of ordinary skill in the art would have arrived, through no more than ordinary creativity, at the multiplication product recited in the Appellants' claims 4, 13 and 20. *See KSR*, 550 U.S. at 418.

For the above reasons we are not persuaded of reversible error in the Examiner's rejections.

*New rejection under 37 C.F.R. § 41.50(b)*

Claims 1-22 are rejected under 35 U.S.C. § 101 as claiming nonstatutory subject matter.

The Supreme Court stated in *Bilski v. Kappos*, 561 U.S. \_\_\_, 130 S.Ct. 3218, 3225 (2010) that “[t]he Court’s precedents provide three specific exceptions to § 101’s broad patent-eligibility principles: ‘laws of nature, physical phenomena, and abstract ideas.’ [*Diamond v.] Chakrabarty*, [447 U.S. 303,] 309 [(1980),] 100 S. Ct. 2204.”

The method claimed in the Appellants' claims 1-6 is merely an abstract idea, i.e., an algorithm for calculating a volume flow of fluid, all steps of which can be carried out mentally. The claims are limited to the technological environment of pumping fluid, but limiting an abstract idea to a particular technological environment does not make the concept patentable. *See Mayo Collaborative Svs. v. Prometheus Labs., Inc.*, 566 U.S. \_\_\_, 132 S.Ct. 1289, 1297 (2012). *See also Parker v. Flook*, 437 U.S. 594, 595 (1978) (“[I]f a claim is directed essentially to a method of

calculating, using a mathematical formula, even if the solution is for a specific purpose, the claimed method is nonstatutory.” (quoting *In re Richman*, 563 F.2d 1026, 1030 (CCPA 1977)). “The process itself, not merely the mathematical algorithm, must be new and useful.” *Flook*, 437 U.S. at 591.

The Appellants’ claim 7 and its dependent claim 8 require a fuel cell system comprising a fuel cell stack, and claims 9-22 require a fuel cell system comprising a fuel cell stack, a pump and a controller. The Appellants acknowledge that such a fuel cell system, except for the controller being programmed to carry out the Appellants’ algorithm, was known in the art (Spec. ¶¶ 0007-9). “[S]imply appending conventional steps, specified at a high level of generality, to laws of nature, natural phenomena and abstract ideas cannot make those laws, phenomena, and ideas patentable.” *Prometheus*, 566 U.S. at \_\_\_, 132 S.Ct. at 1300. The Appellants’ “process [or system] is unpatentable under § 101, not because it contains a mathematical algorithm as one component, but because once that algorithm is assumed to be within the prior art,<sup>[3]</sup> the application [of the algorithm], considered as a whole, contains no patentable invention.” *Flook*, 437 U.S. at 594. The Appellants’ claims 7-22 do not add enough to the algorithm to allow the claimed process or system to qualify as a patent-eligible process or system that applies the algorithm. *See*

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<sup>3</sup> “Whether the algorithm was in fact known or unknown at the time of the claimed invention, as one of the ‘basic tools of scientific and technological work,’ see *Gottschalk v. Benson*, 409 U.S., at 67, 93 S.Ct., at 255, it is treated as though it were a familiar part of the prior art.” *Flook*, 437 U.S. at 591-92.

*Prometheus*, 566 U.S. at \_\_\_, 132 S.Ct. at 1297 (The question is: “[D]o the patent claims add *enough* to their statements of the correlations to allow the processes they describe to qualify as patent-eligible processes that *apply* natural laws?”).

The Appellants’ claim 8 further requires that the fuel cell system is on a vehicle, but merely limiting the patent-ineligible fuel cell system to that application is not enough to transform it into patentable subject matter. *See Prometheus*, 566 U.S. at \_\_\_, 132 S.Ct. at 1294 (“[T]o transform an unpatentable law of nature into a patent-eligible *application* of such a law, one must do more than simply state the law of nature while adding the words ‘apply it.’”).

Accordingly, the Appellants’ claims 1-22 are rejected under 35 U.S.C. § 101.

#### DECISION/ORDER

The rejections under 35 U.S.C. § 103 of claims 1-6 over Smith, claim 7 over Smith in view of Margiott, claim 8 over Smith in view of Margiott and Hrovat, claims 9-15 and 17-22 over Margiott in view of Smith and claim 16 over Margiott in view of Smith and Hrovat are affirmed. A new rejection has been entered under 37 C.F.R. § 41.50(b).

It is ordered that the Examiner’s decision is affirmed.

Regarding the affirmed rejection(s), 37 CFR § 41.52(a)(1) provides “[a]ppellant may file a single request for rehearing within two months from the date of the original decision of the Board.”

In addition to affirming the examiner's rejection(s) of one or more

claims, this decision contains a new ground of rejection pursuant to 37 CFR § 41.50(b) which provides that "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

37 CFR § 41.50(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

(1) Reopen prosecution. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .

(2) Request rehearing. Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

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

AFFIRMED; 37 C.F.R. § 41.50(b)

kmm