THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 46

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte WILLIAM M. MENGER,
ERNEST E. KERN, O.C. KARKALITS,
DONALD L. WISE, ALFRED P. LEUSCHNER,
DAVID ODELSON, and HANS E. GRETHLEIN

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Appeal No. 95-0802
Application 07/814,078[1]

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ON BRIEF

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Before DOWNEY, WILLIAM F. SMITH, and LORIN, Administrative Patent Judges.

WILLIAM F. SMITH, Administrative Patent Judge.

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[1] Application for patent filed December 24, 1991. According to appellants, the application is a continuation of Application 07/686,271, filed April 15, 1991; which is a continuation of Application 07/156,532, filed February 16, 1988; which is a continuation-in-part of Application 06/693,028, filed January 22, 1985, now Patent No. 4,826,769, and a continuation-in-part of Application 06/816,289, filed January 6, 1986, now Patent No. 4,845,034.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the final rejection of claims 47 through 56, all the claims pending in the application.

Claims 47 and 48 are the independent claims pending in this application and are illustrative of the subject matter of this appeal; they read as follows:

47. A method for producing methane from coal comprising:
homogenizing termite digestive tracts to produce a homogenate;
incubating a coal substrate in an incubation medium comprising said homogenate and methanogens, said methanogens selected from the group consisting of methanogens of the homogenate and exogenous methanogens under anaerobic conditions sufficient to generate methane; and
recovering methane from said incubation medium.

48. A method for producing methane from coal comprising:
homogenizing termite digestive tracts to produce a homogenate;
culturing said homogenate in bacterial enrichment medium to produce homogenate-derived microflora;
incubating a coal substrate in an incubation medium containing said homogenate-derived microflora under conditions sufficient to generate methane; and
recovering methane from said incubation medium.

The references relied upon by the examiner are:

Johnson 3,640,846 Feb. 8, 1972

Condensed Chemical Dictionary, (8th ed., Van Nostrand Reinhold Co., New York, 1974)

Lee et al. (Lee 1971), ed. "Termites and Soils," Academic Press, pp. 128-45 (1971)

French et al. (French), "Lignin Degradation in the Termites Coptotermes lacteus and Nasutitermes exitiosus," Mater. Org., (Berl.), Vol. 10, no. 4, pp. 281-88 (1975)

O'Brien et al. (O'Brien), "Role of Microorganisms in the Metabolism of Termites," Aust. J. Biol. Sci., Vol. 35, pp. 239-62 (1982)

Odelson et al. (Odelson), "Nutrition and Growth Characteristics of Trichomitopsis termopsidis, a Cellulolytic Protozoan from Termites," Appl. and Environ. Microbiol., Vol. 49, no. 3, pp. 614-21 (1985)

Lee et al. (Lee 1987), "Association of Methanogenic Bacteria with Flagellated Protozoa from a Termite Hindgut," Curr. Microbiol., Vol. 15, pp. 337-41 (1987)

A patent discussed by this merits panel is:

Srivastava et al.	5,670,345	Sep. 23, 1997

Claim 52 stands rejected under 35 U.S.C. § 112, fourth paragraph. Claims 47 through 56 stand rejected under 35 U.S.C. § 112, first paragraph, as being non-enabled. Claims 47 through 56 also stand rejected under 35 U.S.C. § 103. As evidence of obviousness the examiner relies upon Johnson, Lee (1987), Lee (1971), Odelson , O'Brien , Condensed Chemical Dictionary and French. We affirm the rejection under 35 U.S.C. § 112, fourth paragraph, reverse the rejection under 35 U.S.C. § 112, first paragraph, and reverse the rejection under 35 U.S.C. § 103. In addition, we raise an issue for the examiner to consider upon return of the application.

DISCUSSION

Dependency

Appellants do not dispute the merits of the rejection of claim 52 under 35 U.S.C. § 112, fourth paragraph. Accordingly, we affirm the rejection.

Enablement

In setting forth the rejection of claims 47 through 56 under 35 U.S.C. § 112, first paragraph, the Examiner notes that the invention depends upon complex and unpredictable living systems; that the claims are broadly drawn to a method of producing methane from coal by incubating the coal in the presence of termite digestive tracts or microorganisms derived from the digestive tracts; and that the working examples involve only a small number of the 2000 known termite species and one type of coal. The Examiner argues that the specification provides no criteria for selecting suitable termite species; that the species used are too few to be representative because termites are a heterogeneous group; and that lignite is not representative of coal in general because different grades of coal, derived from different plant materials, would be expected to vary in their composition and accessibility to degradation. In our view, the Examiner's position can be summarized as follows: (1) the specification provides insufficient guidance to enable one of skill in the art to practice the claimed invention throughout its scope, absent undue experimentation, and (2) the claims encompass potentially inoperative embodiments.

We find that the examiner has not met the initial burden of providing reasons establishing a lack of enablement for the claims. The mere fact that the working examples involve living systems and are limited to a small proportion of the embodiments

encompassed by the claims, does not constitute evidence to doubt Appellants' assertions regarding embodiments other than those demonstrated in the specification. Moreover, given the straightforward, routine protocol outlined in the specification, we are in agreement with Appellants that the experimentation necessary to practice the claimed invention throughout its scope would not be undue, and that "one of skill in the art having read this patent application, would nonetheless be armed with the skills required to undertake any screening or procedural methods required to carry out the claimed invention." Brief, page 14. As explained in PPG Indus., Inc. v. Guardian Indus. Corp., 75 F.3d 1558, 1564, 37 USPQ2d 1618, 1623 (Fed. Cir. 1996), the test for undue experimentation is not merely quantitative:

> In unpredictable art areas, this court has refused to find broad generic claims enabled by specifications that demonstrate the enablement of only one or a few embodiments and do not demonstrate with reasonable specificity how to make and use other potential embodiments across the full scope of the claim. See, e.g., In re Goodman, 11 F.3d 1046, 1050-52, 29 USPQ2d 2010, 2013-15 (Fed. Cir. 1993); Amgen, Inc. v. Chugai Pharmaceutical Co., 927 F.2d. 1200, 1212-14, 18 USPQ2d 1016, 1026-28 (Fed. Cir.), cert. denied, 502 U.S. 856 (1991); In re Vaeck, 947 F.2d at 496, 20 USPQ2d at 1445. Enablement is lacking in those cases, the court has explained, because the undescribed embodiments cannot be made, based on the disclosure in the specification, without undue experimentation. But the question of undue experimentation is a matter of degree. The fact that some experimentation is necessary does not preclude enablement; what is required is that the amount of experimentation "must not be unduly extensive." Atlas Powder Co., v. E.I. DuPont De Nemours & Co., 750 F.2d 1569, 1576, 224 USPQ 409, 413 (Fed. Cir. 1984). The Patent and Trademark Office Board of Appeals summarized the point well when it stated:

> The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a desired embodiment of the invention claimed.

Ex parte Jackson, 217 USPQ 804, 807 (1982).

Finally, there is no evidence of record which would indicate that the claims encompass a significant number of inoperative embodiments. As set forth in Atlas Powder Co. v. E.I. Du Pont De Nemours & Co., 750 F.2d 1569, 1576-77, 224 USPQ 409, 414 (Fed. Cir. 1984):

> Even if some of the claimed combinations were inoperative, the claims are not necessarily invalid. "It is not a function of the claims to specifically exclude . . . possible inoperative substances . . . . In re Dinh-Nguyen, 492 F.2d 856, 859-59, 181 USPQ 46, 48 (CCPA 1974) (emphasis omitted). Accord, In re Geerdes, 491 F.2d 1260, 1265, 180 USPQ 789, 793 (CCPA 1974); In re Anderson, 471 F.2d 1237, 1242, 176 USPQ 331, 334-35 (CCPA 1971). Of course, if the number of inoperative combinations becomes significant, and in effect forces one of ordinary skill in the art to experiment unduly in order to practice the claimed invention, the claims might indeed be invalid. See, e.g., In re Cook, 439 F.2d 730, 735, 169 USPQ 298, 302 (CCPA 1971).

Accordingly, we reverse the rejection of claims 47 through 56 under 35 U.S.C. § 112, first paragraph.

Obviousness

The claimed invention is directed to a method of generating methane from coal by incubating coal with termite digestive tracts or methanogens derived from the digestive tracts, with or without the addition of exogenous methanogens.

The prior art relied upon establishes that production of methane from lignite and sub-bituminous coal using a microbial consortium from sewage sludge was known at the time of the invention. Production of methane from wood using organisms present in termite digestive tracts was also known; and finally, the organisms were known to produce methane by degrading cellulose and lignin. The Examiner relies upon the Condensed Chemical Dictionary (CCD) to establish that "[t]he composition of a coal such as lignite would reasonably be expected to be similar to the wood from which it is derived with respect to lignin and cellulose content." The CCD defines "lignin" as the major noncarbohydrate constituent of wood; "lignite" as a low rank coal between peat and sub-bituminous; and "peat" as partially decayed vegetable matter.

The Examiner concludes that it would have been obvious for one of ordinary skill in the art to have substituted microorganisms from termite digestive tracts for microorganisms from sewage sludge in producing methane from coal, because of the similarities between the prior art processes of generating methane from coal and from wood; the similarities between coal and wood; and the recognition in the art that

microorganisms found in termite digestive tracts produce methane by degrading lignin and cellulose.

After careful review of the references and the reasoning presented in the rejection, we are in agreement with Appellants that the rejection rests upon two inferences: (1) methanogens derived from termite digestive tracts and methanogens derived from sewage sludge are functionally equivalent, and (2) coal and wood are equivalent substrates. The problem with these two inferences is that they are interdependent. The methanogens from the two sources can be recognized as functional equivalents only if the two substrates, coal and wood, are also recognized as equivalent, and vice versa. However, pointing to the Kirk-Othmer Encyclopedia of Chemical Terminology (Third Ed., Vol. 6, 1979, pages 224-241) as support, Appellants argue that coalification alters plant matter chemically and physically, depleting the plant matter of some constituents and causing the formation of complex organic compounds such as polymers with fused aromatic rings and crosslinking. In light of this, the evidence relied upon by the Examiner to establish that wood and coal are viewed in the art as chemically and physically similar is not persuasive, and inference (1) cannot be sustained. In reaching this conclusion, we have taken into account that the substrates encompassed by the claims include low grade coals (e.g., lignite). However, CCD does not provide sufficient evidence to establish that

one skilled in the art would have considered lignite an equivalent substrate for methanogens, regardless of their source.

We find that the Examiner has not met the initial burden of establishing a prima facie case of obviousness. Accordingly, we reverse the rejection of claims 47 through 56 under 35 U.S.C. § 103.

OTHER ISSUES

The merits panel has become aware of the issuance of U.S. Patent 5,670,345 to Srivastava, While the patent does not appear to be prior art, it is noted that claim 10 is directed to a method of producing methane from coal by incubating the coal with an anaerobic culture, Mic-1, which was isolated from Zootermopsis sp. (column 4, lines 9-20). It is suggested that the Examiner review the patent upon return of the application to the examining group and take whatever action may be deemed appropriate.

SUMMARY

The decision of the examiner is Affirmed-in-part.

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

AFFIRMED-IN-PART

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Mary F. Downey	)
Administrative Patent Judge	)
	)
	)
	) BOARD OF PATENT
William F. Smith	)
Administrative Patent Judge	) APPEALS AND
	)
	) INTERFERENCES
	)
Hubert C. Lorin	)
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