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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RICHARD NICOLETTI and LEWIS NAYLOR

Appeal 2015-004138
Application 12/688,589
Technology Center 1600

Before DONALD E. ADAMS, JEFFREY N. FREDMAN, and JOHN E. SCHNEIDER, *Administrative Patent Judges*.

FREDMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal[1] under 35 U.S.C. § 134 involving a method of sludge biodrying. The Examiner rejected the claims as obvious. We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

Statement of the Case

Background

"Composting is a biological process of decomposition. Given adequate time and the proper environmental conditions, microorganisms turn raw organic matter into stabilized products" (Spec. 1:16–18).

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[1] Appellants identify the Real Party in Interest as Evoqua Water Technologies LLC (*see* App. Br. 4).

The Claims

Claims 1, 4, 5, 7–18, 20–30, and 56–58 are on appeal. Claim 1 is representative and reads as follows (emphasis added):

> 1. A method of sludge biodrying comprising:
> providing a non-cellulosic first material consisting of one of finished compost, dried noncomposted undigested sewage sludge having a dry solids content of between about 50% and about 95%, and a combination thereof;
> providing a compostable sludge consisting essentially of undigested sewage sludge;
> forming a mixed sludge consisting essentially of the first material and the compostable sludge mixed in a ratio of between about 2:1 and about 1:2 by weight when the first material consists of finished compost and in a ratio of between about 1:1 and about 1:2 by weight when the first material consists of dried non-composted undigested sewage sludge, ***the mixed sludge having a C:N ratio of less than about 15:1 by weight***;
> introducing the mixed sludge into a composting bay;
> aerating the mixed sludge in the composting bay;
> providing conditions for the mixed sludge to be maintained aerobically in the composting bay;
> mechanically agitating the mixed sludge in the composting bay;
> biodrying the mixed sludge with heat produced by a digestive action of microorganisms within the composting bay for a period of time sufficient to form a compost having a dry solids content of between about 50% and about 100% and a C:N ratio less than that of the mixed sludge introduced into the composting bay;
> maintaining pH, temperature, and moisture content of the mixed sludge within ranges which suppress the formation of volatile ammonia from ammonium in the mixed sludge throughout the biodrying of the mixed sludge;
> removing the compost from the composting bay; and recycling a portion of the compost as the finished compost.

The Issues

A. The Examiner rejected claims 1, 5, 7, 20, and 56–58 under 35 U.S.C. § 103(a) as obvious over Jung,[2] Hagen,[3] Krueger,[4] Moss,[5] WSU,[6] and Parvaresh[7] (Ans. 2–6).

B. The Examiner rejected claim 4 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh and Richard[8] (Ans. 6–7).

C. The Examiner rejected claims 8–14 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, and Kajitvichyanukul[9] (Ans. 8–9).

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[2] Jung et al., US 4,255,389, issued Mar. 10, 1981 ("Jung").
[3] Hagen et al., US 5,387,036, issued Feb. 7, 1995 ("Hagen").
[4] Krueger et al., *"Where's The Bulk?" Biosolids Composting Without The Use Of Bulking Materials At The San Angelo Water Utilities' Kickapoo Composting Facility*, 1–17 (2006) ("Krueger").
[5] Moss, W., US 2006/0283220 A1, published Dec. 21, 2006 ("Moss").
[6] *Compost Fundamentals*, https://web.archive.org/web/20071104075321/http://whatcom.wsu.edu/ag/compost/fundamentals/consideration_reclamation.htm, 1–3 (2008) (accessed Apr. 21, 2014) ("WSU").
[7] Parvaresh et al., *Determination of Carbon/Nitrogen Ratio and Heavy Metals in Bulking Agents Used for Sewage Composting*, 33 Iranian J. Public Health 20–23 (2004).
[8] Richard, T., *Municipal Solid Waste Composting: Physical Processing*, http://compost.css.cornell.edu/MSWFactSheets/msw.fs1.html, 1–6 (2004) (accessed May 31, 2012) ("Richard").
[9] Kajitvichyanukul et al, *Landfilling Engineering and Management*, in Handbook of Environmental Engineering, Volume 7 415–442 (Wang et al., Ed.s) (2008) ("Kajitvichyanukul").

D. The Examiner rejected claim 11 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, Kajitvichyanukul, and Le[10] (Ans. 9–11).

E. The Examiner rejected claims 15 and 16 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, Gorby,[11] and Inoue[12] (Ans. 11–12).

F. The Examiner rejected claim 17 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, and Lavelle[13] (Ans. 12–13).

G. The Examiner rejected claim 18 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, Lavelle, and Bellamy[14] (Ans. 13–14).

H. The Examiner rejected claims 21–24 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, and Cole[15] (Ans. 14–15).

I. The Examiner rejected claim 25 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, and Waldenville[16] (Ans. 16).

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[10] Le, S., US 2005/0077236 A1, published Apr. 14, 2005 ("Le").
[11] Gorby, H, US 2,947,619, issued Aug. 2, 1969 ("Gorby").
[12] Inoue, S., US 5,354,349, issued Oct. 11, 1994 ("Inoue").
[13] Lavelle, IV, W., US 5,558,686, issued Sept. 24, 1996 ("Lavelle").
[14] Bellamy, W., US 3,462,275, issued Aug. 19, 1969 ("Bellamy").
[15] Cole et al., US 5,906,436, issued May 25, 1999 ("Cole").
[16] Waldenville, D., US 3,845,939, issued Nov. 5, 1974 ("Waldenville").

J. The Examiner rejected claims 26–30 under 35 U.S.C. § 103(a) as obvious over Jung, Hagen, Krueger, Moss, WSU, Parvaresh, and Cruson[17] (Ans. 16–18).

Because the same issues are dispositive for all of these rejections, and all of the rejections rely upon Jung, Hagen, Krueger, Moss, WSU, and Parvaresh, we will consider them together.

The Examiner finds that Jung and Hagen teach the required composting methods (Ans. 2–3) and Krueger teaches the ratio of materials required by claim 1 (Ans. 4). The Examiner finds:

> Parvaresh teaches that the C:N ratio of sludge is normally in the range of 10:1to20:1. (Page 21). As such, Parvaresh serves as evidence that a C:N ratio of between about 8:1 and less than about 15:1 by weight would be an inherent property of the mixed sludge when introduced into the composting bay and could be readily maintained in the composting bay.

(Ans. 5). The Examiner also finds it obvious to optimize the process "because WSU, in a similar method, teaches that nitrogen loss, during aerobic fermentation, can be advantageously suppressed through controlling C:N ratio, pH, moisture content, aeration, temperature, and/or the form of nitrogen compounds at the start of the composting materials" (Ans. 6).

Appellants contend the "C:N ratio of the recycled compost in Jung is not disclosed, and thus there is no teaching that the mixture of sewage sludge and compost as disclosed in Jung would have any particular C:N ratio" (App. Br. 9). Appellants also contend the "disclosures of Parvaresh

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[17] Cruson et al., US 2005/0061044 A1, published Mar. 24, 2005 ("Cruson").

and WSU which would have lead one of ordinary skill in the art away from the method of independent claim 1 are not contradicted by any other reference cited by the Examiner" (App. Br. 10).

The issue with respect to this rejection is: Does the evidence of record support the Examiner's conclusion that the prior art inherently teaches or otherwise suggests a biodrying process with "the mixed sludge having a C:N ratio of less than about 15:1 by weight" as recited in claim 1?

Findings of Fact

1. Jung teaches "a method which a preliminary mixture is formed from the material to be composted and sludge compost taken from the rotary drum" in order "to enable a hygienically pure and spreadable humus fertilizer to be obtained" (Jung 2:11–17).

2. Krueger teaches:

> Class B anaerobically digested biosolids arrive at the compost facility with a moisture content of approximately 80%. Research revealed that aerobic composting requires a moisture content between 50% to 30%. Blending the incoming feedstock with finished compost was chosen as the method to adjust the moisture content and also seed the incoming material with the compost organisms. The facility constructs the windrows using a ratio of 1 part digested biosolids to 1 to 2 parts finished compost.

(Krueger 6).

3. Krueger teaches that "four experimental rows were formed. Each windrow contained a total of approximately 60 cubic yards. The blend ratios of finished compost to anaerobically digested biosolids were set at 1:1, 2:1, 3:1and 4:1, respectively" (Krueger 12).

4. Parvaresh teaches "[s]ludge normally has C/N ratios in range of 10 to 20. To offset an imbalance in the C/N ratio, compost amendments usually are necessary. Typical compost amendments include materials with high C/N ratio such as 1) sawdust, 2) leaves, 3) wood chips, 4) rice hulls and 5) old compost" (Parvaresh 21, col. 1).

5. Parvaresh teaches a "biodegradable carbon-nitrogen (C/N) weight ratio of 25 to 35 has been found to provide optimal conditions for compost process. Lower C/N ratio increases the loss of nitrogen by leaching (e.g. nitrate mobilization) and ammonia volatilization" (Parvaresh 21, col. 1).

6. WSU teaches "[n]itrogen loss as ammonia in aerobic composting is affected by the **C:N** ratio, pH, moisture content, aeration, temperature, and the form of nitrogen compounds at the start of the composting materials" (WSU 1).

7. WSU teaches

> a **C:N** ratio in the raw compostable material of around 30:1 is best for good composting is satisfactory for tying up or binding nitrogen in biological cell material, preventing its escape. To avoid nitrogen loss, optimum ratios of C:N range from 26 to as high as 38 depending on conditions. A ratio of available carbon to available nitrogen of about 30 or more permits minimum loss of nitrogen.

(WSU 1).

8. Cole teaches:

> It is well known in the art that the preferred carbon-to-nitrogen ratio for composting is about 30 parts carbon for each part nitrogen by weight (30:1). At lower ratios the excess nitrogen supplied will be lost in the form of mobile nitrogen compounds,

> such as ammonia gas, and can cause undesirable odors or other environmental problems.

(Cole 1:26–31).

Principles of Law

"Inherency . . . may not be established by probabilities or possibilities. The mere fact that a certain thing *may* result from a given set of circumstances is not sufficient." *MEHL/Biophile Int'l. Corp. v. Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999).

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed.Cir.1994).

Analysis

While Jung, Hagen, and Krueger reasonably suggest the limitations of claim 1 other than the C:N ratio required for the mixed sludge, the Examiner has not established that the composition of Krueger inherently comprises a C:N ratio of less than about 15:1 in mixed sludge nor has the Examiner provided a reason, consonant with the prior art, for selecting a C:N ratio of less than about 15:1 in mixed sludge.

We recognize, but find unpersuasive, the Examiner's finding that Krueger's mixed sludge "is identical, in preparation and thus composition, to the mixed sludge of the instant method" (Ans. 18). Claim 1 recited a combination of undigested sewage sludge with either finished compost or

dried non-composted undigested sewage sludge in ratios between 2:1 to 1:2 by weight where the final C:N ratio is less than about 15:1 by weight.

While Krueger teaches a blend of 1 part digested biosolids to 1 to 2 parts finished compost (FF 2), Krueger does not teach the use of undigested sewage sludge but rather begins with "Class B anaerobically digested biosolids" (FF 2). Thus, the evidence does not support the Examiner's position that Krueger's starting materials are identical to those recited in claim 1.

Even if Krueger taught the use of undigested sewage sludge, we are not persuaded by the Examiner's reliance on Parvaresh that the undigested sewage sludge would inherently demonstrate C:N ratios within the scope of the claim because Parvaresh teaches that sludge "normally has C/N ratios in range of 10 to 20" (FF 4). This means that while it may sometimes be the case that the sludge will fall within the scope of the claim, sometimes the C:N ratio will be 16 to 20 to 1, not "less than about 15:1" as required by claim 1, and therefore sludge does not necessarily or inherently have the required C:N ratio. *MEHL*, 192 F.3d at 1365. *See PAR Pharmaceutical, Inc. v. TWI Pharmaceuticals, Inc.* 773 F.3d 1186, 1195 (Fed Cir. 2014). ("[T]he concept of inherency must be limited when applied to obviousness, and is present only when the limitation at issue is the 'natural result' of the combination of prior art elements.")

We also agree with Appellants that the "disclosures of Parvaresh and WSU which would have lead one of ordinary skill in the art away from the method of independent claim 1 are not contradicted by any other reference cited by the Examiner" (App. Br. 10).

In particular, Parvaresh discourages the use of C:N ratios below 25 because "[l]ower C/N ratio increases the loss of nitrogen by leaching . . . and ammonia volatilization" (FF 5). WSU discourages the use of C:N ratios below 26 to avoid nitrogen loss (FF 7) and Cole discourages C:N ratios below 30:1 because at "lower ratios, the excess nitrogen supplied will be lost in the form of mobile nitrogen compounds, such as ammonia gas, and can cause undesirable odors and other environmental problems" (FF 8).

Thus, the only evidence of record, cited by the Examiner, establishes that C:N ratios below 25:1 increase nitrogen loss, increase ammonia volatilization and cause undesirable odors (FF 5, 7, 8). We agree with Appellants that these teachings would reasonably discourage the ordinary artisan from selecting a C:N ratio of about 15:1 or less for sludge processing as recited in claim 1.

Conclusion of Law

The evidence of record does not support the Examiner's conclusion that the prior art inherently teaches or otherwise suggests a biodrying process with "the mixed sludge having a C:N ratio of less than about 15:1 by weight" as recited in claim 1.

SUMMARY

In summary, we reverse the obviousness rejections.

REVERSED