

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 22

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PAULA A. W. KRAUTER
and GORDON W. KRAUTER

Appeal No. 1999-2503
Application 08/805,005¹

ON BRIEF

Before METZ, OWENS and PAWLIKOWSKI, Administrative Patent Judges.

METZ, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's refusal to allow claims 33 through 58 and 62

¹ Application for patent filed February 12, 1997. According to the official records of the United States Patent and Trademark Office (PTO), this application is a continuation of Serial Number 08/512,496, filed on August 8, 1995, and now abandoned.

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through 68, all the claims remaining in this application.

THE INVENTION

The appealed subject matter is directed to: an apparatus useful in the remediation of a metal from metal contaminated ground water (claims 33 through 41 and 64); a process for remediation of metal contaminated water using a living *S. cerevisiae* cell biomass (claims 42 through 44); a process for remediation of chromium VI contaminated water with living *S. cerevisiae* cells under anaerobic conditions (claims 45 through 57); a process for the remediation of chromium VI contaminated water using living *S. cerevisiae* cells under aerobic conditions (claims 58 and 62); a process for remediation of chromium VI contaminated water using dead *S. cerevisiae* cell biomass (claims 63 and 65); and, a process for remediation of metal contaminated water using dead *S. cerevisiae* cell biomass (claims 66 through 68).

According to appellants, they discovered that the yeast *Saccharomyces cerevisiae* (also known as Bakers yeast), has the

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ability to remove or reduce metals, generally, and chromium, in its plus six oxidation state, specifically, from ground water contaminated with said metals. In addition to chromium, the yeast is useful in removing molybdenum, cobalt, zinc, nickel, calcium, strontium, mercury and copper from water.

Appellants disclose that *S. cerevisiae* has been shown to be capable of accumulating cobalt, cesium, strontium, uranium, copper and chromium in its plus two oxidation state. See page 3, line 17 through page 4, line 5 of the specification.² According to appellants, their process obtains removal or reduction of the metals from water by bioreduction and bioaccumulation.

Claims 33 and 42 are believed to be adequately representative of the appealed subject matter and are reproduced below for a more facile understanding of the claimed invention.

Claim 33. A system for remediation of a metal from metal contaminated ground water using a living *S. cerevisiae* cell biomass, said system consisting

² Although the references are cited in the specification, appellants have not favored the record with copies of any of the cited articles.

essentially of:

(a) a bioreactor for contacting the metal contaminated water with the nonpathogenic living *S. cerevisiae* cell biomass to bring about bioreduction and bioaccumulation of said metal;

(b) nonpathogenic *S. cerevisiae* cell biomass comprising living cells; and

(c) means for separating and removing the metal from a treated water.

Claim 42. A process for remediation of a metal contaminated water comprising bioreduction and bioaccumulation of a metal from the metal contaminated water using a living *S. cerevisiae* cell biomass, said process comprising steps:

(a) contacting the metal contaminated water with a biomass of nonpathogenic, metal tolerant live *S. cerevisiae* cells at a temperature from about 4°C to about 100°C, said biomass being added to the water in an amount from about 2g to about 100 g/L to form a water biomass mixture;

(b) reacting said water/biomass mixture for about 4 to about 100 hours at a continuous temperature from about 4°C to about 100°C in the presence of a carbon source at pH from about 2 to about 9, thereby achieving the bioreduction and bioaccumulation of said metal with said biomass; and

(c) separating the remediated water from said biomass.

THE REFERENCES

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The references of record which are being relied on by the examiner as evidence of obviousness are:

Nagodawithana et al. 1985	4,530,846	July 23,
Brierley et al. 1988	4,789,481	December 6,
Greene et al. 1991	5,055,402	October 8,

THE REJECTIONS

Claims 63 and 65 through 68 stand rejected under 35 U.S.C.

§ 103 from the disclosure of Greene et al. or the disclosure of Brierley et al. Claims 33 through 62 and 64 stand rejected under 35 U.S.C. § 103 from Nagodawithana et al. considered with Greene et al. or Brierley et al.

OPINION

We begin by observing that while appellants have presented numerous claims of varying scope, the claimed process, in essence, requires mixing the yeast with contaminated water, allowing the yeast and the contaminated water to react under certain conditions of temperature, time and pH and thereafter separating the "remediated water" from the cell biomass. Except for the claim terminology "cell

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biomass", the claim terminology is plain and easily understood without reference to appellants' disclosure. Reference to appellants' disclosure reveals that "biomass" is defined as "a mass of biological material, in this case *Saccharomyces cerevisiae* and may contain living cells, dead cells or a mixture thereof." See page 5, line 37 through page 6, line 2 of the specification. Accordingly, we find that the claim language "*S. cerevisiae* cell biomass" denotes a mass of cells obtained from and containing only *S. cerevisiae* cell material, either living, dead or mixtures of living and dead.

In appellants' brief, appellants invite our attention to their "comments" in prior papers filed in this application for the arguments in support of their position with respect to the prior art rejections before us. See pages 5, 6 and 7 of appellants' main brief. Nevertheless, 37 C.F.R. § 1.192(c) requires that it is appellants' brief which must set forth the arguments and authorities on which appellants rely. It is at least a violation of the spirit if not the letter of the rule to incorporate an argument by reference to an earlier filed paper. Accordingly, we have not considered the arguments in the papers to which appellants invite our attention.

THE REJECTION OVER GREENE ET AL.

According to page 5 of the examiner's Answer, "Greene discloses removal of metal ions, including chromium VI (see column 3, line 19) from water by using a microorganism containing adsorbent composition which may utilize *S. cerevisiae* (see example 9), as claimed." Nevertheless, the reference to chromium VI in column 3, line 19 is part of a discussion by Greene et al. of the prior art binding capacities of algae as either "hard" or "soft" depending on the relative ability of a ligand and a metal ion to bind to each other. The reference to chromium plus six (Cr^{+6}) in line 19 merely denotes chromium plus six ion as an ion which is considered to be "hard" in terms of a metal ion (A)-ligand (B) complex (see column 2, lines 60 et seq.).

Example 9 of Greene et al. is directed to the immobilization of metal ion-binding microorganisms other than algae in insoluble metallic gel beads. Therein, red marine algae (*Laminara japonica*) powder is mixed with sodium hydroxide to form a mixture to which is added powdered *Saccharomyces cerevisiae* to form a "homogeneous *Laminara-Saccharomyces* slurry" (see column 44, line 55 through column

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45, line 2). The slurry is thereafter extruded into a 3% calcium chloride solution and insoluble beads form. The insoluble beads are recovered and dried in an oven. Thereafter, the dried beads are heated for about 4 hours at about 400EC.

From the above relied upon disclosure, we find it impossible to determine the basis for the examiner's conclusion that Greene et al. would have rendered obvious the process of claims 63 and 66. The examiner has certainly not explained why he believes the beads in Example 9 meet the claim limitation for a "cell biomass." We find Greene et al. does not disclose the use of a "dead *S. cerevisiae* cell biomass" as required by the claims. Rather, considering Greene et al. in a light most favorable to the examiner's position, Greene et al. prepares calcium beads containing some portion or fraction of *S. cerevisiae* in combination with some fraction of a red algae component for use of the beads in a column through which water contaminated with metal ions is passed and wherein the beads entrain certain metal ions in the water.

Apparently, it is the examiner's unstated opinion that the beads of Example 9 are the "dead *S. cerevisiae* cell

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biomass" required by the claims. As we have explained above, we decline to give the claim terminology such scope. Rather, we repeat here that we read appellants' claims as limited to the use of only *S. cerevisiae* cells and, therefore, the calcium-containing beads in Greene et al.'s Example 9, which also contain red algae cell material, do not fall within the reagents used in appellants' claimed process. Accordingly, the rejection is **reversed**.

THE REJECTION OVER BRIERLEY ET AL.

Brierley et al., as noted by the examiner, is directed to removing metal contaminants from water using a dead cell biomass obtained from yeasts, generally (see column 5, line 36 through column 6, line 5; claim 21), and *Saccharomyces uvarum*, specifically (see column 4, lines 59 through 62). Brierley et al. disclose that their method is useful for removing metals having an atomic number greater than 20 and exemplifies silver, copper and lead. The process is recognized as useful in extracting from solution metals below iron in the electromotive series (column 4, lines 10 through 18). The method utilizes "standard water treatment units" (see column 2, line 67 through column 3, line 2; column 3, lines 33

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through 38). Brierley et al. recognize that certain microorganisms are more selective to the recovery of certain metals than others (column 5, lines 17 through 23).

While the examiner recognizes that Brierley et al. do not disclose or suggest *S. cerevisiae* as the useful microorganism for use in their process and that Brierley et al. do not recognize that their process would remove chromium, the examiner concludes that the use of a different species of *Saccharomyces* would have been expected to have "similar characteristics" as the species disclosed by Brierley et al. and that a species different from the disclosed species in Brierley et al. would also have been expected to remove chromium "due to the disclosure of removal of a variety of metals (see column 4, lines 15-18)" (see page 6 of the Answer).

Glaring by its absence from the examiner's stated position is any evidence which supports the examiner's bald conclusions. In the first instance, whether or not different species of *Saccharomyces* would have or would have been expected to have similar properties with respect to metal entrainment is unknown based on this record. While appellants

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have cited in their specification certain publications which seem to indicate that the yeast specifically required by the claims does have at least an affinity for certain metals, including chromium plus two (Cr^{+2}), these publications are neither of record nor relied on by the examiner. Additionally, with respect to claim 63 which is limited to the removal of chromium plus six, Brierley et al.'s disclosure of silver, copper, lead and metals below iron in the electromotive series does not describe or suggest chromium let alone chromium plus six. Absent from the disclosure to which the examiner directs our attention in column 4, lines 15-18 is any reference to chromium. Indeed, because chromium is above iron in the electromotive series, Brierley et al.'s disclosure relied on by the examiner would not have directed a person of ordinary skill in the art to use Brierley et al.'s method to remove chromium plus six.

While claim 66 is directed to metal removal without regard to the actual metal removed, and while claim 67 is directed to certain metals specifically disclosed in Brierley et al., the process of claims 66 and 67 still requires a

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particular species of *Saccharomyces* not disclosed or suggested by Brierley et al. Thus, while we agree that Brierley et al. would have rendered obvious removing metals from water using a cell biomass prepared from *Saccharomyces uvarum*, it is left open to conjecture whether or not *Saccharomyces cerevisiae* would also have been expected to be useful. Without evidence to support his conclusion that *Saccharomyces cerevisiae* would have been expected to have the same or similar properties as *Saccharomyces uvarum*, the examiner's stated position cannot be sustained. Accordingly, we need not reach the examiner's further stated position with respect to the reaction conditions and proportions required by the claims because the examiner has failed to establish that the basic process claimed would have been obvious. Accordingly, we are constrained, on this record, to reverse the rejection over Brierley et al.

THE REJECTION OVER NAGODAWITHANA ET AL.

The examiner has rejected all the appealed claims save claims 63, and 65 through 68 under 35 U.S.C. § 103 from Nagodawithana et al. considered with Greene et al. or Brierley et al. Although the claims rejected include claims 33 through

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41 and 64, which are claims directed to an apparatus ("system") for carrying out the claimed process, the examiner has failed to read the relied upon prior art on any of the claimed elements of appellants' "system." Thus we have no way of understanding what in the prior art relied on serves as, for example, the "bioreactor", the "means for separating and removing the metal from a treated water", "injection systems", "stir-tank", "settling tanks", "storage tanks", "means for thermal maintenance of constant temperature", "means for buffering the treated water", and "means for adding a carbon source" required by these claims.

Further, Nagodawithana et al. is directed to preparing a selenium containing yeast for use as a supplementary diet source and not to removal of metal contaminants from water. Thus we find it difficult to understand, save for the disclosure in Nagodawithana et al. of *Saccharomyces cerevisiae*, the relevance of this reference to the claimed process. Nagodawithana et al. does not serve as the evidence that *Saccharomyces cerevisiae* removes chromium which we said was missing above. Indeed, selenium is not even a metal, a fact specifically recognized by the examiner at page 6 of his

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Answer. The examiner's attempt to bridge this gap in the evidence by reference to Greene et al. at column 3, lines 15-21 does not succeed. Contrary to the examiner's representation, the disclosure in Greene et al. at column 3, lines 15-21 does not establish in the broad sense that "selenium would be expected to have similar binding characteristics as a variety of metals." The discussion in Greene et al. is a discussion of the algal binding capacities for different metal ions and cannot be extended or extrapolated to include the binding capacities or affinities for *Saccharomyces cerevisiae*. Accordingly, the rejection is **reversed**.

OTHER ISSUES

As we have observed above, the subject matter of claims 33 through 41 and 64 is directed to an apparatus ("system"). Nevertheless, the examiner's search notes do not indicate that any search has been made in the relevant apparatus art. Upon return of this application to the examining group, the examiner should make a search of the relevant apparatus art. In making his search, the examiner is advised to read the claims in

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light of appellants' disclosure at page 8, line 21 through page 11, line 17 of the specification wherein the claimed "system" is further described. Further, the examiner is advised that the inclusion in appellants' system of one of the reactants ("cell biomass") is considered to be a recitation of the material intended to be worked upon by the claimed apparatus and does not impose any structural limitations on the apparatus which would

differentiate it from any prior art satisfying all other structural limitations of the claims. Stated another way, appellants' claimed apparatus ("system") does not undergo a change in structure by including in the apparatus the "cell biomass" used to treat the water.

Appellants should provide to the examiner the publications discussed at pages 3 and 4 of the specification concerning the properties of *Saccharomyces cerevisiae* towards metal ions, generally, and chromium, specifically. The examiner should carefully consider those references and reconsider the patentability of the claims in light of said references and the disclosure in Brierley et al., particularly

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those claims not limited to removing chromium or chromium plus six but to metal removal generally.

SUMMARY

Based on this record and the evidence relied on by the examiner, we have concluded that the examiner has failed to make out a *prima facie* case of obviousness with respect to the claimed subject matter. On this record, the rejection of the claims as

being unpatentable under 35 U.S.C. § 103 is reversed. The decision of the examiner is **REVERSED**.

REVERSED

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Administrative Patent Judge)	
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