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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte RAJEEV GUPTA and KANWARPAL SINGH DHUGGA¹

Appeal 2019-004229
Application 14/626,178
Technology Center 1600

Before ERIC B. GRIMES, JOHN G. NEW, and DAVID COTTA,
Administrative Patent Judges.

GRIMES, *Administrative Patent Judge.*

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134(a) involving claims to a method of increasing maize yield, which have been rejected as anticipated or obvious. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

STATEMENT OF THE CASE

“Several independent lines of evidence indicate that glutamine synthetase (GS) is involved in yield formation and its expression levels

¹ Appellant identifies the real party in interest as Pioneer Hi-Bred International, Inc. Appeal Br. 3.

affect nitrogen use efficiency (NUE) in maize.” Spec.² 3:3–5. “The current invention involves efforts to over-express the cytosolic isoforms of GS under the control of different promoters in maize to improve NUE and thus grain yield.” *Id.* at 3:20–21.

Claims 9, 10, and 12–14 are on appeal. Claim 9 is the only independent claim and reads as follows:

9. A method of increasing yield in a maize plant, the method comprising:
 - a. increasing expression of a polynucleotide encoding a glutamine synthetase in the maize plant, wherein the polynucleotide is operably linked to a heterologous regulatory element, and wherein the glutamine synthetase comprises an amino acid sequence that has at least 90% sequence identity to SEQ ID NO: 52; and
 - b. growing the maize plant in a plant growing environment thereby increasing the yield.

The claims stand rejected as follows:

Claims 9, 10, and 12–14 under 35 U.S.C. § 102(b) as anticipated by, or alternatively under 35 U.S.C. § 103(a) as obvious based on, Hershey WO³ in light of Hershey US⁴ (Ans. 3–4) and

Claims 9, 10, and 12–14 under 35 U.S.C. § 102(b) as anticipated by, or alternatively under 35 U.S.C. § 103(a) as obvious based on, La Rosa⁵ (Ans. 5).

² Substitute Specification, filed May 4, 2015.

³ Hershey et al., WO 2007/092704 A2, Aug. 16, 2007.

⁴ Hershey et al., US 2007/0300323 A1, Dec. 27, 2007.

⁵ La Rosa et al., US 2004/0214272 A1, Oct. 28, 2004.

I

The Examiner has rejected all of the claims on appeal as anticipated by or obvious in view of Hershey WO in light of Hershey US. The Examiner finds that Hershey WO

teaches a method of increasing grain yield in a maize plant by expressing a sequence encoding SEQ ID NO:136, operably linked to a heterologous regulatory element, such as a root-preferred promoter, in a maize plant, and growing the maize plant in a plant growing environment, thereby increasing the yield of the maize plant.

Ans. 4. In support of this finding, the Examiner cites Hershey WO at “claims 1, 4, 7, 19–21 and 25; pp. 2, 4, 12, 65 and 66; Examples 10 and 11.” *Id.* The Examiner notes that Hershey WO does not disclose the amino acid sequence of its SEQ ID NO:136, but cites Hershey US as having the same Sequence Listing, and showing that SEQ ID NO:136 of both references is 99.5% identical to SEQ ID NO:52 of the instant claims. *Id.*

The Examiner reasons that,

[b]ecause the method steps are the same and are applied to the same population of plants, and the sequence being expressed is the same other than the three conservative amino acid substitutions, the method of Hershey would inherently produce the increased yield including grain yield in maize upon expression of SEQ ID NO:136.

Id. at 4–5.

Appellant argues that “Hershey did not make any plant with increased expression of glutamine synthetase. In the absence of any plant with increased expression of glutamine synthetase, the inherency argument ‘would inherently produce’ does not meet the legal standards for anticipation.” Appeal Br. 8. “Glutamine synthases were mentioned along

with other genes, but no experimental support of any kind was provided to meet the high standards of anticipation.” *Id.*

Appellant also argues that the Examiner

has not established a prima facie case of obviousness because the missing elements and evidence from Hershey is not cured by another objective evidence, other than the examiner impermissibly relying on applicant’s instant application for the missing piece – the missing piece being demonstrated yield increase in maize. Similarly, SEQ ID NO: 136 of Hershey is just one of the many unrelated sequences mentioned as part of a sequence listing.

Id. at 14.

We agree with Appellant that the Examiner has not shown that the method of claim 9 is disclosed by Hershey WO or would have been obvious to a person of ordinary skill in the art based on the Hershey references. Hershey WO states that it “presents methods to alter the genetic composition of crop plants, especially maize, so that such crops can be more productive. . . . The utility of this class of invention is then both yield enhancement and reduced fertilizer costs.” Hershey WO 2:5–9.

Hershey WO discloses nitrogen use efficiency (NUE) genes. *Id.* at 2:2–4. Among the disclosed genes is “the nucleotide sequence encoding an amino acid sequence comprising SEQ ID NO: . . . 136.” *Id.* at 2:30–34. Hershey WO describes SEQ ID NO:136 as glutamine synthase. *Id.* at 60.

Hershey WO discloses “a recombinant expression cassette comprising a nucleic acid as described. Additionally, the present invention relates to a vector containing the recombinant expression cassette. Further, the vector containing the recombinant expression cassette can facilitate the transcription and translation of the nucleic acid in a host cell.” *Id.* at 4:7–11.

Hershey WO describes types of promoters that can be used in its invention. *Id.* at 12.

Hershey WO also discloses “a transgenic plant or plant cells, containing the nucleic acids of the present invention. . . . In another embodiment, the transgenic plant is a maize plant.” *Id.* at 4:15–20. Hershey WO provides prophetic examples describing different ways of transforming and regenerating transgenic maize plants. *Id.* at 63–66. Hershey WO states that “T₀ transgenic maize plants containing the NUE construct under the control of a promoter were generated. These plants were grown in greenhouse conditions.” *Id.* at 77:14–15. No further description is provided regarding which “NUE construct,” under the control of which promoter, is intended. No results are described for the transgenic plants or their progeny.

“Anticipation requires that all of the claim elements and their limitations are shown in a single prior art reference.” *In re Skvorecz*, 580 F.3d 1262, 1266 (Fed. Cir. 2009). “[I]t is not enough that the prior art reference . . . includes multiple, distinct teachings that the artisan might somehow combine to achieve the claimed invention.” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed. Cir. 2008).

[U]nless a reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations arranged or combined in the same way as recited in the claim, it cannot be said to prove prior invention of the thing claimed and, thus, cannot anticipate under 35 U.S.C. § 102.

Id.

Here, the Examiner relies on multiple, distinct teachings in Hershey WO in order to meet the limitations of the claims on appeal. In order to anticipate claim 9, however, the reference must disclose all of the limitations

arranged or combined as recited in the claim, not as separate elements that could be combined in such a way that they would meet the claim limitations. The Examiner has not pointed to a disclosure in Hershey WO of a single, specific method that includes all of the limitations of claim 9, and therefore, has not shown that claim 9 is anticipated by Hershey WO.

With regard to the alternative, § 103, basis of the rejection, the Examiner relies on Hershey US only as evidence of the amino acid sequence of Hershey WO's SEQ ID NO:136. *See* Ans. 4. The Examiner also "takes the position that such a disclosure [of Hershey WO] is sufficient to anticipate Applicant's claims, and/or render those claims obvious to one of ordinary skill in the art." *Id.* at 7.

"An examiner bears the initial burden of presenting a prima facie case of obviousness." *In re Huai-Hung Kao*, 639 F.3d 1057, 1066 (Fed. Cir. 2011). "[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418–19 (2007). "[T]here must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *Id.* at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

The Examiner has not set out a prima facie case of obviousness, including articulated reasoning with rational underpinning, to show that a person of ordinary skill in the art would have combined the elements of the prior art in the manner required by claim 9.

We therefore reverse the rejection of claims 9, 10, and 12–14 under 35 U.S.C. § 102(b), or alternatively under 35 U.S.C. § 103(a), based on Hershey WO in light of Hershey US.

II

The Examiner has rejected all of the claims on appeal as anticipated by or obvious in view of La Rosa. The Examiner finds that

La Rosa teaches a method of improving plant properties including grain or seed yield by expressing a polynucleotide encoding SEQ ID NO:252,576 which has 99.8% sequence identity to SEQ ID NO:52 of the instant application, operably linked to a heterologous regulatory element such as a promoter, in a maize plant. . . . The plant is grown in a plant growing environment to obtain the increased grain yield phenotype.

Ans. 5. In support of this finding, the Examiner cites La Rosa's paragraphs 21 and 30, and its claims 2 and 3. *Id.*

The Examiner reasons that

[e]ven though La Rosa does not specifically correlate the expression of SEQ ID NO:252576 with increased yield and increased grain yield in maize, the method steps of La Rosa are identical to those claimed, and are applied to the same population of plants, and thus would inherently result in increased yield and increased grain yield in a maize plant.

Id. With regard to the alternative, § 103, basis of the rejection, the Examiner notes that “[t]he only obviousness analysis here is whether it would have been prima facie obvious to replace one amino acid with a conservative amino acid, as that is the only difference between La Rosa and Applicant's claimed invention.” *Id.* at 11.

Appellant argues that “La Rosa did not make any plant with increased expression of glutamine synthetase. In the absence of any plant with increased expression of glutamine synthetase, the inherency argument ‘would inherently produce’ does not meet the legal standards for anticipation.” Appeal Br. 7. Appellant argues that the legal standard requires that “the alleged teaching should be ‘necessarily present in the prior art’ and

not simply an ‘invitation to investigate’, which was the case with respect to La Rosa – an invitation to further investigate the functions of ~200,000 unrelated sequences.” *Id.* “[N]o plant was made by La Rosa and therefore there was no increased expression of any glutamine synthetase in any plant, let alone a maize plant.” *Id.* at 8.

We agree with Appellant that the Examiner has not shown that La Rosa anticipates or would have made obvious the method of claim 9. La Rosa discloses “polynucleotides for use in plant improvement . . . , in particular, sequences from *Zea mays* and the polypeptides encoded by such cDNAs.” La Rosa ¶ 4. “Polypeptides of the present invention are provided as SEQ ID NO: 184,664 through SEQ ID NO: 369,326.” *Id.* ¶ 6. The Examiner identifies the polypeptide of La Rosa’s SEQ ID NO: 252,576 as being 99.8% identical to SEQ ID NO: 52 of claim 9. Ans. 5.

La Rosa discloses that its “polynucleotides . . . find particular use in generation of transgenic plants to provide for increased or decreased expression of the polypeptides encoded by the cDNA polynucleotides.” La Rosa ¶ 21. La Rosa states that such plants can include crop plants, including maize, and that various improved characteristics, including increased yield, can result. *Id.*

La Rosa does not, however, disclose a transgenic maize plant transformed with a polynucleotide sequence encoding the polypeptide of its SEQ ID NO: 252,576 under the control of a heterologous regulatory element, as required by claim 9. La Rosa, therefore, does not disclose all of the limitations of claim 9 “arranged or combined in the same way as recited in the claim.” *Net MoneyIN*, 545 F.3d at 1371. For that reason, “it cannot be

said to prove prior invention of the thing claimed and, thus, cannot anticipate under 35 U.S.C. § 102.” *Id.*

As noted above, the Examiner relies on § 103 only with regard to “whether it would have been *prima facie* obvious to replace one amino acid with a conservative amino acid.” Ans. 11. The Examiner, therefore, has not set out a *prima facie* case of obviousness, including articulated reasoning with rational underpinning, to show that a person of ordinary skill in the art would have combined elements disclosed by La Rosa in the manner required by claim 9.

CONCLUSION

In summary:

Claims Rejected	Basis	Affirmed	Reversed
9, 10, 12–14	§ 102(b)/§ 103 Hershey WO, Hershey US		9, 10, 12–14
9, 10, 12–14	§ 102(b)/§ 103 La Rosa		9, 10, 12–14
Overall Outcome			9, 10, 12–14

REVERSED