UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KIRUBA SIVASUBRAMANIAM,
EVANGELOS TRIFON LASKARIS
and JAMES PELLEGRINO ALEXANDER

Appeal 2008-1135
Application 10/444,253[1]
Technology Center 2800

Decided: September 10, 2008

Before JOSEPH F. RUGGIERO, ROBERT E. NAPPI,
and MARC S. HOFF, *Administrative Patent Judges.*

HOFF, *Administrative Patent Judge.*

DECISION ON APPEAL

---

[1] Application filed May 27, 2003. The real party in interest is General Electric Company.

STATEMENT OF CASE

Appellants appeal under 35 U.S.C. § 134 from a Final Rejection of claims 1-10, 25-32, and 34-40. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

Appellants' invention relates to a method for generating electricity using a stationary superconducting field coil and a stationary stator winding. The method includes creating a magnetic field with the field coil, rotating a homopolar rotor within the magnetic field such that a rotating magnetic field is created in the stationary stator winding (Spec. 2, para. [0004]). The rotor comprises a plurality of circumferentially-spaced first pole pieces coupled to the shaft and extending radially outwardly from the shaft (Spec. 2, para. [0005]).

Claim 38 is exemplary:

38. a dynamoelectric machine comprising:

a stator comprising a stationary magnetic core, and a plurality of stator windings positioned within said core, said windings electrically coupled to form an electrical circuit;

a rotor comprising at least one set of pole pieces protruding from a shaft in a radial outward direction, each said set of pole pieces for generating a rotating magnetic field; and

a single stationary superconducting field coil circumscribing said shaft for generating a magnetic field in each said set of pole pieces;

wherein said stator includes a first substantially axially oriented portion coupled to a second substantially axially oriented portion using a third portion that is oriented substantially diagonally to a longitudinal axis of said rotor.

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

De Rugeris	US 3,535,572	Oct. 20, 1970
Richter	US 3,737,696	Jun. 5, 1973
Wetzig	US 4,088,911	May 9, 1978
Miller	US 5,001,378	Mar. 19, 1991
Hotta	US 5,177,388	Jan. 5, 1993

Claims 1-6, 8, 9, 25-31, 34, 35, and 37-40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Richter in view of Wetzig and Miller.

Claims 7 and 32 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Richter in view of Wetzig, Miller, and De Rugeris.

Claims 10 and 36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Richter in view of Wetzig, Miller, and Hotta.

Appellants contend that Richter teaches away from the use of a non-cylindrical rotor, and that Wetzig does not teach a stationary superconducting field winding.

Rather than repeat the arguments of Appellants or the Examiner, we make reference to the Appeal Brief (filed January 22, 2007), the Reply Brief (filed July 6, 2007) and the Answer (mailed May 8, 2007) for their respective details.

ISSUE

The principal issue in the appeal before us is whether the Examiner erred in rejecting the claims over the combination of Richter, which teaches

the use of a cylindrical rotor to reduce windage losses, with Miller, who teaches a salient pole rotor disclosed to reduce windage losses, and Wetzig.

FINDINGS OF FACT

The following Findings of Fact (FF) are shown by a preponderance of the evidence.

The Invention

1. According to Appellants, the invention relates to a method for generating electricity using a stationary superconducting field coil and a stationary stator winding. The method includes creating a magnetic field with the field coil, rotating a homopolar rotor within the magnetic field such that a rotating magnetic field is created in the stationary stator winding (Spec. 2, para. [0004]). The rotor comprises a plurality of circumferentially-spaced first pole pieces coupled to the shaft and extending radially outwardly from the shaft (Spec. 2, para. [0005]).

Richter

2. Richter teaches a homopolar inductor alternator which includes a solid cylindrical rotor having axially in-line magnetic poles (col. 4, ll. 28-37).

3. Richter teaches that windage losses are an important problem, especially at high rotational speeds (col. 3, ll. 7-11).

4. Richter's solution to the problem of windage losses consists of filling the interpolar spaces with non-magnetic material to create a solid cylindrical rotor (col. 3, ll. 19-21).

Wetzig

5. Wetzig teaches a unipolar machine in which the rotating cylinders of the machine are supported on a rotor hub having a central recess. The field winding is arranged in the central recess of the rotor hub and is formed as a one-piece ring (col. 1, ll. 39-46).

6. Wetzig teaches that field winding 11 and its surrounding cryostat are mounted in recess 16 of the rotor hub 5 by a bolt 23, which is attached to the housing 25 (col. 3, ll. 30-32; Fig. 2).

Miller

7. Miller teaches a transverse pole, salient, homopolar rotor with shrouds on the axially inner and axially outer sides of two axially spaced sets of circumferentially spaced salient poles having spaced recesses between the poles (col. 2, ll. 40-44).

8. Miller teaches that, at high speeds, dynamoelectric machines employing salient pole rotors can experience substantial windage losses (col. 2, ll. 7-10).

9. Miller acknowledges Richter's approach of filling the interpole recesses to form a cylindrical rotor (col. 2, ll. 24-25).

10. Miller states that Richter's approach has not been optimized to allow both for sustained high speed operation and convenient, economical construction of a rotor (col. 2, ll. 30-34).

11. Miller teaches that to reduce windage power losses, an outer shroud 31 is provided at the axially outer end of each set of salient poles 28. Shroud 31 closes the outer end of recesses 26 blocking axial air flow into the recesses and thereby reducing windage losses (col. 5, ll. 16-20).

De Rugeris

12. De Rugeris teaches an alternator whose armature comprises sets of series-connected coils or windings which form different generating circuits, and each of said coils or windings includes two twin portions which are spaced from each other in the direction of the axis of rotation of whatever part of the alternator is the rotor (col. 1, l. 68 – col. 2, l. 2).

Hotta

13. Hotta teaches an alternator which comprises a rotor having a plurality of magnetic poles, and a plurality of stators arranged in tandem axially of the rotor in the housing, which stators have multi-phase windings and tooth-shaped cores positioned to be opposite to the magnetic poles of the rotors, respectively (col. 1, ll. 46-53).

PRINCIPLES OF LAW

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S. Ct. at 1734 ("While the sequence of these

questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.")

In *KSR*, the Supreme Court emphasized "the need for caution in granting a patent based on the combination of elements found in the prior art," *id.* at 1739, and discussed circumstances in which a patent might be determined to be obvious. In particular, the Supreme Court emphasized that "the principles laid down in *Graham* reaffirmed the 'functional approach' of *Hotchkiss*, 11 How. 248." *KSR*, 127 S. Ct. at 1739 (citing *Graham v. John Deere Co.*, 383 U.S. 1, 12 (1966) (emphasis added)), and reaffirmed principles based on its precedent that "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Id.* The Court explained:

> When a work is available in one form of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

Id. at 1740. The operative question in this "functional approach" is thus "whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id.*

The determination of obviousness must consider, *inter alia*, whether a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and whether there would have

been a reasonable expectation of success in doing so. *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1125 (Fed. Cir. 2000). *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1164 (Fed. Cir. 2006). Where the teachings of two or more prior art references conflict, the Examiner must weigh the power of each reference to suggest solutions to one of ordinary skill in the art, considering the degree to which one reference might accurately discredit another. *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991). If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984). Further, our reviewing court has held that "[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); *Para-Ordnance Mfg., Inc. v. SGS Importers Int'l., Inc.*, 73 F.3d 1085, 1090 (Fed. Cir. 1995).

ANALYSIS

Claims 1-6, 8, 9, 25-31, 34, 35, and 37-40

We select claim 38 as representative of this group, pursuant to our authority under 37 C.F.R. § 41.37(c)(1)(vii).

Appellants argue that Richter teaches a rotor of a cylindrical configuration to minimize windage losses (FF 4). Therefore, Appellants reason, Richter teaches a principle of operation that requires a cylindrical

rotor for the express purpose of minimizing windage losses, and teaches away from a non-cylindrical rotor or a rotor having protruding features, as recited in the claim (App. Br. 10).

Under *Gordon* and *Gurley*, *supra*, a reference may be said to teach away if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, or if 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 (*Gordon*, 733 F.2d at 902; *Gurley*, 27 F.3d at 553). Richter teaches that windage losses are an important problem, especially at high rotational speeds (FF 3), and teaches the solution of filling the interpolar spaces with non-magnetic material to create a solid cylindrical rotor (FF 4). Richter does not discourage other options for reducing windage losses, nor affirmatively discourage the use of a non-cylindrical rotor. Miller also acknowledges that, at high speeds, dynamoelectric machines employing salient pole rotors can experience substantial windage losses (FF 8). Miller explicitly acknowledges Richter's approach of filling the interpole recesses (FF 9), but states that Richter's approach has not been optimized to allow both for sustained high speed operation and convenient, economical construction of a rotor (FF 10).

Miller, then, cognizant of the problem of windage losses and aware of Richter's teachings, proposes a solution to their common problem that includes the use of a salient pole rotor (FF 11). Richter teaches filling interpolar spaces to create a cylindrical rotor not for its own sake but to address the serious problem of windage losses (FF 4). Modifying Richter in

accordance with the principles of Miller, *i.e.*, constructing a salient pole rotor including the shrouds Miller teaches, would not render Richter unsatisfactory for its intended purpose, because of Miller's teaching of advantageous reduction in windage losses (FF 11). Likewise, modifying Richter in the manner proposed by Miller is not discouraged by Richter, because Miller teaches how windage power losses may be reduced (*id.*). We find, therefore, that Richter does not teach away from the claimed invention, and conclude that the Examiner did not err in finding motivation to combine Richter with Wetzig and Miller to achieve the instant invention.

Appellants argue that the cited references do not teach or suggest "a single *stationary* superconducting field coil" (App. Br. 10), because the field winding of Wetzig allegedly moves with the rotor hub 5 (*id.*).

We are not persuaded by Appellants' position, because we agree with the Examiner that Wetzig's field winding does not move with the rotor. Wetzig teaches that field winding 11 and its surrounding cryostat are mounted in recess 16 of the rotor hub 5 by a bolt 23, which is attached to the housing 25, and is not connected to the rotor hub (FF 6).

Finally, Appellants argue that the Examiner has not shown the requisite motivation or suggestion to combine the references, because Richter and Miller teach away from one another (App. Br. 11-12). As explained *supra*, we are not persuaded that the Richter and Miller references teach away from one another. Therefore, we are not persuaded of error in the Examiner's proposed combination of references.

Thus, we do not find error in the Examiner's rejection of claim 38, nor that of claims 1-6, 8, 9, 25-31, 34, 35, 37, 39, and 40 not separately argued, under 35 U.S.C. § 103(a).

Claims 7 and 32

Appellants argue that De Rugeris does not cure the deficiencies of the rejection applied to independent claims 1 and 25, from which claims 7 and 32 depend respectively (App. Br. 12-13). Because we find *supra* that the rejections of claims 1 and 25 are not erroneous, we do not find error in the rejections of claims 7 and 32 under 35 U.S.C. § 103(a).

Claims 10 and 36

Appellants argue that Hotta does not cure the defects of the rejection applied to independent claims 1 and 25, from which claims 10 and 36 depend respectively (App. Br. 13). Because we find *supra* that the rejections of claims 1 and 25 are not erroneous, we do not find error in the rejections of claims 10 and 36 under 35 U.S.C. § 103(a).

CONCLUSION OF LAW

We conclude that Appellants have not shown that the Examiner erred in rejecting claims 1-10, 25-32, and 34-40. Claims 1-10, 25-32, and 34-40 are not patentable.

DECISION

The Examiner's decision rejecting claims 1-10, 25-32, and 34-40 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

KIS

GENERAL ELECTRIC COMPANY (PCPI)
C/O FLETCHER YODER
P. O. BOX 692289
HOUSTON, TX 77269-2289