UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DIETMAR HIRSCH and JURGEN LINZMEIER

Appeal 2009-007787
Application 11/266,656
Technology Center 3600

Decided: January 8, 2010

Before: WILLIAM F. PATE III, JENNIFER D. BAHR, and LINDA E. HORNER, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Dietmar Hirsch et al. (Appellants) seek our review under 35 U.S.C. § 134 of the Examiner's decision rejecting claims 1, 3, 5, and 6, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6(b) (2002).

SUMMARY OF DECISION

We AFFIRM-IN-PART.

THE INVENTION

Appellants' claimed invention is a heat shield sleeve affixed so that it rotates with a drive shaft. Spec. 1, paras. 0002, 0005. Claim 1, reproduced below, is representative of the subject matter on appeal.

> 1. A drive shaft assembly, comprising:
>
> a rotatably disposed drive shaft;
>
> a heat shield sleeve enclosing at least a segment of said drive shaft and fixed to said drive shaft for rotation therewith, said heat shield sleeve having heat-reflecting and/or heat-insulating properties;
>
> wherein said heat shield sleeve is disposed relative to said drive shaft to define a hollow air space forming an insulation area between said drive shaft and said heat shield sleeve.

THE EVIDENCE

The Examiner relies upon the following evidence:

Rutter	US 3,190,412	Jun. 22, 1965
Lakiza	US 4,127,080	Nov. 28, 1978
Mazuy	US 2003/0136553 A1	Jul. 24, 2003

THE REJECTIONS

Appellants seek review of the following rejections by the Examiner:

1. Rejection of claims 1, 3, and 5 under 35 U.S.C. § 102(b) as anticipated by Lakiza.

2. Rejection of claims 1, 3, and 5 under 35 U.S.C. § 102(b) as anticipated by Mazuy.
3. Rejection of claim 6 under 35 U.S.C. § 103(a) as unpatentable over Mazuy.
4. Rejection of claim 6 under 35 U.S.C. § 103(a) as unpatentable over Mazuy and Rutter.

ISSUES

Appellants argue against the anticipation rejection of claims 1, 3, and 5 by Lakiza as a group. App. Br. 4-5; Reply Br. 1-3. We select claim 1 as the representative claim, and claims 3 and 5 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(vii) (2009). Appellants contend that Lakiza does not anticipate claim 1 because Lakiza does not have a structure that may be referred to as the claimed heat shield sleeve and does not have a structure that is "disposed relative to said drive shaft to define a hollow air space forming an insulation area between said drive shaft and said heat shield sleeve", as claimed. App. Br. 5.

Appellants argue against the anticipation rejection of claims 1, 3, and 5 by Mazuy as a group. App. Br. 5-6; Reply Br. 3-4. We select claim 1 as the representative claim, and claims 3 and 5 stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(vii). Appellants contend that Mazuy does not anticipate claim 1 because Mazuy does not disclose a heat shield sleeve having a hollow, insulative area between the heat shield sleeve and the drive shaft. App. Br. 5-6; Reply Br. 3-4.

The Examiner concluded that claim 6 is unpatentable over Mazuy because it would have been obvious to make Mazuy's heat shield of

aluminum based on its suitability for the intended use as a matter of obvious design choice. Ans. 4. Alternatively, the Examiner concluded that claim 6 is unpatentable over Mazuy and Rutter because Rutter discloses that aluminum and stainless steel are art-recognized equivalent materials for sheet metal heat shields. Ans. 4-5.

Appellants contend that aluminum would not have the proper expansion coefficient to keep Mazuy's heat shield in contact with the drive shaft as designed. App. Br. 6-7. Appellants also contend that Rutter does not disclose that aluminum and steel are equivalent, but rather discloses that either may be used as Rutter's heat shields 12. App. Br. 7-8.

The issues before us are:

Have Appellants shown the Examiner erred in finding that Lakiza discloses the heat shield sleeve as called for in claim 1?

Have Appellants shown the Examiner erred in finding that Mazuy discloses a heat shield sleeve having a hollow, insulative area between the heat shield sleeve and the drive shaft as called for in claim 1?

Have Appellants demonstrated that the Examiner failed to provide a sufficient reason with a rational underpinning to explain why one having ordinary skill in the art would have modified Mazuy's heat shield to be made of aluminum?

FINDINGS OF FACT

We find that the following enumerated facts are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

1. Lakiza discloses a tubular shaft used in marine line shaftings, such as in propulsion and tunnel shafts of a ship's line shafting, designed to have an increased load capacity. Lakiza, col. 1, ll. 6-10; col. 3, ll. 27-29.
2. Lakiza discloses a tubular shaft 1 comprised of at least two coaxially arranged tubes, such as: an outer tube 2 and an inner tube 3. Lakiza, col. 4, ll. 38-40, 44; fig. 1. Outer tube 2 has flanges 4 and 5 affixed to each end. Lakiza, col. 4, ll. 45-46; fig. 1. Inner tube 3 has flange 6 affixed to one end and flange 7 is movably mounted to inner tube 3 so as to axially travel with respect to flange 5 of outer tube 2 (rotationally disposed). Lakiza, col. 4, ll. 47-51; fig. 1. Lakiza discloses that flanges 4, 5, 6, and 7 of outer tube 2 and inner tube 3 have holes 9 to accommodate means for interconnecting the flanges, such as bolts 10. Lakiza, col. 4, ll. 63-66; figs. 1, 3. Lakiza discloses that elastic supports 11 having springs 12 may be mounted on the outer surface of inner tube 3 to provide support to the inner surface of outer tube 2 to dampen vibrations. Lakiza, col. 5, ll. 15-20; figs. 1, 2.
3. Appellants' Specification does not provide a lexicographic definition of the term "fixed" as used in claim 1. Spec. *passim*.
4. The word "fixed" is commonly understood to mean "securely placed or fastened." *Webster's Third New International Dictionary, Unabridged* (1961) ("fixed," adjective, definition 1a). Available on-line at http://lionreference.chadwyck.com/.
5. Mazuy discloses a thermal protection shield for a rotating shaft, especially for a primary coolant pump shaft of a nuclear power

station. Mazuy 1, para. 0001. Mazuy discloses that a primary coolant pump for a nuclear power station has a hot part (lower part A), and a cold part (upper part B), with each region penetrated by a shaft 1. Mazuy 1, paras. 0026-0027; fig. 1. Between the lower part A and the upper part B is a transition region C, where shaft 1 is protected by a thermal protection shield 10. Mazuy 2, paras. 0032-0033; fig. 1.

6. Mazuy discloses a first embodiment of the thermal protection shield 10[1] comprising a ring 11 shrunk over its entire length onto shaft 1. Mazuy 2, para. 0034; fig. 2. The compositions of ring 11 and shaft 1 are chosen to maintain metal-to-metal contact between the elements in standard operating situations, such as ring 11 being composed of a nickel alloy and shaft 1 being composed of austenitic stainless steel. Mazuy 2, paras. 0034-0035. The nickel alloy of ring 11 has a lower expansion coefficient than that of the austenitic stainless steel of shaft 1, and withstands thermal transients without becoming plasticized. Mazuy 2, para. 0036.
7. Mazuy discloses a second embodiment of thermal protection shield 10, which adds an external ring 15 of austenitic stainless steel around ring 11 in order to protect ring 11 from instabilities in the transition region between the hot and cold water. Mazuy 2, paras. 0039, 0041; fig. 3. External ring 15 is shrunk at each of its ends onto ring 11, forming a cylindrical cavity 16 having a clearance between the external surface of ring 11 and the internal surface of

[1] The thermal protection shield is mistakenly labeled as "2" in the description and properly labeled as "10" in Figure 2.

external ring 15. Mazuy 2, para. 0040; fig. 3. The thermal gradient of normal operating conditions deforms external ring 15 so that it comes into contact with the external surface of ring 11 and eliminates or minimizes the film of water that can circulate between ring 11 and external ring 15. Mazuy 2, paras. 0042-0043; fig. 3. A variant of the second embodiment of thermal protection shield 10 includes projecting annular portions 16a on the inner surface of the external ring 15 for reducing the clearance between the inner surface of external ring 15 within cavity 16 and the outer surface of ring 11. Mazuy 2, para. 0047; fig. 4.

8. Rutter discloses use of metallic insulations for deterring heat transfer, including heat reflective shield members 12 made of either polished aluminum or stainless steel. Rutter, col. 1, ll. 10-11; col. 3, ll. 35-37; fig. 1.

PRINCIPLES OF LAW

Appellants have the burden on appeal to the Board to demonstrate error in the Examiner's position. *See In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness.") (quoting *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998)).

"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.*, 550 U.S. 398, 406 (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*, 550 U.S. at 407 ("While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.")

ANALYSIS

Rejection of claims 1, 3, and 5 under 35 U.S.C. § 102(b) as anticipated by Lakiza

Claim 1 recites a drive shaft assembly that includes a rotatably disposed drive shaft, and a heat shield sleeve disposed relative to the drive shaft so as to define a hollow, insulative air space between the drive shaft and the heat shield sleeve. Claim 1 recites that the heat shield sleeve is "fixed to said drive shaft for rotation therewith." Appellants' Specification does not define "fixed" as used in claim 1, and a common meaning is "securely placed or fastened" (Facts 3, 4). Claim 1 uses the open ended term "comprising," so that additional, unrecited elements are permitted. *See Genentech, Inc. v. Chiron Corp*., 112 F.3d 495, 501 (Fed. Cir. 1997) ("Comprising" is a term of art used in claim language which means that the named elements are essential, but other elements may be added and still form a construct within the scope of the claim.). A person of ordinary skill

in the art would interpret claim 1 to require the heat shield sleeve to have a hollow, insulative air space between the drive shaft and that the heat shield sleeve, and to be fastened to the drive shaft so that it rotates with the drive shaft.

Lakiza discloses a tubular shaft used in marine line shaftings, such as in propulsion and tunnel shafts of a ship's line shafting designed to have an increased load capacity (Fact 1). Lakiza's tubular shaft 1 is comprised of an inner tube 3 and an outer tube 2, each tube having flanges at each end (Fact 2).

Appellants present four contentions in support of the argument that Lakiza does not disclose the claimed heat shield. App. Br. 4-5; Reply Br. 1-3. First, Appellants contend that Lakiza's tubular shaft 1 corresponds to the claimed drive shaft, and Lakiza does not disclose a heat shield because as a marine shaft, a heat shield is unnecessary. App. Br. 4-5; Reply Br. 1-2. Appellants' argument ignores the Examiner's finding that Lakiza's outer tube 2 is the claimed heat shield and Lakiza's inner tube 3 is the claimed drive shaft (Ans. 3-4), and fails to demonstrate error in that finding.

Second, Appellants contend that Lakiza's outer tube 2 does not function as a heat shield because heat applied would be transmitted to the flanges at the end portions of outer tube 2. Reply Br. 2. Appellants' argument is unconvincing because it is premised on a limitation that is not present in the claim, as claim 1 does not contain a limitation that the heat shield prevents the transfer of heat to end portions of the heat shield.

Third, Appellants contend that outer tube 2 is connected to inner tube 3 by flanges, and consequently is not fixed to the drive shaft as claimed. Reply Br. 2. This contention is also not supported by the claim, as claim 1

requires the heat shield to be fastened so that it rotates with the drive shaft, and additional, unrecited elements (e.g. Lakiza's flanges) are permitted. Lakiza discloses that flanges 4 and 5 are affixed to the ends of outer tube 2, flanges 6 and 7 are affixed to the ends of inner tube 3, and flanges 4, 5, 6, and 7 are connected by bolts 10 through holes 9 (Fact 2). Thus, the heat shield (outer tube 2) is fastened to the drive shaft (inner tube 3) by the flanges 4, 5, 6, and 7, and bolts 10 through holes 9, so that it rotates with the drive shaft (inner tube 3) as claimed.

Fourth, Appellants contend that Lakiza's shaft is designed to be capable of higher torque than a similar shaft, and is not designed to provide a shaft with heat-reflecting and/or insulating properties as claimed. App. Br. 4. Lakiza need not disclose that its outer tube 2 is intended to be used as a heat shield in order to anticipate the claimed structure; rather, the outer tube must merely be capable of performing such a function. *In re Schreiber*, 128 F.3d 1473, 1477-1478 (Fed. Cir. 1997). The Examiner found that Lakiza's outer tube has heat-reflecting or insulating properties and is thus capable of performing the intended function, and Appellants have presented no convincing argument to the contrary. See Ans. 5-6.

Appellants have failed to demonstrate error by the Examiner in the rejection of claim 1. Claims 3 and 5 fall with claim 1.

Rejection of claims 1, 3, and 5 under 35 U.S.C. § 102(b) as anticipated by Mazuy

Claim 1 recites that the heat shield sleeve is disposed relative to the drive shaft so as to define a hollow, insulative air space between the drive shaft and the heat shield sleeve.

Mazuy discloses a thermal protection shield 10 for protecting a rotating shaft 1 with a ring 11 shrunk over its entire length to the shaft 1 (Facts 5, 6). Mazuy discloses that external ring 15 is disposed around ring 11 to provide ring 11 thermal protection (Fact 6). External ring 15 is shrunk at each of its ends onto ring 11, eliminating or reducing water circulation between external ring 15 and ring 11, and creating a cavity 16 between the inner surface of external ring 15 and the outer surface of ring 11 (Fact 6).

The Examiner found that Mazuy's shaft 1 and ring 11 are the claimed drive shaft, and that cavity 16 is the claimed hollow, insulative air space. Ans. 4. Rather than address this finding by the Examiner, Appellants contend that there is no air space between Mazuy's shaft 1 and ring 11. App. Br. 5-6; Reply Br. 3-4. While Mazuy describes ring 11 as a thermal protection shield, nothing in claim 1 precludes the interpretation that ring 11 is part of the claimed drive shaft. Appellants have failed to demonstrate error by the Examiner in the rejection of claim 1. Claims 3 and 5 fall with claim 1.

Rejection of claim 6 under 35 U.S.C. § 103(a) as unpatentable over Mazuy; or under 35 U.S.C. § 103(a) as unpatentable over Mazuy and Rutter

Claim 6 depends from claim 5, which depends from independent claim 1, and contains the limitation that the heat shield sleeve is comprised of a sheet metal body of aluminum alloy or aluminum.

Mazuy discloses the materials used to form external ring 15 and ring 11 are selected based on thermal expansion coefficients so that the thermal gradient of normal operating conditions deforms external ring 15, made of austenitic stainless steel, so that it comes into contact with the external surface of ring 11, made of nickel alloy, reducing or eliminating water

circulation between ring 11 and external ring 15 (Facts 6, 7). Rutter discloses that reflective heat shields used to deter heat transfer may be made of polished aluminum or stainless steel (Fact 8).

The Examiner's rationale that aluminum would be an obvious design choice is insufficient to explain why a person of ordinary skill would seek to make Mazuy's external ring 15 of aluminum. See Ans. 4. Mazuy discloses external ring 15 and ring 11 are made of materials selected based on thermal expansion coefficients so that external ring 15 remains in contact with ring 11 when at operating temperatures, and the Examiner's rationale does not explain how the properties of aluminum would produce that same contact.

The Examiner's rationale that Rutter discloses aluminum and stainless steel are art recognized equivalent materials for metallic shields is also insufficient to explain why a person of ordinary skill in the art would seek to make Mazuy's external ring 15 of aluminum instead of austenitic stainless steel as the Examiner has overstated what Rutter discloses. See Ans. 4-5. While Rutter discloses that either polished aluminum or stainless steel may be used as a heat shield, this falls short of a disclosure that aluminum and stainless steel have approximately the same expansion coefficient (Fact 8). Mazuy's heat shield is designed based on the interaction between external ring 15 and ring 11 when at operating temperatures, and Rutter does not disclose that aluminum and stainless steel have approximately the same expansion coefficient so that aluminum would produce the desired contact (Facts 7, 8).

Thus, we see no reason, and the Examiner has not provided an adequate articulation of a reason, why a person of ordinary skill in the art

would have been led to modify Mazuy's heat shield to be made of aluminum.

CONCLUSIONS

Appellants have failed to show the Examiner erred in finding that Lakiza discloses the heat shield sleeve of claim 1.

Appellants have failed to show the Examiner erred in finding that Mazuy discloses a heat shield sleeve having a hollow, insulative area between the heat shield sleeve and the drive shaft.

Appellants have demonstrated the Examiner failed to provide a sufficient reason with a rational underpinning to explain why one having ordinary skill in the art would have modified Mazuy's heat shield to be made of aluminum.

DECISION

We AFFIRM the decision of the Examiner to reject claims 1, 3, and 5.

We REVERSE the decision of the Examiner to reject claim 6.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED-IN-PART

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LERNER GREENBERG STEMER LLP
P O BOX 2480
HOLLYWOOD, FL 33022-2480