Paper No. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte JON C. SCHAEFFER, MARK A. ROSENZWEIG,
NORMAN R. LINDBLAD and WENDY H. MURPHY

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Appeal No. 1998-2409
Application 08/398,259

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ON BRIEF

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Before WARREN, OWENS and JEFFREY T. SMITH, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the examiner's final rejection of claims 1-20, which are all of the claims in the application.

THE INVENTION

Appellants' claimed invention is directed toward a method for preparing a coated article and toward the coated article. Appellants state that except for the recited substrate sulfur content of less than about 1 ppm, articles of this type were

known in the art (specification, page 5, lines 25-26). Claims 1 and 16 are illustrative:

1. A method for preparing a coated article, comprising the steps of:

furnishing an article substrate having a free sulfur content of less than about 1 part per million;

depositing a layer of a platinum-group metal over the article substrate; and

applying a ceramic coating over the layer of a platinum-group metal.

16. A coated article, comprising:

an article substrate having a sulfur content of less than about 1 part per million;

a platinum-group metal layer overlying the article substrate; and

a ceramic coating overlying the platinum-group metal layer.

THE REFERENCES

McGill et al. (McGill)	4,399,199	Aug. 16, 1983
Moroishi et al. (Moroishi)	4,530,720	Jul. 23, 1985
Osozawa et al. (Osozawa)	4,626,408	Dec. 2, 1986

THE REJECTION

Claims 1-20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Osozawa or Moroishi, in view of McGill.

OPINION

We reverse the rejection over Osozawa in view of McGill. As for the rejection over Moroishi in view of McGill, we affirm the

rejection of claims 1, 3-6, 9-16, 18 and 20 and reverse the rejection of claims 2, 7, 8, 17 and 19.

Rejection over Osozawa in view of McGill

Osozawa discloses a Ni-based alloy which, Osozawa states, is "excellent in intergranular corrosion resistance, stress corrosion cracking resistance, mechanical strength and hot workability" (col. 1, lines 9-12). Osozawa teaches that when the alloy contains neither B nor Mg, the hot workability is markedly lowered when the S content is higher than 0.0010% (10 ppm) (col. 2, lines 46-49). The lowest exemplified alloy sulfur contents are 6 ppm in an example of the invention (table 1, alloy no. 3), and 4 ppm in a comparative example (table 1, alloy no. 12). Osozawa does not indicate whether the disclosed sulfur content is free sulfur, sulfur which is chemically combined with one or more elements, or total sulfur. Thus, it is not apparent whether Osozawa's alloy has a free sulfur content within the range recited in appellants' claims.

McGill discloses an article suitable for use at temperatures up to 1600°C comprising a metallic substrate having thereon a coating or layer including one or more of the platinum group metals or an alloy including one or more of the platinum group metals, on which is deposited a ceramic thermal barrier layer

(col. 2, lines 29-50). McGill states that "the aim of the present invention is to improve the adherence, durability and corrosion resistance of a thermal barrier system without affecting the prime purpose of said system, namely to reduce substrate metal surface temperature thus allowing current high temperature materials to operate effectively in hotter combustion gas streams" (col. 3, line 57 - col. 4, line 2).

The examiner argues that it would have been obvious to one of ordinary skill in the art to optimize Osozawa's sulfur content within Osozawa's range of at most 10 ppm, thereby arriving at appellants' free sulfur content of less than about 1 ppm (answer, pages 4-5). Appellants, however, have selected their free sulfur content for the purpose of reducing the tendency of the protective system to debond (specification, page 6, lines 7-11). Osozawa, on the other hand, selected his sulfur content, which has not been established by the examiner as being free sulfur rather than combined or total sulfur, to improve hot workability (col. 2, lines 46-49). The examiner has not explained why Osozawa and McGill would have led one of ordinary skill in the art to optimize Osozawa's sulfur content for appellants' purpose, or why it reasonably appears that optimizing Osozawa's sulfur content for the different purpose disclosed by Osozawa would

result in a free sulfur content of less than about 1 ppm. The examiner has merely provided speculation that optimizing Osozawa's sulfur content would result in the free sulfur content recited in appellants' claims, and such speculation is not sufficient for establishing a *prima facie* case of obviousness. *See In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968); *In re Sporck*, 301 F.2d 686, 690, 133 USPQ 360, 364 (CCPA 1962). Accordingly, we reverse the rejection over Osozawa in view of McGill.

Rejection over Moroishi in view of McGill

Moroishi discloses that sulfur has an adverse effect on the oxidation of austenitic steels and that the oxidation resistance of such steels can be remarkably improved when the sulfur content is limited to not more than 0.003% (30 ppm) (col. 2, lines 46-51). It is desirable, Moroishi teaches, to make the sulfur content as low as possible, preferably less than 0.0015% (15 ppm) (col. 6, lines 65-66). The lowest disclosed sulfur content is 0.001% (10 ppm) (figure; tables 2-7). Moroishi teaches that "sulfur in an extremely small amount, i.e., not more than 0.003% [30 ppm], easily and completely combines with any Ca, Mg, etc. introduced into the steel from a refractory material of a furnace structure or a slag during the preparation of the melt to form a

stable sulfide or oxysulfide of Ca, Mg, which is stable at a high temperature. These compounds do not decompose at high service temperatures to provide free sulfur" (col. 3, lines 48-56). To accelerate the formation of stable sulfur compounds and thereby further improve resistance to oxidation, Ca, Mg, rare earths or Y can be intentionally added to the melt (col. 3, lines 48-66; col. 6, lines 43-55). Thus, it reasonably appears that Moroishi's alloy either has essentially no (i.e., less than about 1 ppm) free sulfur, due to the presence of elements such as Ca and Mg, or that the reference would have led one of ordinary skill in the art to add Ca, Mg, rare earths or Y in order to essentially eliminate any free sulfur and thereby improve oxidation resistance.

McGill teaches that the substrate onto which his platinum group metal-containing coating or layer and thermal barrier coating or layer are applied preferably "comprises an alloy, for example a Ni-, Co or Fe-based superalloy or a refractory alloy, or a refractory metal" (col. 2, lines 37-39). McGill's invention is described with respect to gas turbine engine components, but also applies to "other technologies such as coal gasification, glass processing and oil refining" (col. 4, lines 11-13). Moroishi's austenitic steels are used in high temperature

apparatus such as a heating furnace, heat exchanger, burner of heating equipment, automobile exhaust converter etc." (col. 1, lines 17-20), which are the type of applications envisioned by McGill. Consequently, the combined teachings of Moroishi and McGill would have fairly suggested, to one of ordinary skill in the art, applying McGill's coatings or layers to Moroishi's substrate to obtain the benefit in Moroishi's apparatus of McGill's thermal barrier layer system.

Appellants argue that Moroishi does not disclose a coating and McGill does not mention sulfur (brief, pages 4-9). This argument is not well taken because appellants are attacking the references individually when the rejection is based on a combination of references. *See In re Keller*, 642 F.2d 413, 426, 208 USPQ 871, 882 (CCPA 1981); *In re Young*, 403 F.2d 754, 757-58, 159 USPQ 725, 728 (CCPA 1968). As discussed above, Moroishi and McGill, taken together, would have fairly suggested, to one of ordinary skill in the art, applying McGill's coatings or layers to Moroishi's essentially sulfur free substrate.

Appellants argue that neither of the references discloses the limitations in claims 3-6 (brief, page 9). However, the limitation in claim 3 that the substrate is fabricated from a material having a free sulfur content of less than about 1 ppm

reasonably appears to be met by Moroishi's teaching that Ca, Mg, etc. can be present in the melt such that they combine with sulfur to eliminate the adverse effects of free sulfur (col. 3, lines 48-58; col. 6, lines 47-51). The requirement in claim 4 that a scavenger element is reacted with free sulfur to reduce the free sulfur content to 1 ppm, the requirement in claim 5 that the scavenger is yttrium, hafnium or zirconium, and the requirement in claim 6 that the substrate is processed to reduce the free sulfur content to less than about 1 ppm, would have been fairly suggested to one of ordinary skill in the art by Moroishi's teaching that Ca, Mg, rare earth or Y can be added to form stable sulfur compounds from free sulfur, thereby eliminating the undesirable effects of free sulfur (col. 3, lines 16-66; col. 6, lines 47-55).

For the above reasons we conclude, based upon the preponderance of the evidence, that the invention recited in appellants' claims 1, 3-6, 14 and 16 would have been obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103. Accordingly, we affirm the rejection over Moroishi in view of McGill of these claims and claims 9-13, 15, 18 and 20 which each stand or fall with one of independent claims 1, 14 and 16 (brief, page 10).

Claims 2, 17 and 19 require that the substrate is a nickel-based superalloy. McGill's substrate can be such a superalloy (col. 2, lines 37-39). However, Moroishi teaches that it is austenitic steels whose oxidation resistance is improved by low sulfur content (col. 2, lines 29-33). The examiner does not explain why the applied references would have led one of ordinary skill in the art to apply Moroishi's teaching to nickel-based superalloys. Claim 8 requires that the substrate is contacted with a hydrogen-containing gas at elevated temperatures. The examiner has not explained where the applied references disclose this step or why they would have fairly suggested it to one of ordinary skill in the art. We therefore reverse the rejection over Moroishi in view of McGill of claims 2, 7, 8, 17 and 19.

DECISION

The rejection of claims 1-20 under 35 U.S.C. § 103 over Osozawa in view of McGill is reversed. The rejection under 35 U.S.C. § 103 over Moroishi in view of McGill of claims 1, 3-6, 9-16, 18 and 20 is affirmed and of claims 2, 7, 8, 17 and 19 is reversed.

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

AFFIRMED-IN-PART

CHARLES F. WARREN Administrative Patent Judge	)	
TERRY J. OWENS Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JEFFREY T. SMITH Administrative Patent Judge	)	

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