The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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. 11

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DANIEL EYLON
and STEPHEN W. SCHWENKER

Appeal No. 1997-3260
Application 08/506,153

ON BRIEF

Before JOHN D. SMITH, WARREN and OWENS, *Administrative Patent Judges.*

OWENS, *Administrative Patent Judge.*

DECISION ON APPEAL

This is an appeal from the examiner's refusal to allow claims 9-12 which were added after final rejection. These are all of the claims remaining in the application.

THE INVENTION

Appellants' claimed invention is directed toward a method

for making a high temperature oxidation resistant metal matrix composite, wherein an alloy/fiber preform is used which has a graduated fiber density such that the density is lower near what will become the surface of the composite exposed to high temperature, oxidizing conditions, and higher toward the interior of the composite. A use for the composite is in aerospace applications (specification, page 1). Claim 9 is illustrative and reads as follows:

> 9. A method to produce high temperature oxidation resistant metal matrix composites which comprises the steps of (a) laying up an alloy/fiber preform consisting of a plurality of alternating layers of metal alloy and fibers and (b) consolidating the preform by heating the alloy-fiber preform to a temperature below the beta-transus temperature of the alloy while applying a pressure of at least 10 Ksi for a time sufficient to effect consolidation, wherein the layers of fibers in the preform are graduated so that fiber density is lower nearer what will become the surface of the composite exposed to high temperature, oxidizing conditions, and fiber density is higher toward the interior of the composite.

THE REFERENCES

Eylon et al. (Eylon ‘816)	4,733,816	Mar. 29, 1988
Froes et al. (Froes)	4,746,374	May 24, 1988
Eylon et al. (Eylon ‘432)	4,822,432	Apr. 18, 1989
Wright et al. (Wright)	4,919,594	Apr. 24, 1990
Smith, Jr. et al. (Smith ‘460)	5,104,460	Apr. 14, 1992

Smith, Jr. et al. (Smith ‘025)	5,118,025	Jun. 2, 1992
Boury et al. (Boury)	5,174,368	Dec. 29, 1992

THE REJECTIONS

Claims 9-12 stand rejected under 35 U.S.C. § 103 as being unpatentable over any one of Eylon ‘816, Eylon ‘432, Wright, Froes, Smith ‘460 or Smith ‘025, in view of Boury.

DECISION

We have carefully considered all of the arguments advanced by appellants and the examiner and agree with appellants that the aforementioned rejections are not well founded. Accordingly, we reverse these rejections.

It is undisputed that each of the primary references discloses or would have fairly suggested, to one of ordinary skill in the art, all aspects of appellants’ claimed invention except forming the layers of fibers in the preform in a graduated manner such that the fiber density is lower near what will become the surface of the composite exposed to high temperature, oxidizing conditions, and is higher toward the interior of the composite.

Boury, the secondary reference which is combined with

each of the primary references, discloses “a composite material having a reinforcement texture and a matrix, the composition of the matrix varying substantially without discontinuity along a thickness direction of the structure, from being an essentially refractory material, in the region of a front face intended to be exposed to very high temperatures, to being an essentially heat conductive material” (col. 2, lines 4-11).

The examiner argues that “each of the primary references discloses actual process steps for producing a metal matrix composite substantially the same as the steps recited in the claims on appeal” (answer, page 5). The examiner, however, has not explained where any of the primary references discloses a step for making the fiber density graduated. Nor has the examiner explained why Boury would have fairly suggested, to one of ordinary skill in the art, making such a modification to any of the primary references. Instead, the examiner has merely made an assertion to that effect (answer, page 5).

The primary references disclose techniques for

consolidating a composite preform using heat and pressure. Boury, in contrast, discloses a method wherein a fibrous preform having a graduated fiber density which is highest at the face to be exposed to high temperature is subjected to chemical vapor infiltration to form a coating of refractory material on the fibers until the pores at the level of the face to be exposed to high temperature are virtually all occupied, leaving a residual porosity which increases in the direction of the opposite face (col. 4, line 59 - col. 5, line 7). Heat conductive material such as silicon then is flowed in a molten state to terminate the densification of the

preform by occupying the residual pores (col. 5, lines 8-12).

The examiner apparently assumes that one of ordinary skill in the art, given the graduated fiber density of Boury, would have been led to modify the methods of the primary references to achieve a graduated fiber density. The examiner has the initial burden of explaining why the applied references would have provided one of ordinary skill in the art with both a motivation to make such a modification and a reasonable expectation of success in doing so, *see In re Vaeck*, 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991)*; In re O'Farrell*, 853 F.2d 894, 902, 7 USPQ2d 1673, 1680 (Fed. Cir. 1988), and has not set forth such an explanation.

Regardless, even if one of ordinary skill in the art had been led to provide in the primary references the graduated fiber density of Boury, the examiner has not established that doing so would have produced the claimed invention. Appellants' claims require that the fiber density is lower near what will become the surface of the composite exposed to high temperature, oxidizing conditions, whereas Boury's fiber density is highest at that surface. The examiner argues that

the claims do not require any surface of the composite to be exposed to high temperature,

oxidizing conditions but, rather, recite a future exposure which may take place at a later time (answer, pages 5-6). However, although appellants' claims do not recite a step of exposing a surface of the composite to high temperature, oxidizing conditions, they include a step of graduating the fiber density of the preform such that it is lower near the surface which will be exposed to high temperature, oxidizing conditions, and higher toward the interior of the composite. Thus, the claims place a capability requirement on the composite made by the method, i.e., that a surface of the composite having a relatively low fiber density compared to the interior of the composite is capable of being the surface exposed to high temperature, oxidizing conditions. The examiner has not established that the methods of the primary references modified by Boury as proposed by the examiner could make a composite which is capable of being used in this manner. Boury teaches that the fibrous preforms are made such that they have a shape which corresponds substantially to that of the structure being manufactured (col. 2, lines 34-30), and the disclosed manufactured structures are "combustion chamber walls of combined jet and rocket engines, . . . parts of

aerodynamic structures of hypersonic space planes, especially the nose tip, leading surfaces of wings and air intake fairings" (col. 1, lines 13-17). The examiner has not explained why, if a composite is shaped so that the surface to be exposed to high temperature, oxidizing conditions is the surface having a higher fiber density, the surface having the lower fiber density also would have a shape such that it could be the surface exposed to the high temperature, oxidizing conditions.

For the above reasons, we conclude that the examiner has not carried the burden of establishing a *prima facie* case of obviousness of the invention recited in any of appellants' claims.

DECISION

The rejections of claims 9-12 under 35 U.S.C. § 103 over any one of Eylon ‘816, Eylon ‘432, Wright, Froes, Smith ‘460 or Smith ‘025, in view of Boury, are reversed.

REVERSED

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

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