Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte DAVID WILLIAM CRALL AND PETER JOHN LINKO III

Appeal No. 2002-2148
Application No. 09/627,143

ON BRIEF

Before COHEN, STAAB, and NASE, Administrative Patent Judges.

NASE, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1 to 19, which are all of the claims pending in this application.

We AFFIRM-IN-PART.

BACKGROUND

The appellants' invention relates to a metallic article including an integral end or tip portion subject to damage such as cracking (specification, p. 1). A copy of the claims under appeal is set forth in the appendix to the appellants' brief.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Sue et al. (Sue)	4,839,245	June 13, 1989
Mannava et al. (Mannava)	5,620,307	Apr. 15, 1997
Prevey, III	5,826,453	Oct. 27, 1998

Claims 1, 2 and 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Mannava.

Claims 3 to 7 and 9 to 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Mannava in view of Sue.

Claims 14 to 17 stand rejected under 35 U.S.C. § 103 as being unpatentable over Mannava in view of Prevey.

Claims 18 and 19 stand rejected under 35 U.S.C. § 103 as being unpatentable over Mannava in view of Prevey and Sue.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the final rejection (Paper No. 7, mailed October 29, 2001) and the answer (Paper No. 14, mailed April 23, 2002) for the examiner's complete reasoning in support of the rejections, and to the brief[1] (Paper No. 13, filed March 18, 2002) and reply brief (Paper No. 15, filed June 14, 2002) for the appellants' arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by the appellants and the examiner. As a consequence of our review, we make the determinations which follow.

[1] In our view, the appellants' statement in the brief (p. 1) that "[t]he real party in interest is the assignee of record" fails to comply with the requirement of 37 CFR § 1.192(c)(1) to identify (i.e., name) the real party in interest when the party named in the caption of the brief is not the real party in interest.

The anticipation rejection

We sustain the rejection of claims 1, 2 and 8 under 35 U.S.C. § 102(b) as being anticipated by Mannava.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. Verdegaal Bros. Inc. v. Union Oil Co., 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir.), cert. denied, 484 U.S. 827 (1987). The inquiry as to whether a reference anticipates a claim must focus on what subject matter is encompassed by the claim and what subject matter is described by the reference. As set forth by the court in Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026 (1984), it is only necessary for the claims to "'read on' something disclosed in the reference, i.e., all limitations of the claim are found in the reference, or 'fully met' by it."

Claim 1 reads as follows:

> An article made of a metallic material, the article comprising:
> a body; and,
> an end portion integral with the body;
> the end portion comprising a band of the metallic material through the entire cross section of the end portion and integral with and into the body;
> the band being under a compressive stress greater than the body.

Mannava's invention relates to gas turbine engine rotor blades and, more particularly, to blade tips having localized compressive residual stresses imparted by laser shock peening. Mannava teaches (column 1, line 59-66) that

> [t]he burrs, nicks, and tears, hereinafter referred to as the tip damage, become the source of high stress concentrations or stress risers and may severely limit the life of the blades due to High Cycle Fatigue (HCF) from vibratory stresses discussed above. It is also expensive to refurbish and/or replace compressor and turbine blades and, therefore, any means to enhance the rotor capability and, in particular, to extend aircraft engine blade life is very desirable.

Mannava then states (column 2, lines 40-49) that

> [t]he present invention provides a gas turbine engine blade having at least one laser shock peened surface along the tip of the blade and a region of deep compressive residual stresses imparted by laser shock peening (LSP) extending from the laser shock peened surface into the blade. Preferably, the blade has laser shock peened surfaces on both suction and pressure sides of the blade wherein both sides were simultaneously laser shock peened. The present invention can be used for new, used, and repaired compressor and turbine blades.

Figure 2 of Mannava illustrate a compressor blade having an airfoil 34 extending radially outward from a blade platform 36 to a blade tip 38. The compressor blade includes a root section 40 extending radially inward from the platform 36 to a radially inward end 37 of the root section 40. At the radially inward end 37 of the root section 40 is a blade root 42 which is connected to the platform 36 by a blade shank 44. A chord C of the airfoil 34 is the line between the leading edge LE and trailing edge TE at each cross section of the blade as illustrated in Figure 4. The airfoil 34 extends in the

chordwise direction between a leading edge LE and a trailing edge TE of the airfoil. A pressure side 46 of the airfoil 34 faces in the general direction of rotation and a suction side 48 is on the other side of the airfoil and a mean-line ML (see Figure 4) is generally disposed midway between the two faces in the chordwise direction.

The compressor blade has a tip section 50 that extends along the tip 38 of the airfoil 34 from the leading LE to the trailing edge TE. The airfoil 34 is subject to vibrations generated during engine operation and the tip damage 52 operate as high cycle fatigue stress risers producing additional stress concentrations around them. Mannava teaches (column 4, lines 40-52) that

> [t]his stress may be due to excitations of the blade in chordwise bending modes commonly referred to as "stripe modes". The dominant failure mode at the blade tip 38 may not always be the maximum stress mode but rather a lower stress mode or combination of modes that exist for longer durations over the engine's mission. By way of example, the predetermined nodal line 59 at the blade tip 38 illustrated in FIG. 2 corresponds to excitation at N PR (Per Rev or Per Revolution) of the engine's rotor where N corresponds to the number of compressor vanes 8A in front of or behind the blade. The tip damage 52 located in this area of the blade tip 38 has the greatest potential for failing the blade under these excitations.

The tip section 50 includes a predetermined first width W1 such that the tip section 50 encompasses any burrs 52 that may occur along the tip 38 of the airfoil 34.

To counter fatigue failure of portions of the blade along possible crack lines that can develop and emanate from the burrs along the blade tip 38 at least one and

preferably both of the pressure side 46 and the suction side 48 have a laser shock peened surface 54 and a pre-stressed region 56 having deep compressive residual stresses imparted by laser shock peening (LSP) extending into the airfoil 34 from the laser shock peened surface in the tip section 50 along the blade tip 38 as seen in Figure 2. Preferably, the pre-stressed regions 56 are coextensive with the blade tip 38 in the chordwise direction to the full extent of width W1 and are deep enough into the airfoil 34 to coalesce for at least a part of the width W1. The laser beam shock induced deep compressive residual stresses in the compressive pre-stressed regions 56 are generally about 50-150 KPSI (Kilo Pounds per Square Inch) extending from the laser shock surfaces 54 to a depth of about 20-50 mils into laser shock induced compressive residually pre-stressed regions 56.

The appellants argue (brief, pp. 5-7) that the subject matter of claims 1, 2 and 8 is not met by Mannava since Mannava does not teach a band under a compressive stress greater than the body through the entire cross section of the band. The examiner responded to this argument (answer, p. 4) by asserting that the claims do not recite the entire cross section of the band being under a compressive stress greater than the body. In the examiner's view, the claims recite only that a compressive stress greater than the body is in the band. The appellants strongly disagreed (reply brief, pp. 1-2) with the examiner's interpretation of the claimed subject matter. Specifically, the

appellants state that the invention is based on the provision of a band of material through the entire cross section of the band is under a compressive stress greater than that of the body. In support thereof, the appellants cite to (1) page 2, lines 10-13, which provides that the band is under a compressive stress greater than the body; and (2) page 3, lines 20-26, which provides that the "band is under a compressive stress substantially through the entire band, rather than just in a surface layer or region, in an amount greater than that of the body."

The United States Patent and Trademark Office (USPTO) applies to the verbiage of the claims before it the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the appellants' specification. In re Morris, 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997). See also In re Sneed, 710 F.2d 1544, 1548, 218 USPQ 385, 388 (Fed. Cir. 1983). Moreover, limitations are not to be read into the claims from the specification. In re Van Geuns, 988 F.2d 1181, 1184, 26 USPQ2d 1057, 1059 (Fed. Cir. 1993) citing In re Zletz, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

In our view, the examiner is correct that the broadest reasonable meaning of the claimed limitations in dispute (i.e., a band of the metallic material through the entire cross section of the end portion and integral with and into the body; the band being under a compressive stress greater than the body) without reading limitations from the specification into the claims is that the claims recite only that a compressive stress greater than the body is in the band. Thus, we disagree with the appellants that the claims recite that the band of material through the entire cross section of the band is under a compressive stress greater than that of the body. If the appellants desired that claims 1, 2 and 8 to be so restricted, the appellants could have amended those claims.[2]

For the reasons set forth above, the decision of the examiner to reject claims 1, 2 and 8 under 35 U.S.C. § 102(b) is affirmed.

The obviousness rejection of claims 3 to 7 and 9 to 13

We sustain the rejection of claims 3 to 7 and 9 to 13 under 35 U.S.C. § 103 as being unpatentable over Mannava in view of Sue.

In this rejection, the examiner (final rejection, pp. 4-5) determined that

[2] Claim 14, treated infra, recites that roller deformation is performed on the end portion to the depth into the end portion until the compressive stress is provided through the entire cross section of the end portion. Thus, claim 14 is limited to the material through the entire cross section of the band being under a compressive stress greater than that of the body.

(1) Mannava disclosed all the claimed subject matter except for the alloy composition of the metallic material; and (2) it would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify the blade of Mannava based on the teachings of Sue to be an alloy based on at least one element selected from the group consisting of Ti, Fe, Ni, and Co.

In the brief (pp. 7-8), the appellants do not contest the examiner's combination of Mannava and Sue. The appellants do argue that certain limitations are not taught by Mannava (i.e., the band extends radially into the airfoil to a depth selected from operational experience to resist operational damage as recited in claims 3 and 9; the band extends radially into the airfoil to a depth less than a location at which an excessive, detrimental amount of residual tensile stress in the airfoil is required to balance the compressive stress in the band, as measured by at least one tested vibratory response mode unique to the airfoil as recited in claims 4 and 10; and the location is greater than about 10% of a span length of the airfoil as recited in claims 5 and 11).

In the answer (pp. 5-6), the examiner explained how the above-identified limitations of claims 3 to 5 and 9 to 11 are found and disclosed in Mannava. The appellants did not challenge the examiner's explanation of how the above-identified limitations of claims 3 to 5 and 9 to 11 are readable on Mannava in the reply brief.

In our opinion, the examiner's uncontested explanation as to how the above-identified limitations of claims 3 to 5 and 9 to 11 are readable on Mannava is correct. Accordingly, the decision of the examiner to reject claims 3 to 7 and 9 to 13 under 35 U.S.C. § 103 is affirmed.

The obviousness rejection of claims 14 to 19

We will not sustain either the rejection of claims 14 to 17 under 35 U.S.C. § 103 as being unpatentable over Mannava in view of Prevey or the rejection of claims 18 and 19 under 35 U.S.C. § 103 as being unpatentable over Mannava in view of Prevey and Sue.

Claim 14 reads as follows:

> In a method of making the article of claim 1, the steps of:
> selecting a depth of the band into the end portion; and then,
> performing roller deformation on the end portion to the depth into the end portion until the compressive stress is provided through the entire cross section of the end portion.

Claim 14, unlike claim 1, is clearly limited to the material through the entire cross section of the band being under a compressive stress greater than that of the body. However, Mannava does not teach or suggest this limitation for the reasons set forth by

the appellants in the briefs. Moreover, this limitation is not suggested by the other applied prior art (i.e., Sue and Prevey).

Since all the limitations of claim 14, and claims 15 to 19 dependent thereon, are not taught or suggested by the applied prior art for the reasons set forth above, the decision of the examiner to reject claims 14 to 19 under 35 U.S.C. § 103 is reversed.

CONCLUSION

To summarize, the decision of the examiner to reject claims 1, 2 and 8 under 35 U.S.C. § 102(b) is affirmed; the decision of the examiner to reject claims 3 to 7 and 9 to 13 under 35 U.S.C. § 103 is affirmed; and the decision of the examiner to reject claims 14 to 19 under 35 U.S.C. § 103 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

IRWIN CHARLES COHEN Administrative Patent Judge	)
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