

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GENERAL ELECTRIC COMPANY,
Petitioner,

v.

UNITED TECHNOLOGIES CORPORATION,
Patent Owner.

Case IPR2016-00862
Patent 8,689,568 B2

Before HYUN J. JUNG, SCOTT A. DANIELS, and
GEORGE R. HOSKINS, *Administrative Patent Judges*.

HOSKINS, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

General Electric Company (“Petitioner”) filed a Petition (Paper 1, “Pet.”) pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–21 of U.S. Patent No. 8,689,568 B2 (“the ’568 patent”). United Technologies Corporation (“Patent Owner”) filed a Preliminary Response (Paper 6). On September 29, 2016, we instituted review of claims 1–11 and 13–21, but not of claim 12 (Paper 8, “Inst. Dec.”).

During the trial, Patent Owner timely filed a Response (Paper 14, “PO Resp.”). Petitioner timely filed a Reply (Paper 17, “Pet. Reply”). An oral hearing was held on July 24, 2017, and a copy of the transcript was entered into the record (Paper 22, “Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of the claims for which trial proceeded. Based on the record before us, Petitioner has shown, by a preponderance of the evidence, that claims 1–11 and 13–21 of the ’568 patent are unpatentable.

II. BACKGROUND

A. *Related Proceedings*

Neither party has identified any other judicial or administrative matter that would affect, or be affected by, a decision in this proceeding. Pet. 1; Paper 5, 1; 37 C.F.R. § 42.8(b)(2).

B. *The ’568 Patent*

The ’568 patent is directed to “cooling techniques for airfoils and other gas turbine engine components exposed to hot working fluid flow.” Ex. 1001, 1:20–27. Figures 4 and 5 of the ’568 patent are reproduced below:

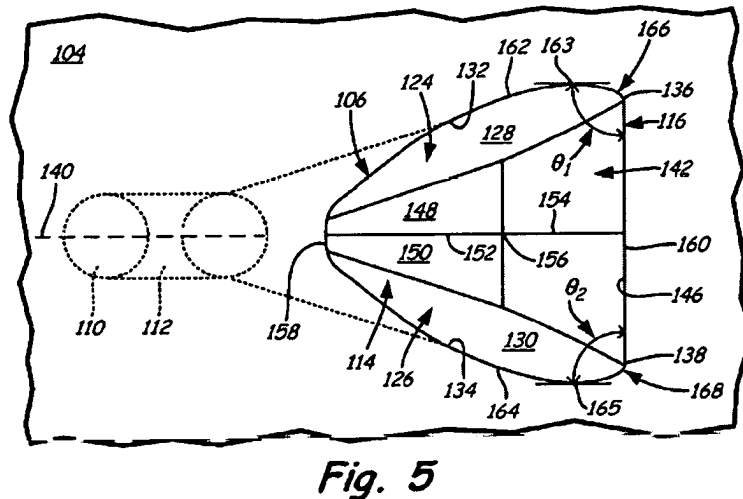
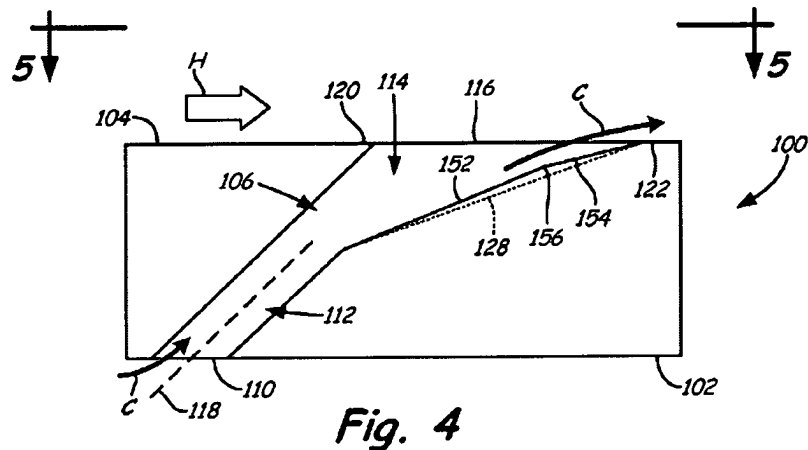


Figure 4 is a sectional view of cooling hole 106 in wall 100, and Figure 5 is a view of the same hole taken along line 5-5 in Figure 4, looking down at surface 104 of wall 100. *Id.* at 3:52–55, 6:16–18, 6:53–57. Cooling air C enters cooling hole 106 at inlet 110 in first surface 102, passes through metering section 112 of hole 106, then enters diffusing section 114 of hole 106, and exits at outlet 116 along second surface 104. *Id.* at 6:57–63. Metering section 112 “controls (meters) the flow of air through cooling hole 106.” *Id.* at 6:64–66. The ’568 patent claims focus on a cooling hole’s diffusing section and outlet.

“As shown best in FIG. 5, diffusing section 114 includes two channel-like lobes 124 and 126.” *Id.* at 7:38–39. “Lobes 124 and 126 are surfaces of wall 100 which define the void of cooling hole 106 at diffusing section 114.” *Id.* at 7:43–44. First lobe 124 has bottom surface 128 and side wall 132 to direct cooling air C through the lobe, toward trailing edge 136 of first lobe 124. *Id.* at 7:45–61. Second lobe 126 similarly has bottom surface 130, side wall 134, and trailing edge 138. *Id.* Lobes 124 and 126 are separated by inclined portions 148 and 150 at an upstream end, and interlobe region 142 at a downstream end. *Id.* at 7:62–8:27. Ridge 152 between inclined portions 148 and 150 “aids in separating and directing the flow of cooling air C into first lobe 124 and second lobe 126.” *Id.* at 8:28–34.

Outlet 116 includes upstream end 158 and downstream end 160, with first lateral edge 162 and second lateral edge 164 extending between the two ends. *Id.* at 9:5–17. As first lateral edge 162 extends downstream from upstream end 158, the edge “laterally diverges away from centerline axis 140” until it reaches stationary point 163, at which point edge 162 begins to “converge[] towards centerline axis 140.” *Id.* at 9:19–25. Second edge 164 is configured similarly. *Id.* at 9:25–32. To lessen “the adverse effects of [thermo-mechanical fatigue] due to [the] geometry at outlet 116” having “sharp corners” at each end of a “V-shaped” trailing edge in prior art cooling holes, “downstream end 160 is straight and extends between trailing edge 136 of first lobe 124 and trailing edge 138 of second lobe 126, forming a straight trailing edge at outlet 116.” *Id.* at 9:33–10:11.

C. Illustrative Claim

Trial was instituted as to independent claims 1 and 14, and their respective dependent claims. Claim 1 is illustrative:

1. A gas turbine engine component comprising:
 - a wall having first and second opposing surfaces and defining a cooling hole, the cooling hole extending through the wall from an inlet located at the first wall surface to an outlet located at the second wall surface and having:
 - a metering section extending downstream from the inlet;
 - and
 - a diffusing section extending from the metering section to the outlet and comprising:
 - a first lobe diverging longitudinally and laterally from the metering section and having a trailing edge;
 - a second lobe diverging longitudinally and laterally from the metering section and having a trailing edge;
 - an upstream end located at the outlet;
 - a downstream end generally opposite the upstream end and located at the outlet, wherein the downstream end extends in a straight and lateral direction from an end of the first lobe to an end of the second lobe, and wherein the downstream end is at least axially coextensive with the trailing edges of the first and second lobes;
 - a first sidewall having a first edge extending along the outlet between the upstream end and the downstream end trailing edge, the first edge diverging laterally from the upstream end and converging laterally before reaching the downstream end; and
 - a second sidewall having a second edge extending along the outlet between the upstream end and the downstream end generally opposite the first sidewall, the second edge diverging laterally from the upstream end and converging laterally before reaching the downstream end.

Ex. 1001, 13:43–14:8.

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