

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GENERAL ELECTRIC COMPANY,
Petitioner,

v.

UNITED TECHNOLOGIES CORPORATION,
Patent Owner.

Case IPR2016-00952
Patent 9,121,412 B2

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

JUNG, *Administrative Patent Judge*.

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.”), requesting institution of an *inter partes* review of claims 1–5 and 7–11 of U.S. Patent No. 9,121,412 B2 (Ex. 1001, “the ’412 patent”). United Technologies Corporation (“Patent Owner”) timely filed a Preliminary Response (Paper 7, “Prelim. Resp.”) and a Disclaimer in Patent Under 37 C.F.R. § 1.321(a) (Ex. 2008) that disclaimed claims 9 and 10. Upon considering these submissions, we instituted *inter partes* review of claims 1, 2, 4, 5, 7, 8, and 11 of the ’412 patent. Paper 9 (“Dec. on Inst.”).

After institution, Patent Owner filed a Response (Paper 15, “PO Resp.”), to which Petitioner filed a Reply (Paper 21, “Pet. Reply”). Petitioner proffered a Declaration of Reza Abhari, Ph.D. (Ex. 1003, “Abhari Declaration” or “Abhari Decl.”) with its Petition and a Reply Declaration of Dr. Abhari (Ex. 1034, “Abhari Reply Decl.”). Patent Owner proffered a Declaration of Dr. K. Mathioudakis (Ex. 2015, “Mathioudakis Declaration” or “Mathioudakis Decl.”). Also, deposition transcripts were filed for Dr. Abhari (Ex. 2013) and Dr. Mathioudakis (Ex. 1031).

An oral hearing in this proceeding was held on July 24, 2017; a transcript of the hearing is included in the record (Paper 35, “Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claim 11 of the ’412 patent is unpatentable. We further determine that Petitioner has not shown by a preponderance of the evidence that claims 1, 2, 4, 5, 7, and 8 of the ’412 patent are unpatentable.

A. Grounds of Unpatentability at Issue

We instituted *inter partes* review on the grounds that

(1) claims 1, 2, 4, 5, 7, and 8, under 35 U.S.C. § 102(b), are anticipated by Davies¹;

(2) claims 1, 2, 4, 5, 7, 8, and 11, under 35 U.S.C. § 103, are unpatentable over Davies in view of the knowledge of one of ordinary skill in the art; and

(3) claim 5, under 35 U.S.C. § 103, is unpatentable over Davies in view of Middleton². Dec. on Inst. 14, 15, 18, 20, 24.

B. Related Proceedings

The parties indicate that there are no related proceedings involving the '412 patent. Pet. 1; Paper 5, 1.

C. The '412 Patent (Ex. 1001)

The '412 patent relates to “an engine having a geared turbo fan architecture that is designed to efficiently operate with a high bypass ratio and a low pressure ratio.” Ex. 1001, 1:14–17. Figure 1 of the '412 patent is reproduced below.

¹ D. G. M. Davies and D. C. Miller, *A Variable Pitch Fan for an Ultra Quiet Demonstrator Engine*, Proc. 1976 Spring Convention Seeds for Success in Civil Aircraft Design in the Next Two Decades (1976) (Ex. 1005).

² Peter Middleton, *614: VFW's Jet Feederliner*, 100 Flight International 725 (1971) (Ex. 1006).

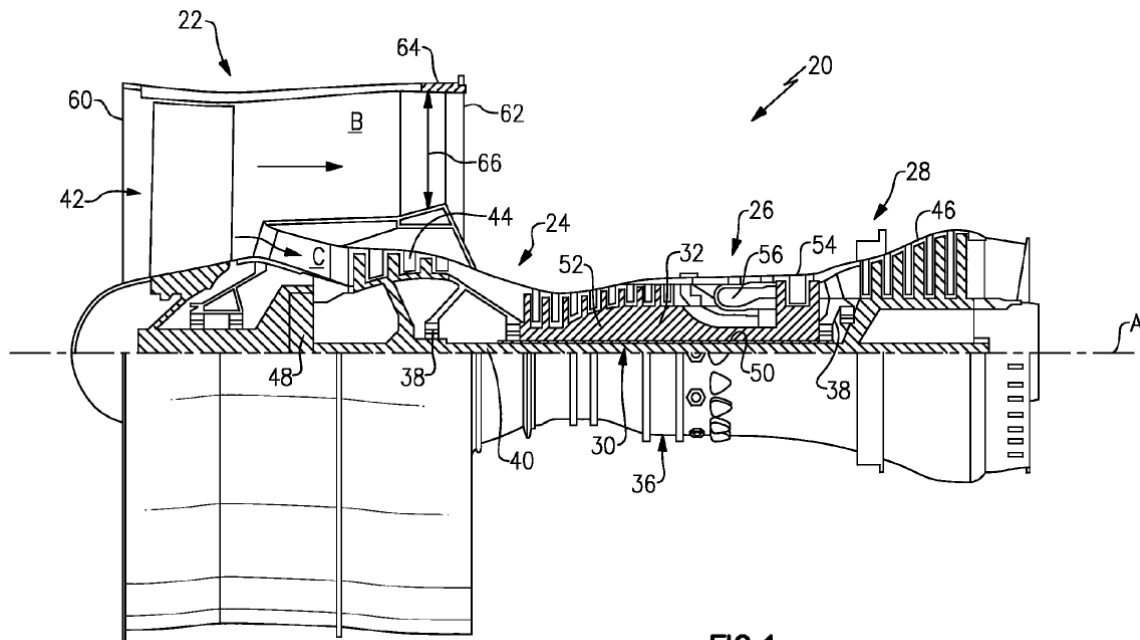


FIG. 1

Figure 1 is a schematic cross-section of a gas turbine engine. *Id.* at 2:4. Gas turbine engine 20 includes fan section 22, compressor section 24, combustor section 26, and turbine section 28. *Id.* at 2:11–14. Fan section 22 drives air along bypass flow passage B, and compressor section 24 drives air along core flow passage C. *Id.* at 2:18–21. Low speed spool 30 includes inner shaft 40 that is coupled to propulsor 42, low pressure compressor 44, and low pressure turbine 46. *Id.* at 2:28–30. Low pressure turbine 46 drives propulsor 42 through gear assembly 48, which allows low speed spool 30 to drive propulsor 42 at a different speed. *Id.* at 2:31–34.

Gas turbine engine 20 defines a design pressure ratio with regard to an inlet pressure at inlet 60 and an outlet pressure at outlet 62 of the bypass flow passage B. *Id.* at 2:51–55. The design pressure ratio can be between 1.1 and 1.35. *Id.* at 3:28–30.

Figure 2 of the '412 patent is reproduced below.

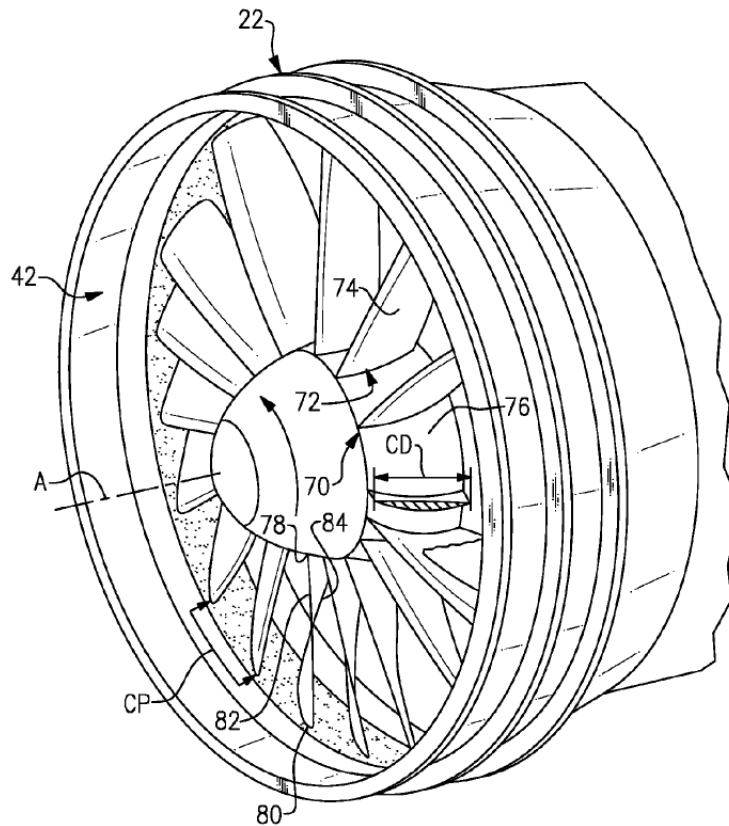


FIG. 2

Figure 2 is a perspective view of a fan section. *Id.* at 2:5–6. Propulsor 42 includes rotor 70 having row 72 of blades 74 that extend from hub 76. *Id.* at 2:66–3:2. Blades 74 have root 78, tip 80, leading edge 82, and trailing edge 84. *Id.* at 3:2–5. In the embodiment of Figure 2, the number (“N”) of blades 74 is 10–16. *Id.* at 3:16–21.

Also, a chord dimension (“CD”) is the length between leading edge 82 and trailing edge 84 at tip 80 (*id.* at 3:5–7), and a circumferential pitch (“CP”) is equivalent to the arc distance between tips 80 of neighboring blades 74 (*id.* at 3:7–10). According to the ’412 patent, a “solidity value is defined as a ratio (R) of CD/CP (i.e., CD divided by CP).” *Id.* at 3:22–25. The solidity value can be between 0.6 and 1.1. *Id.* at 3:25–26. Propulsor 42

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