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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JAYANT SABNIS

Appeal 2015-000869
Application 13/871,221
Technology Center 3700

Before EDWARD A. BROWN, WILLIAM A. CAPP, and GEORGE R. HOSKINS, *Administrative Patent Judges*.

CAPP, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant seeks our review under 35 U.S.C. § 134 of the final rejection of claims 1–30 as unpatentable under 35 U.S.C. § 103(a) over Smith (US 2009/0097967 Al, pub. Apr. 16, 2009).[1,2] We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

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[1] The heading of the rejection in the Final Office Action lists only claims 1–24. Final Action 4. However, the statement of the rejection also addresses claims 25–30. *Id.* at 9–14. Accordingly, we understand that the rejection covers claims 1–30.

[2] A non-statutory double patenting rejection of claims 1–29 is included in the Final Office Action. Final Action 2–3. As indicated in the Terminal Disclaimer Review Decision dated March 12, 2014, the Terminal Disclaimer filed February 14, 2014 has been approved.

THE INVENTION

Appellant's invention relates to turbofan engines. Spec. ¶ 2. Claim 1, reproduced below with the language at issue highlighted, is illustrative of the subject matter on appeal.

> 1. A turbofan engine comprising:
>
> a gas generator section for generating a gas stream flow with higher energy per unit mass flow than that contained in ambient air;
>
> a power turbine converting the gas stream flow into shaft power, the power turbine rotating at a first rotational speed;
>
> a speed reduction device driven by the power turbine; and
>
> a propulsor section including a fan driven by the power turbine through the speed reduction device at a second speed lower than the first speed for generating propulsive thrust as a mass flow rate of air through a bypass flow path,
>
> *wherein the fan includes a tip diameter greater than about fifty (50) inches and an Engine Unit Thrust Parameter ("EUTP") defined as net engine thrust divided by a product of the mass flow rate of air through the bypass flow path, a tip diameter of the fan and the first rotational speed of the power turbine is less than about 0.30 at a take-off condition.*

OPINION

Unpatentability of Claims 1–30 over Smith

Claim 1

The Examiner finds that Smith discloses all of the elements of claim 1 except for an Engine Unit Thrust Parameter ("EUTP") that is less than about 0.30 at a take-off condition. Final Action 4–5. In particular, the Examiner finds that Smith teaches the same structure as that of the instant application, and further teaches that thrust is a function of density, velocity, and area and that one or more of those parameters can be manipulated to vary the amount and direction of the thrust provided. *Id.* at 5. The Examiner concludes that a

person of ordinary skill in the art would have been able to vary any of the parameters of the EUTP, such as the thrust of the engine, the mass flow rate of the air through the bypass flow path, a tip diameter of the fan, and the rotational speed of the power turbine, to achieve the claimed invention. *Id.* The Examiner relies on the principles enunciated in *In re Aller*, 220 F.2d 454, 456 (CCPA 1955) and MPEP § 2144.05 II.A., for the proposition that it would have only taken ordinary skill to adjust the values of engine operation to achieve the claimed engine thrust parameter value.

Appellant traverses the Examiner's rejection by arguing that Smith fails to recognize EUTP as a result effective variable. Appeal Br. 5. In particular, Appellant relies on *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977) as placing an initial burden on the Examiner to show that a parameter to be optimized is a result-effective variable. *Id.* at 6.

In response, the Examiner states that all of the claimed parameters were known at the time of the invention. Ans. 2. The Examiner relies on principles of inherency to establish the relationship between EUTP and the various engine parameters used to calculated ETUP. *Id.*[3] Therefore, according to the Examiner, if the desired EUTP value is the optimum number, the optimization of the parameters would have led to an optimized EUTP. *Id.*

Discovering the optimum value of a result effective variable is generally considered to be within the ambit of ordinary skill. *See In re*

[3] EUTP is defined as net engine thrust divided by a product of the mass flow rate of air through the bypass flow path, a tip diameter of the fan and the first rotational speed of the power turbine. Claims App. Claim 1; *see also* Spec. ¶¶ 4, 59–62.

Boesch, 617 F.2d 272, 276 (CCPA 1980). Thus, "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 (1955). The mere fact that multiple result-effective variables are combined does not necessarily render their combination beyond the capability of a person having ordinary skill in the art. *See In re Applied Materials, Inc.*, 692 F.3d 1289, 1298 (Fed. Cir. 2012). However, this rule is limited to cases in which the optimized variable is previously recognized as a result-effective variable. *See Antonie,* 559 F.2d at 620.

Appellant's Specification explains that the overall efficiency of a turbofan engine is a combination of how well the gas generator section (62), the power turbine section (76), and the propulsor section (64) convert input energy into the desired output. Spec. ¶ 58, Fig. 2. The Specification further explains that the thrust generation efficiency of the engine is related to a ratio of the net thrust of the engine divided by the product of: (1) mass flow rate of air through the fan by-pass section, (2) the fan tip diameter; and (3) the rotational speed of the power turbine section. *Id.* ¶ 59. The Specification defines this relationship as Engine Unit Thrust Parameter ("EUTP") using the following formula:

$$EUTP = \frac{Net\ Thrust\ of\ the\ Engine}{[(mass\ flow\ rate\ of\ air\ through\ fan\ bypass)\ (Fan\ Tip\ Diameter)\ (speed\ of\ the\ power\ turbine)]}$$

Id. ¶ 61.

Smith is directed to a gas turbine engine with a variable geometry fan exit guide vane system. Smith, Abstract. The passage of Smith relied on by the Examiner as disclosing parameters that can be optimized to achieve the claimed EUTP value states:

> Thrust is a function of density, velocity, and area. One or more of these parameters can be manipulated to vary the amount and direction of thrust provided by the bypass flow B. A significant amount of thrust is provided by the bypass flow B due to the high bypass ratio. The fan section 20 of the engine 10 is nominally designed for a particular flight condition-typically cruise at 0.8M and 35,000 feet.

Smith ¶ 25; *see also* Final Action 5. The recited passage of Smith relates to varying the parameters of density, velocity, and area to affect the thrust or output of an engine.

Appellant's performance parameter, EUTP, relates to the efficiency, not just the output, of an engine. "Net Thrust of the Engine" is merely the numerator of the EUTP ratio; that is, only one quantity of the equation. The EUTP ratio is concerned with the Net Thrust of the Engine in relation to the product of three other quantities, namely: (1) mass flow rate of air through the fan by-pass section; (2) the fan tip diameter; and (3) the rotational speed of the power turbine section is in claim 1. Spec. ¶¶ 58–62.

Generally, a recognition in the prior art that a property is affected by the variable is sufficient to find the variable result-effective. *Applied Materials*, 692 F.3d at 1297. However, the dispute between the Examiner and the Appellant, in the instant case, is not so much on whether certain variables are "result-effective" as it is about which "result" is being affected by the variables. The Examiner focuses on engine thrust as a result that is affected by variables, such as density. Final Action 5. However, EUTP is a parameter that relates to engine *efficiency*, not engine *output*. The Examiner fails to supply evidence that establishes a relationship between engine efficiency (EUTP) and the combination of the four variables recited in

claim 1, in the specific claimed ratio relationship, that make up Appellant's EUTP equation.

In view of the foregoing, we do not sustain the Examiner's unpatentability rejection of claim 1.

Claims 11 and 20

Claims 11 and 20 are independent claims. Claims App. As with claim 1, each of claims 11 and 20 contain a limitation directed to a value for an Engine Unit Thrust Parameter defined as in claim 1. *Id.* The Examiner's rejection of these claims suffers from the same infirmity that was identified above with respect to claim 1. Thus, for essentially the same reason expressed above in connection with claim 1, we do not sustain the rejection of claims 11 and 20.

Claims 2–10, 12–19, and 21–30

Claims 2–10, 12–19, and 21–30 depend, respectively, from ether claim 1, 11, or 20. Claims App. As such, the Examiner's rejection of these claims suffers from the same infirmity that was identified above with respect to claims 1, 11, and 20. Thus, for essentially the same reason expressed above in connection with claims 1, 11, and 20, we do not sustain the rejection of claims 2–10, 12–19, and 21–30.

DECISION

The decision of the Examiner to reject claims 1–30 is reversed.

REVERSED