UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/090,805	04/05/2016	Carsten SCHOENHOFF	6570-P50293	1076

13897 7590 07/02/2020

Abel Schillinger, LLP
5929 Balcones Drive
Suite 300
Austin, TX 78731

EXAMINER	
KANG, EDWIN G	

ART UNIT	PAPER NUMBER
3741	

NOTIFICATION DATE	DELIVERY MODE
07/02/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

hmuensterer@abel-ip.com
mail@Abel-IP.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte CARSTEN SCHOENHOFF, RUDOLF STANKA, ERICH STEINHARDT, CLAUS RIEGLER, STEPHEN ROYSTON WILLIAMS, HANS-PETER HACKENBERG, ECKART HENRICH, STEFAN WEBER, KLAUS PETER RUED, HERMANN KLINGELS, PATRICK WACKERS, CHRISTOPH BICHLMAIER, STEFAN BUSAM, MATTHIAS KROBOTH, and NORBERT HUEBNER

Appeal 2019-006583
Application 15/090,805
Technology Center 3700

Before EDWARD A. BROWN, MICHAEL L HOELTER, and JAMES A. WORTH, *Administrative Patent Judges*.

BROWN, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant[1] seeks review under 35 U.S.C. § 134(a) of the Examiner's decision rejecting claims 1–20. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

---

[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as MTU Aero Engines AG. Appeal Br. 3.

CLAIMED SUBJECT MATTER

Claims 1, 17, and 18 are independent claims. Claim 1 illustrates the claimed subject matter.

> 1. A turbofan aircraft engine, wherein the turbofan aircraft engine comprises:
>
> a primary duct including a combustion chamber;
>
> a first turbine disposed downstream of the combustion chamber;
>
> a compressor disposed upstream of the combustion chamber and coupled to the first turbine; and
>
> a second turbine disposed downstream of the first turbine and coupled to a fan for feeding a secondary duct of the turbofan aircraft engine, a bypass ratio of an inlet area of the secondary duct to an inlet area of the primary duct being at least 7; and
>
> wherein the second turbine comprises at least a first stage and a last stage, and the second turbine has a length 1, a quotient r/l of a mean outer radius r of the last stage divided by the length l being at least 1.4.

Appeal Br. 21 (Claims App.).

REJECTIONS ON APPEAL

Claim 17 is rejected under 35 U.S.C. § 112(b) as being indefinite. Ans. 41; Final Act. 7.[2]

Claims 1–20 are rejected under 35 U.S.C. § 112(a) as failing to comply with the enablement requirement. Final Act. 7.

Claims 1–20 are rejected under 35 U.S.C. § 112(a) as failing to comply with the written description requirement. Final Act. 3.

[2] The rejection of claims 1–16 and 18–20 under this ground has been withdrawn. Ans. 41; Final Act. 7.

Claims 1–20 are rejected under 35 U.S.C. § 103 as unpatentable over Pratt and Whitney, "PW 1100G-JM Secondary Airflow and Lubrication Systems," Aug. 2014 (hereinafter, "Pratt and Whitney") and NASA, "Analysis of Turbofan Propulsion System Weight and Dimensions," Jan. 1977 (hereinafter, "NASA"). Final Act. 26.

ANALYSIS

Claim 17 – Indefiniteness

We understand that the Examiner has withdrawn the rejection of claims 1, 17, 18 under 35 U.S.C. § 112(b) based on the recited limitation "mean radius." Ans. 41; Final Act. 21–23. However, the Examiner does not indicate that the rejection of claim 17 based on a lack of antecedent basis for the limitation "the length" has been withdrawn. *Id.* Appellant states that "the length" should be "a length" to provide antecedent basis. Reply Br. 2. Despite the lack of antecedent basis, however, we agree with Appellant that the meaning of "the length" is sufficiently clear. *Id. See Energizer Holdings, Inc. v. Int'l Trade Comm'n*, 435 F.3d 1366, 1370–71 (Fed. Cir. 2006). Thus, we do not sustain the rejection of claim 17 under 35 U.S.C. § 112(b) as being indefinite.

Claims 1–20 – Enablement

To comply with the enablement requirement of 35 U.S.C. § 112(a), the as-filed disclosure must be sufficiently complete to enable a person of ordinary skill in the art at the time of the invention to make and use the claimed invention without undue experimentation. *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988). Factors to be considered by the PTO in

determining whether a disclosure would require undue experimentation include multiple factors set forth in *Wands.*[3] *See* MPEP § 2164.01(a). When rejecting a claim for lack of enablement, the PTO has the initial burden to provide "a reasonable explanation" of why it believes the specification is not enabling. *In re Wright*, 999 F.2d 1557, 1561–62 (Fed. Cir. 1993). If the PTO meets its initial burden, the burden then shifts to Appellant to show that one of ordinary skill in the art could have practiced the claimed invention without undue experimentation. *In re Strahilevitz*, 668 F.2d 1229, 1232 (CCPA 1982). An enablement rejection can be based on scope of enablement or on total lack of enablement for any subject matter within the scope of the claims. *In re Cortright*, 165 F.3d 1353, 1356 (Fed. Cir. 1999). The supporting disclosure must adequately apprise those skilled in the art, in light of the knowledge of those ordinary artisans, how to make and to use the claimed subject matter throughout the entire scope of the claim. *AK Steel Corp. v. Sollac*, 344 F.3d 1234, 1244 (Fed. Cir. 2003), *cert denied*, 124 S.Ct. 2390 (U.S. May 24, 2004) ("[T]he applicant's specification must enable one of ordinary skill in the art to practice the full scope of the claimed invention. [citing *Wright*, 999 F.2d at 1561].").

[3] The "Wands factors" include (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. *Id.*

Claims 1–4 and 8–17

Claim 1 recites the limitations "a bypass ratio of an inlet area of the secondary duct to an inlet area of the primary duct being at least 7" and "a quotient r/1 of a mean outer radius r of the last stage divided by the length l being at least 1.4." Appeal Br. 21 (Claims App.). As to claim 1, the Examiner finds that the disclosure does not enable a bypass ratio of 20, 30, or 40. Final Act. 8. The Examiner determines that the quantity of experimentation needed to make and use the claimed subject matter based on the disclosure would be undue based on analyzing the following *Wands* factors: the breadth of the claims, the state of the prior art, the amount of direction or guidance presented, the presence or absence of working examples, and the quantity of experimentation necessary. *Id.* at 8–10. Regarding the claimed r/1 limitation, the Examiner finds that the disclosure does not enable a quotient r/l value of 10, 100, or 1000. *Id.* at 10. The Examiner analyzes the *Wands* factors of the breadth of the claims, the amount of direction or guidance presented, and the quantity of experimentation necessary, and determines that the quantity of experimentation needed to make and use the claimed subject matter based on the disclosure would be undue. *Id.* at 10–11.

Appellant contends that because "both the bypass ratio and the quotient r/1 depend on only two parameters which can readily be varied, it is apparent to one of ordinary skill in the art how any bypass ratio and any quotient r/1 can be achieved." Appeal Br. 11. Appellant also contends that "[i]n this case not even experimentation (which would theoretically even be permissible, as long as it is not undue) is required." *Id.*

These contentions are not persuasive. The pertinent issue is not simply whether a skilled artisan would have the requisite skill to change the inlet area of a secondary duct and an inlet area of a primary duct to change the bypass ratio, and also the requisite skill to change a mean outer radius of a last stage of a second turbine and the length of the second turbine to change the quotient r/l, as claimed, in view of Appellant's disclosure. Rather, the issue is whether Appellant's disclosure provides enablement for a turbofan aircraft engine, as claimed, in which both the bypass ratio and quotient r/l have no recited upper limit.

First, Appellant does not apprise us of any error in the Examiner's analysis of the *Wands* factors for claim 1.

Second, as to enablement of open-ended limitations, we note:

> Open-ended claims are not inherently improper, as for all claims, their appropriateness depends on the particular facts of the invention, the disclosure, and the prior art. They may be supported if there is an inherent, albeit not precisely known, upper limit and the specification enables one of skill in the art to approach that limit.

See Scripps Clinic & Research Foundation v. Genentech, Inc., 927 F.2d 1565, 1572 (Fed. Cir. 1991) (citing *In re Fisher*, 427 F.2d 833 (CCPA 1970)). Appellant's disclosure does not indicate *any* numerical value of an inherent, practical upper limit of the bypass ratio or quotient r/l. In fact, the Specification describes that "[t]he length of the second turbine *also is not particularly limited*," and "[t]he mean outer radius r of the last stage of the second turbine *also is not particularly limited*." Spec. 6, ll. 14, 17–18 (emphases added). These passages appear to disclose or imply that the quotient r/l likewise "is not particularly limited."

Third, Appellant does not persuasively show that one of ordinary skill in the art would be able to make and use a turbofan aircraft engine in which the bypass ratio and the quotient r/l has its inherent upper limit, as broadly encompassed by the claim language. Accordingly, we are not persuaded by Appellant that the supporting disclosure adequately apprises those skilled in the art, in light of the knowledge of those ordinary artisans, how to make and to use the claimed subject matter throughout the entire scope of the claim. *See AK Steel Corp.*, 344 F.3d at 1244.

Thus, we sustain the rejection of claim 1, and claims 2–4 and 8–16 which depend from claim 1, and independent claim 17, which are not separately argued, under the enablement requirement of 35 U.S.C. § 112(a).

Claims 5–7

Claim 5–7 depend from claim 1 and recite the quotient r/l is "not higher than 2.1," "not higher than 2.0," and "not higher than 1.7," respectively. Appeal Br. 21–22 (Claims App.). Appellant correctly contends that "claims 5–7 provide an upper value for the quotient of r/1 and thus, a range for this quotient." *Id.* at 12. However, the Examiner again explains that these claims also recite a bypass ratio of at least 7, as recited in claim 1 and discussed above. Ans. 45. Accordingly, we sustain the rejection of claims 5–7 under the enablement requirement of 35 U.S.C. § 112(a) for the same reasons as for claim 1.

Claims 18–20

Claim 18 recites "a bypass ratio of an inlet area of the secondary duct to an inlet area of the primary duct being *at least 7*." Appeal Br. 23 (Claims App.) (emphasis added). The Examiner finds that the disclosure does not

enable a bypass ratio of 20, 30, or 40.[4] Final Act. 18. The Examiner analyzes the same *Wands* as addressed for claim 1 and determines that the quantity of experimentation needed to make and use the claimed subject matter based on the disclosure would be undue. *Id.* at 18–19.

Appellant addresses the Examiner's rejection of claim 18 based on the recited quotient r/l value, which has been withdrawn by the Examiner. Appeal Br. 12; Ans. 41. Appellant does not address the rejection of claim 18 based on the recited bypass ratio limitation discussed above. Appeal Br. 12. Hence, we sustain the rejection of claim 18 and its dependent claims 19 and 20 under the enablement requirement of 35 U.S.C. § 112(a).

Claims 1–20 – Written Description

Claims 1–4 and 8–17

As for claim 1, the Examiner states, "[b]ypass ratios range from 2 to upwards of 15" (Final Act. 3), but the disclosure "does not describe a bypass ratio of 20, 30, or 40" (*id.* at 4 (boldface omitted)). The Examiner finds that the Specification only describes, "[i]n one aspect of the turbofan aircraft engine of the present invention, the bypass ratio may be at least 7.5, e.g., at least 8, at least 8.5, or at least 9." *Id.* (boldface omitted) (citing Spec. 6, ll. 5–7[5]). The Examiner states, "[i]t is not known how to make a bypass ratio of 20, 30 or 40" and the "[t]he disclosure does not state whether the bypass

[4] The rejection of claim 18 based on the recitation of "a quotient r/1 of a mean outer radius r of the last stage divided by the length 1 being at least 1.4" has been withdrawn. Ans. 41; Final Act. 19–20.

[5] Page 6, lines 5–7 of the Specification describes, "the bypass ratio in the turbofan aircraft engine of the present invention is at least 7, but will often be at least 8, e.g., at least 9, at least 10, or at least 11."

inlet area is increased, the core inlet area is decreased, or some combination of both to reach a bypass ratio of 20, 30 or 40." *Id.* (boldface omitted).

The Examiner also finds that the disclosure "does not describe a ratio of 10, 100, or 1000," but only describes that "the quotient r/1 of the second turbine will often be higher than 1.4, e.g., at least 1.41, at least 1.45, at least 1.5 or at least 1.55." Final Act. 4 (boldface omitted) (citing Spec. 6, ll. 5–7[6]). The Examiner states, "[i]t is not known how to make a quotient r/l of 10, 100, or 1000" and "[t]he disclosure does not state whether r or l or both are varied in order to obtain a quotient of 10, 100, or 1000." *Id.* (boldface omitted).

The test for sufficiency under the written description requirement of 35 U.S.C. § 112 "is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). To have "possession," "the specification must . . . show that the inventor actually invented the invention claimed." *Id.* The purpose of the written description requirement is to prevent an applicant from later asserting that he invented that which he did not; the applicant is therefore required to recount his invention in such detail that his future claims can be determined to be encompassed within his original creation. *Amgen Inc. v. Hoechst Marion Roussel Inc.*, 314 F.3d 1313, 1330 (Fed. Cir. 2003) (citing *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1561 (Fed. Cir. 1991)).

[6] The Examiner appears to be quoting the description at page 6, lines 8–9 of the Specification.

Appellant contends that the claims do not recite a bypass ratio of 20, 30 or 40, or a quotient r/1 of 10, 100 or 1000. Appeal Br. 8. We understand Appellant's argument is that claim 1 does not expressly recite any one of these numerical values of the bypass ratio or quotient r/l, and thus, the Examiner has misconstrued these limitations. We are mindful that the Specification need only describe the invention, as claimed. *See Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1333 (Fed. Cir. 2003). However, although claim 1 does not expressly recite any one of the specific numerical values of the bypass ratio or quotient r/l discussed by the Examiner (Final Act. 3–4), both the bypass ratio and the quotient r/l have no expressly recited upper limit in claim 1. We are not persuaded by Appellant that the numerical values stated by the Examiner are *not* encompassed by claim 1 solely because the values are not expressly recited.

Appellant also contends that, even if claim 1 theoretically encompasses bypass ratios of 1000 or even higher, one of ordinary skill in the art would recognize that such bypass ratio values "make no technical sense whatsoever.'" Appeal Br. 9.

First, the Examiner states that the Specification does not describe a bypass ratio of 20, 30, or 40. Final Act. 4. Second, the Examiner responds that "[a] bypass ratio of 40 is at least 7. Furthermore, [c]laim 1 . . . recite[s] a quotient r/l being at least 1.4 which encompasses quotients r/l of 10, 100, or 1000. A quotient r/l of 1000 is at least 1.4." Ans. 42. The Examiner has construed claim 1 to encompass such higher values because both the bypass ratio and quotient r/l have a recited lower limit but no recited upper limit. We agree with Appellant insofar as the Examiner has not established a legal basis to require Appellant to demonstrate possession of technically

nonsensical (i.e., unachievable) numerical values of the bypass ratio or quotient r/l ratio in order to meet the written description requirement. However, the Examiner has stated that claim 1 encompasses a bypass ratio of 20, 30, or 40 and a quotient r/l value of 10. These values are much smaller than the value Appellant has focused on. Appellant does not assert persuasively that a bypass ratio of 20 or a quotient r/l value of 10 for example, is technically nonsensical.

Appellant also asserts that the Examiner has pointed to literature that reflects what those skilled in the art know is technically feasible/reasonable. Appeal Br. 9–10 (citing Final Act. 64). Appellant does not, however, indicate what specific information this literature reflects is "technically feasible/reasonable," or explain specifically how this information shows what upper values of the bypass ratio and quotient r/l recited in claim 1 Appellant had possession of.

Appellant further contends that the Examiner has not provided any evidence that shows those skilled in the art "cannot be assumed to know how certain bypass ratios and ratios r/1 which can reasonably be considered to be encompassed by the instant claims can be achieved." Appeal Br. 10.

This contention does not indicate what bypass ratio and quotient r/1 upper limit values "can reasonably be considered to be encompassed" by claim 1, that is, what upper values of these limitations the disclosure reasonably conveys to those skilled in the art that the inventors had possession of. In this regard, the highest numerical value of the bypass ratio described in the Specification that we find is "at least 11." *See* Spec. 6, ll. 5–7. And, the Specification describes that "[the quotient r/l] will often not be higher than 2.1, e.g., not higher than 2.05, or not higher than 2.0." Spec.

6, ll. 9–10. The Specification does not explicitly describe a quotient r/l value higher than 2.1. However, a bypass ratio value of 11 and a quotient r/l value of 2.1 are not substantially greater than the numerical values of at least 7 and at least 1.4 recited in claim 1, that is, the *lower* values of the ranges.

The Specification does not explicitly describe, or imply, *any* numerical value of a maximum technically achievable upper limit of the bypass ratio or quotient r/l of the claimed turbofan aircraft engine. Contending that a technically sensible upper limit of these limitations exists and would be understood by one skilled in the art is different from Appellant actually demonstrating possession of an invention that encompasses those upper limits. Moreover, Appellant does not persuasively show possession of a (i.e., the same) turbofan aircraft engine in which the bypass ratio and quotient r/l both have their technically achievable upper limit, as broadly encompassed by the claim language.

Thus, we sustain the rejection of claim 1, and also claims 2–4 and 8–16 which depend from claim 1, and independent claim 17, which are not separately argued, under the written description requirement of 35 U.S.C. § 112(a).

Claims 5–7

Appellant correctly points out that "claims 5–7 provide an upper value for the quotient of r/1 and thus, a range for this quotient." Appeal Br. 10. However, the Examiner explains that "claims 5–7 also recite a bypass ratio of at least 7," as recited in claim 1. Ans. 44. Hence, we sustain the rejection of claims 5–7 under the written description requirement of 35 U.S.C. § 112(a) for the same reasons as for claim 1.

Claims 18–20

The Examiner finds that claim 18 fails to comply with the written description requirement for the same reasons discussed above regarding the bypass ratio limitation recited in claim 1.[7] Final Act. 6.

Appellant addresses the Examiner's withdrawn rejection of claim 18 based on the recited quotient r/l value. Appeal Br. 10–11; Ans. 41. Appellant does not, however, address the rejection of claim 18 based on the bypass ratio limitation. Appeal Br. 10–11. Hence, we sustain the rejection of claim 18 and its dependent claims 19 and 20 under the written description requirement of 35 U.S.C. § 112(a).

Obviousness over Pratt and Whitney and NASA

As for claim 1, the Examiner finds that Pratt and Whitney discloses a turbofan aircraft engine comprising, *inter alia*, a second turbine (LPT) comprising at least a first stage (V1, T1) and a last stage (V3, T3), where the second turbine has a length l and the last stage has a mean outer radius r. Final Act. 26–27. The Examiner concedes that Pratt and Whitney does not disclose a quotient r/l being at least 1.4, as claimed. *Id.* at 27.

The Examiner finds that NASA teaches that the engine weight and size affect the engine noise. Final Act. 27 (citing NASA p. 1, "'This is an even more important factor when there is an emphasis on reduced aircraft noise[.]'"; "'The various tradeoffs between noise, engine weight, and size are difficult to evaluate in preliminary design and are frequently

[7] The rejection of claim 18 based on the recitation of "a quotient r/1 of a mean outer radius r of the last stage divided by the length 1 being at least 1.4" has been withdrawn. Ans. 41; Final Act. 7.

overlooked[.]'") (boldface omitted). The Examiner also finds that NASA teaches that the low pressure turbine length (L_{LPT}) affects the engine length (L_E). *Id.* (citing NASA, p. 8, sketch (a)). The Examiner determines that because the mean outer radius of a stage of the low pressure turbine affects the length of the low pressure turbine, then the mean outer radius and the low pressure turbine length affect the engine noise. *Id.* at 27–28 (citing NASA Fig. 11). Therefore, the Examiner concludes, one of ordinary skill would recognize that the mean outer radius and low pressure turbine length are result-effective variables that control the engine noise. *Id.* at 28 (citing *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977)). The Examiner states, "'[W]here 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.'" *Id.* at 29 (citing *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)) (bold face omitted). *Id.* at 28. The Examiner submits that the claimed quotient r/l limitation is an obvious optimization of the prior art obtainable by an ordinary skilled worker through routine experimentation. *Id.* at 29. The Examiner concludes that it would have been obvious to one of ordinary skill in the art to modify Pratt and Whitney to include the claimed quotient r/l limitation, as taught by NASA, *to optimize the engine noise*. *Id.*

In contrast, Appellant contends that NASA would not have motivated one of ordinary skill in the art to optimize both the length and mean outer radius of the low pressure turbine of a turbofan aircraft engine to control the engine noise. Appeal Br. 15. Appellant contends that NASA does not mention that either one of these two low pressure turbine dimensions (variables) should be optimized for any reason, let alone to reduce engine noise. *Id.* In support, Appellant quotes multiple passages in NASA. *Id.* at

15–17 (quoting NASA p. 1, last para.; p. 2, second para.; p. 9, last two paras.; p. 17, next-to-last para.–p. 18). Appellant contends that these passages show that NASA is not concerned with reducing engine noise, but rather, is concerned with predicting propulsion weight and dimensions. *Id.* at 17. As for engine noise, Appellant points out that NASA notes, "fan noise of higher bypass ratio turbofan engines is controlled primarily by reducing the fan tip speed and/or installing acoustic treatment material in the inlet of the fan exhaust ducting, i.e., [it] has nothing to do with the dimensions of the low-pressure turbine." *Id.*; *see* NASA p. 1. Appellant also asserts that the weight and size NASA mentions refers to the entire engine. *Id.* at 18.

The applicable legal principles optimization of claimed variables are as follows:

> "[W]here 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 [(CCPA 1955)]. This rule is limited to cases in which the optimized variable is a "result-effective variable." *In re Antonie*, 559 F.2d 618, 620 (CCPA 1977); *see* [*In re*] *Boesch*, 617 F.2d [272,] 276 [(CCPA 1980)] ("[D]iscovery of an optimum value of a result effective variable ... is ordinarily within the skill of the art.").

In re Applied Materials, Inc., 692 F.3d 1289, 1295 (Fed. Cir. 2012). We agree with Appellant that the Examiner has not established, with sufficient evidence, that the recited quotient of the mean outer radius r of a last stage of a second turbine comprising at least a first stage and the last stage and the length l of the second turbine is recognized, in NASA, as a result-effective variable, rendering optimization within the ordinary skill in the art. Moreover, even assuming that the quotient r/l affects the sound of the engine in NASA, there is no teaching or suggestion that "optimizing" this ratio in

NASA to have the claimed value would reasonably be expected to result in optimizing the sound reduction.

Appellant also points out that the claims are drawn to a higher bypass ratio turbofan engine, and "NASA suggests that the major factor contributing to engine noise in a turbofan aircraft engine as instantly claimed is fan noise, not noise that can be attributed to certain dimensions (or a ratio of certain dimensions, respectively) of the LPT." Appeal Br. 19 (citing NASA 1, last para.).

Lastly, Appellant notes the requirement of a reasonable expectation of success for the proposed modification of Pratt and Whitney in view of NASA. Appeal Br. 19. The Examiner seems to deny there is such a requirement. Ans. 46.

We agree with Appellant. *See In re Clinton*, 527 F.2d 1226, 1228 (CCPA 1976) ("Obviousness does not require absolute predictability, but a reasonable expectation of success is necessary."). Accordingly, a reasonable expectation that modifying Pratt and Whitney to include the quotient r/l limitation would, in fact, be successful to "optimize the engine noise," as stated by the Examiner, is necessary to establish obviousness. The Examiner has not established with sufficient evidence that such optimization of engine noise would reasonably be expected to result from the proposed modification of Pratt and Whitney.

We do not sustain the rejection of claim 1, and claims 2–16 depending therefrom, as unpatentable over Pratt and Whitney and NASA.

Claim 17 recites, *inter alia*, the limitation "adjusting a mean outer radius r of the last stage of the second turbine and the length 1 of the second turbine so that a quotient r/1 is at least 1.4." Appeal Br. 23 (Claims App.).

Claim 18 recites, *inter alia*, the limitation "a quotient r/1 of a mean outer radius r of the last stage divided by the length 1 being at least 1.4." *Id*. at 24 (Claims App.). We do not sustain the rejection of claims 17 and 18, and claims 19 and 20 depending from claim 18, as unpatentable over Pratt and Whitney and NASA, for the same reasons as discussed for claim 1.

DECISION SUMMARY

In summary:

Claim(s) Rejected	35 U.S.C. §	Reference(s)/Basis	Affirmed	Reversed
17	112(b)	Indefiniteness		17
1–20	112(a)	Non-Enablement	1–20	
1–20	112(a)	Inadequate Written Description	1–20	
1–20	103	Pratt and Whitney, NASA		1–20
Overall Outcome			1–20	

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED