UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte JOHN M. MORGENSTERN, JAMES B. BACH, and ALAN E. ARSLAN

Appeal 2009-003085
Application 10/714,276
Technology Center 3600

Decided: November 17, 2009


HORNER, Administrative Patent Judge.

DECISION ON APPEAL

STATEMENT OF THE CASE

SUMMARY OF DECISION

We AFFIRM-IN-PART and ENTER A NEW GROUND OF REJECTION PURSUANT TO OUR AUTHORITY UNDER 37 C.F.R. § 41.50(b).

THE INVENTION

The Appellants’ claimed invention is a method of redistributing forces acting on one or more surfaces of an aircraft to minimize shock wave disturbance. Spec. 4, para. 0010. Claims 1 and 29, reproduced below, are representative of the subject matter on appeal.

1. A method for configuring an aircraft for low sonic boom supersonic flight conditions comprising:

   scaling an equivalent area distribution curve of the aircraft to approximate an ideal equivalent area distribution goal curve; and

   relaxing a design constraint to require the equivalent area distribution curve of the aircraft to be at or below the equivalent area distribution goal curve.

29. A method for configuring an aircraft for supersonic flight with low shock wave disturbance constraints comprising:

   redistributing lift of a wing by configuring the wing with areas of far-field expansion ahead of areas of far-field compression; and

   scaling an equivalent area distribution goal curve to maintain the desired aircraft weight while countering excursions below the equivalent area distribution goal curve.
THE EVIDENCE

The Examiner relies upon the following evidence:


THE REJECTION

The Appellants seek review of the Examiner’s rejection of claims 1-12 and 29-39 under 35 U.S.C. § 103(a) as unpatentable over Darden and either Makino or Howe.

ISSUES

The Appellants argue claims 1 and 9 as a group. App. Br. 4-8. As such, we select claim 1 as the representative claim, and claim 9 stands or falls with claim 1. 37 C.F.R. § 41.37(c)(1)(vii) (2009). The Appellants contend that the combined teachings of Darden and either Makino or Howe do not teach or suggest all the claim limitations. App. Br. 4. More specifically, the Appellants argue that “Darden only teaches relaxing the bluntness of the nose, not relaxing a design constraint to allow the equivalent area distribution curve of the aircraft (not just the nose) to be at or below the equivalent area distribution goal curve, as set forth in independent Claim 1.”
App. Br. 4. Further, the Appellants argue that the Examiner’s rationale that a person of ordinary skill in the art would have relaxed the design constraint to design an optimally performing aircraft is not a sufficient reason to modify the references to meet the claims. App. Br. 4.

The Examiner found Darden discloses the steps called for in dependent claims 2, 3, and 4. Ans. 4. The Appellants contend that Darden does not disclose these limitations. App. Br. 7.

The Examiner found that the steps in claims 6, 7, and 11 were steps that “one skilled in the art would have taken to improve the design of the aircraft.” Ans. 4, 5. The Appellants argued that the Examiner’s findings lack adequate evidentiary support. App. Br. 7.

The Examiner found Darden discloses redistributing the lift of the wing by having the far-field expansion area ahead of the areas of far-field compression, as called for in independent claim 29. Ans. 4. The Appellants argue Darden does not even mention expansion and compression areas on the wing. App. Br. 7.

The issues presented by this appeal are:

Have the Appellants shown that the Examiner erred in finding that the combined teachings of Darden and either Makino or Howe render obvious relaxing a design constraint of the aircraft as called for in claim 1?

Have the Appellants shown the Examiner provided an insufficient rationale to support the conclusion of obviousness for claim 1?

Have the Appellants shown that the Examiner erred in finding that Darden teaches each step of claims 2, 3, and 4?
Have the Appellants shown that the Examiner erred in the rejection of claims 6, 7 and 11 because the Examiner’s findings lack adequate evidentiary support? Have the Appellants shown that the Examiner erred in finding that Darden teaches redistributing the lift of the wing by having the far-field expansion area ahead of the areas of far-field compression, as called for in claim 29?

FINDINGS OF FACT

We find that the following enumerated facts are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

1. Appellants admit that Darden teaches relaxing the bluntness of the nose. App. Br. 5.

2. Darden discloses a method that provides sonic-boom-minimizing equivalent area distributions for supersonic cruise conditions by minimizing either shock strength or overpressure through relaxing extreme nose bluntness. Darden at 1, *Summary*. Darden further discloses that in order to reduce the large drag caused by extreme nose bluntness, the bluntness requirement is relaxed to trade-off between blunt-nose, low-boom, and sharp-nose, low-drag configurations. Darden at 1, *Introduction*, para. 2
3. Darden’s method replaces the complex aircraft configuration and lift distribution of aircraft components with an equivalent area distribution defined by Whitham’s “F-function.” Darden at 4, Background, para. 1. The total equivalent area distribution of the aircraft is comprised of two basic components: the actual area of the configuration and the equivalent area due to the distribution of lift. Darden at 4, Background, para. 1; see also Makino at 1, Low-drag/Low-boom Design Method, para. 1 (Makino explaining Darden’s method). Because Darden’s method uses an equivalent area of the aircraft, there are infinite combinations of fuselage and wing geometries having the same total equivalent area distribution. Darden at 4, Background, para. 1; see also Makino at 1-2, Low-drag/Low-boom Design Method, para. 1 (Makino explaining Darden’s method). Thus, Darden’s method does not address specific fuselage and wing geometries.

4. Darden does not disclose segmenting a wing of the aircraft into panels; analyzing the flow characteristics for each panel; and smoothing the configuration of each panel with adjacent panels along the span and the chord of the wing to smooth the wing surface. Darden, passim.

5. Darden does not disclose determining design variables at the root and tip of an aircraft wing along Mach angle lines. Darden, passim.

6. Darden does not disclose maximizing the lift-to-drag ratio for an incidence angle for a wing root and the shape of the remaining portions of the wing. Darden, passim.
7. Darden does not disclose redistributing the lift of the wing by having the areas of far-field expansion ahead of the areas of far-field compression. Daren, *passim*.

**PRINCIPLES OF LAW**

“Section 103 forbids issuance of a patent when ‘the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.’” *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). See also *KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.”)

**ANALYSIS**

*Claim 1*

Claim 1 is a method of configuring an aircraft for low sonic boom supersonic flight conditions comprising scaling an equivalent area distribution curve of the aircraft to approximate an ideal goal curve and relaxing a design constraint to be at or below that goal curve. The Appellants’ Specification describes the method as redistributing forces acting on one or more surfaces to minimize shock wave disturbance.
Spec. 4, para. 0010. A person of ordinary skill in the art would interpret claim 1 to require relaxing a design constraint of one or more surfaces of the aircraft.

We are unpersuaded by the Appellants’ argument that Darden teaches relaxing only the bluntness of the nose rather than relaxing a design constraint of the aircraft. App. Br. 4. First, the argument is not supported by the claim. Claim 1 requires relaxing a design constraint for one or more surfaces of the aircraft. Darden discloses relaxing a design constraint for the nose of the aircraft, which is a surface of the aircraft (Facts 1, 2). Second, the rejection finds that Makino or Howe disclose applying Darden’s teaching of the nose to the rest of the aircraft, so that the Appellants’ argument against Darden amounts to simply an individual attack. Ans. 4; see In re Merck & Co., 800 F.2d 1091, 1097 (Fed. Cir. 1986) (One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references.); In re Keller, 642 F.2d 413, 426 (CCPA 1981).

The Appellants argue that the Examiner erred in finding that a person of ordinary skill in the art would seek both to meet an ideal equivalent area distribution goal curve and to relax a design constraint, because these approaches are inconsistent. App. Br. 4-5. The Appellants also point to a F-5 Shaped Sonic Boom Demonstrator (SSBD-24b4), which took a design approach that did not permit the actual equivalent area distribution curve to go below the corresponding goal curve, as evidence demonstrating the nonobviousness of the claimed method. App. Br. 5-6. On the contrary, the F-5 Shaped Sonic Boom Demonstrator is evidence that a person of ordinary skill would seek to both meet an ideal equivalent area distribution goal curve
and to relax a design constraint. According to the Appellants, the F-5 Shaped Sonic Boom Demonstrator (SSBD-24b4) configuration includes “saddlebags (100) under the wings to keep the area equal to the ideal equivalent area distribution curve while allowing width of the large modification (102) under the fuselage to begin tapering sooner.” App. Br. 6. The F-5 Shaped Sonic Boom Demonstrator configuration is thus evidence that it was known in the art at the time of Appellants’ invention to relax a design constraint (tapering the fuselage sooner) to require the equivalent area distribution curve of the aircraft to be at the equivalent area distribution goal curve as recited in claim 1. Thus, rather than evidence of non-obviousness of the claimed method, the F-5 Shaped Sonic Boom Demonstrator supports the Examiner’s finding.

The Appellants have failed to demonstrate error by the Examiner in the rejection of claim 1. Claim 9 falls with claim 1.

Claim 2

Claim 2 depends from independent claim 1 and adds the limitations of “segmenting a wing of the aircraft into panels; analyzing the flow characteristics for each panel; and smoothing the configuration of each panel with adjacent panels along the span and the chord of the wing to smooth the wing surface.” We agree with the Appellants that Darden does not teach these limitations (Facts 3, 4).

Claims 3, 8, and 10

Claim 3 depends from independent claim 1, and adds the limitation of “determining design variables at the root and the tip of a wing of the aircraft along Mach angle lines (X - Beta*R).” We agree with the Appellants that
Darden does not teach this limitation (Facts 3, 5). We also cannot sustain the rejection of claims 8 and 10 by virtue of their dependence from claim 3.

**Claims 4 and 5**

Claim 4 depends from independent claim 1 and contains the limitation of maximizing the lift-to-drag ratio for an incidence angle for a wing root and the shape of the remaining portions of the wing. We agree with the Appellants that Darden does not teach these limitations (Fact 3, 6). We also cannot sustain the rejection of claim 5 by virtue of its dependence from claim 4.

**Claims 6, 7, 11, 12**

Claim 6 depends from independent claim 1 and contains the additional limitation of dividing the flight regime into multiple flight modes, determining an optimum configuration of non-moving components for one of the flight modes, and determining an optimum configuration of the moving components for the other flight modes based on the configuration of the non-moving components. Claim 7 depends from independent claim 1 and contains the additional limitation of determining an optimum configuration based on at least one of the lift to drag ratio and low sonic boom. Claim 11 depends from independent claim 1 and contains the additional limitation of adjusting the configuration of a wing to redistribute areas of lift and reshaping the fuselage in combination with the wing to match the equivalent area distribution goal curve.

The rejection does not state that Official Notice was taken, nor that the recited steps were common knowledge or well known at the time of the invention. Ans. passim. Further, the rejection does not provide sound technical and scientific reasoning to support a conclusion that the steps of
the claims were common knowledge. See MPEP § 2144.03(B) ("[t]he examiner must provide specific factual findings predicated on sound technical and scientific reasoning to support his or her conclusion of common knowledge.") (citing In re Soli, 317 F.2d 941, 946 (CCPA 1963) and In re Chevenard, 139 F.2d 711, 713 (CCPA 1943)). Without a basis for these findings, we cannot sustain the rejection of claims 6, 7, and 11. We also cannot sustain the rejection of claim 12 by virtue of its dependence on claim 11.

Claims 29-39

Independent claim 29 is a method for configuring an aircraft for supersonic flight with low shock wave disturbance constraints including the steps of redistributing lift of a wing by configuring the wing with areas of far-field expansion ahead of areas of far-field compression; and scaling an equivalent area distribution goal curve to maintain the desired aircraft weight while countering excursions below the equivalent area distribution goal curve.

We agree with the Appellants that Darden does not teach the elements of claim 29. Darden is directed towards modification of the aircraft nose, not the wing, and Darden does not disclose redistributing the lift of the wing by having the far-field expansion area ahead of the areas of far-field compression (Facts 3, 7). Thus, we cannot sustain the rejection of claim 29, or its dependent claims 30-39.

NEW GROUND OF REJECTION OF CLAIMS 1-12 AND 29-39

We enter a new ground of rejection of process claims 1-12 and 29-39 under 35 U.S.C. § 101 as being directed to patent ineligible subject matter.
ADDITIONAL FINDINGS OF FACT

8. The Appellants’ Specification describes achieving a minimized equivalent area distribution curve as “extremely computationally intensive” to arrive at a design that provides optimum performance. Spec. 3-4, para. 0009.


10. The Appellants’ Specification does not state that computations of the claimed methods can only be accomplished through use of a computer. Spec. passim. Though extremely time-consuming, the Appellants’ Specification provides no reason why the claimed methods could not be solved by a human without the aid of a computer or other machine.

11. The Appellants’ Specification does not provide a lexicographic definition of “configuring” as used in the claims. Spec. passim.

12. The word “configuration” is commonly understood to mean “external form, figure, or shape of a thing as resulting from the disposition and shape of its parts.” WEBSTER’S NEW UNIVERSAL UNABRIDGED DICTIONARY (Deluxe 2d ed. 1983) (“configuration,” noun, definition 1).

13. The Appellants’ Specification consistently uses the terms “configuration” and “configuring” to refer to the shape and form (i.e. design) of an aircraft and/or its components. See e.g., Spec. 4, paras. 00011, 00012; id. at 10, paras. 00027, 00029, 00030.
14. The Appellants’ Specification describes that the equivalent area distribution curve is calculated based on an algorithm referred to as an F-function, discovered through the combined work of Seebass, George, and Darden. Spec. 3, para. 0007; id. at 14, para. 00039. The Appellants’ Specification defines an equivalent area distribution curve as the sum of geometric area and lift distribution projected along the length of the aircraft for the given parameters of aircraft weight, flight altitude, and Mach number. Spec. 3, para. 0007; id. at 6-7, para. 00016; id. at 14, para. 00039; fig. 3A.

15. Because the equivalent area distribution curve is for a given aircraft weight, flight altitude, and Mach number, alteration of these parameters will alter, or “scale” the curve for the new set of parameters. See e.g., Spec. 4, para. 00013; id. at 16, para. 00046; figs 5H-5J (scaling for alternative aircraft weight).

ADDITIONAL PRINCIPLES OF LAW

The law in the area of patent-eligible subject matter for process claims has recently been clarified by the Federal Circuit in In re Bilski, 545 F.3d 943 (Fed. Cir. 2008) (en banc), cert. granted, 129 S. Ct. 2735 (Jun. 1, 2009) (No. 08-964).

The en banc court in Bilski held that “the machine-or-transformation test, properly applied, is the governing test for determining patent eligibility of a process under § 101.” Id. at 956. The court in Bilski further held that “the ‘useful, concrete and tangible result’ inquiry is inadequate [to determine whether a claim is patent-eligible under § 101.]” Id. at 959-60.

The court explained the machine-or-transformation test as follows: “A claimed process is surely patent-eligible under § 101 if: (1) it is tied to a
particular machine or apparatus, or (2) it transforms a particular article into a
different state or thing.” Id. at 954 (citations omitted). The court explained
that “the use of a specific machine or transformation of an article must
impose meaningful limits on the claim's scope to impart patent-eligibility”
and “the involvement of the machine or transformation in the claimed
process must not merely be insignificant extra-solution activity.” Id. at 961-
62 (citations omitted). As to the transformation branch of the inquiry, the
court explained that transformation of a particular article into a different
state or thing “must be central to the purpose of the claimed process.” Id.

ANALYSIS

We apply the machine-or-transformation test, as described in Bilski, to
determine whether the subject matter of process claims 1-12 and 29-39 are
patent-eligible under 35 U.S.C. § 101. Because claim construction is “an
important first step in a § 101 analysis,” In re Bilski, at 951, we begin by
determining the scope of the claims involved.

Independent claims 1 and 29 are methods of configuring an aircraft, or
portion of an aircraft, for supersonic flight conditions to minimize sonic
boom at the ground. While the Appellants’ Specification does not provide a
lexicographic definition of “configuring” as used in the claim,
“configuration” is commonly understood to mean the shape of a thing (Fact
12). The Appellants’ Specification consistently uses the term in context to
mean the design for an aircraft (Facts 11 and 13).

Claims 1 and 29 include the limitation of scaling an equivalent area
distribution curve of the aircraft. The Appellants’ Specification describes
the equivalent area distribution curve as an algorithm that is the sum of
geometric area and lift distribution projected along the length of the aircraft
for the given parameters of aircraft weight, flight altitude, and Mach number (Fact 14). The Appellants’ Specification describes scaling as an adjustment to the equivalent area distribution curve based on aircraft weight, flight altitude, or Mach number (Fact 15). Process claims 1 and 29 then involve the use of an algorithm to design the shape of an aircraft or portion of an aircraft to minimize sonic boom.

Claims 2-12 depend directly or indirectly from claim 1, and add limitations related to wing configuration, lift-to-drag ratio, and various other parameters. Claims 30-39 depend from claim 29, adding additional limitations relating to incidence angle, lift-to-drag ratio, and various other parameters.

Process claims 1-12 and 29-39 involve a method that is “extremely computationally intensive,” and the Appellants’ Specification describes an embodiment that executes the method with a computer (Facts 8, 9). However, none of the claims recite a computer, and nothing in the Appellants’ Specification states that the steps of the method could not be completed by a human without aid of a computer or other machine (Fact 10). The limitation of the Specification that a computer may complete the claimed process is not imported into the claims. *E-Pass Techs., Inc. v. 3Com Corp.*, 343 F.3d 1364, 1369 (Fed. Cir. 2003) (Limitations not explicit or inherent in the language of a claim cannot be imported from the specification.).

Likewise, the Specification contains visual depictions of an aircraft designed using the claimed method, but the claims do not recite displaying the design of the aircraft or aircraft component determined by the method, such as on a computer display or by a printout. See figs. 4A-4C. Nor do
any of the claimed processes produce an aircraft or portion of an aircraft based on the design.

A person of ordinary skill in the art reading the claims in light of the Specification would interpret the claims to be directed to designing the shape of an aircraft or portion of an aircraft through use of a process that includes an algorithm. Further, a person or ordinary skill in the art would understand that that claims do not include: a computer, a visual depiction of the design, or production of an aircraft or portion of an aircraft based on the design.

Turning to the “machine-or-transformation test” of Bilski, claims 1-12 and 29-39 fail the first prong of the machine-or-transformation test. None of the claims limit any process step to a particular machine or apparatus. Rather, the claims are directed to designing an aircraft by a method that may, by the broadest reasonable interpretation of the claims, encompass a method of performing calculations on paper.

The steps of process claims 1-12 and 29-39 also fail the second prong of the machine-or-transformation test because the claimed steps do not result in a transformation of data or a transformation of an article into a different state or thing. First, we note that while an aircraft design may be made into a physical thing, claims 1-12 and 29-39 do not recite the step of creating an aircraft, or portion of an aircraft, from the design created by the claimed method. Second, this is not the case of raw data being transformed into a visual depiction of a physical object. See In re Abele, 684 F.2d 902, 908-909 (CCPA 1982). Rather, the claims only produce a theoretical or mathematical design for an aircraft or a portion of an aircraft, which exists only in concept and represents information, an intangible asset.
The method as claimed does not involve the transformation of data or of any other article into a different state or thing, and given that the claim also is not tied to a particular machine or apparatus, the claim entirely fails the machine-or-transformation test and is not drawn to patent-eligible subject matter under 35 U.S.C. § 101.

CONCLUSIONS

The Appellants have failed to show that the Examiner erred in finding that Darden discloses relaxing a design constraint of the aircraft as called for in claim 1.

The Appellants have also failed to show that the Examiner provided an insufficient rationale to support the conclusion of obviousness for claim 1.

The Appellants have shown that the Examiner erred in finding that Darden discloses each of the steps of claims 2, 3, and 4.

The Appellants have also shown that the Examiner erred in the rejection of claims 6, 7 and 11 because the findings lack adequate evidentiary support.

The Appellants have further shown that the Examiner erred in finding that Darden discloses redistributing the lift of the wing by having the far-field expansion area ahead of the areas of far-field compression, as called for in claim 29.

DECISION

We AFFIRM the decision of Examiner to reject claims 1 and 9 under 35 U.S.C. § 103(a).
We REVERSE the decision of the Examiner to reject claims 2-12 and 29-39 under 35 U.S.C. § 103(a).

We enter a NEW GROUND OF REJECTION of claims 1-12 and 29-39 under 35 U.S.C. § 101 as being directed to patent ineligible subject matter.

Regarding the affirmed rejection(s), 37 C.F.R. § 41.52(a)(1) provides “Appellant may file a single request for rehearing within two months from the date of the original decision of the Board.”

In addition to affirming the Examiner's rejection(s) of one or more claims, this decision contains new grounds of rejection pursuant to 37 C.F.R. § 41.50(b) (2009). 37 C.F.R. § 41.50(b) provides "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

37 C.F.R. § 41.50(b) also provides that Appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new grounds of rejection to avoid termination of the appeal as to the rejected claims:

(1) *Reopen prosecution.* Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the Examiner, in which event the proceeding will be remanded to the Examiner. . . .

(2) *Request rehearing.* Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

Should Appellants elect to prosecute further before the Examiner pursuant to 37 C.F.R. § 41.50(b)(1), in order to preserve the right to seek review under 35 U.S.C. §§ 141 or 145 with respect to the affirmed rejection,
the effective date of the affirmance is deferred until conclusion of the prosecution before the Examiner unless, as a mere incident to the limited prosecution, the affirmed rejection is overcome.

If Appellants elect prosecution before the Examiner and this does not result in allowance of the application, abandonment or a second appeal, this case should be returned to the Board of Patent Appeals and Interferences for final action on the affirmed rejection, including any timely request for rehearing thereof.


AFFIRMED-IN-PART; 37 C.F.R. § 41.50(b)

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