United States District Court,
W.D. North Carolina, Asheville Division.

BORGWARNER INC. and Borgwarner Turbo Systems, Inc,
Plaintiffs.
v.
HONEYWELL INTERNATIONAL, INC,
Defendant.

Civil No. 1:07cv184

Feb. 20, 2009.

David M. Barkan, Erin E. Kaiser, Katherine D. Prescott, Fish & Richardson P.C., Redwood City, CA, Joshua A. Griswold, Fish & Richardson, PC, Dallas, TX, Larry Stephen McDevitt, Van Winkle, Buck, Wall, Starnes and Davis, P.A., Asheville, NC, Ralph Adam Phillips, Fish & Richardson, PC, Washington, DC, for Plaintiffs.

Forrest A. Ferrell, Sigmon, Clark, Mackie, Hutton, Hanvey & Ferrell, PA, Hickory, NC, Marc H. Cohen, Philip Chen, Robert G. Krupka, Kirkland & Ellis LLP, Los Angeles, CA, for Defendant.

MEMORANDUM OF DECISION AND ORDER

MARTIN REIDINGER**, District Judge.**

THIS MATTER is before the Court on the parties' respective motions [Docs. 57, 58] for the construction of certain claim language used in U.S. Patent Nos. 6,663,347("the '347 Patent"); 6,629,556 ("the '556 Patent"); and 6,904,949 ("the "9 Patent"). The Court held a claim construction hearing on September 15, 2008.

I. PROCEDURAL HISTORY

On May 30, 2007, the Plaintiffs BorgWarner Inc. and BorgWarner Turbo Systems, Inc. (collectively "BorgWarner") filed this action for patent infringement against the Defendant Honeywell International, Inc. ("Honeywell"). FN1 [Doc. 1]. On July 30, 2007, Honeywell filed a motion [Doc. 26] to transfer this action to the Central District of California, and this motion was referred to the Magistrate Judge for a recommendation as to disposition. On October 16, 2007, the Magistrate Judge entered a Memorandum and Recommendation [Doc. 38], recommending that the motion to transfer venue be denied. Honeywell filed objections to the Magistrate Judge's Recommendation. [Doc. 40]. On February 11, 2008, the Court FN2 entered an Order overruling Honeywell's objections and denying the motion to transfer. [Doc. 45]. Thereafter, the Court entered a Pretrial Order and Case Management Plan [Doc. 47], setting certain scheduling deadlines and establishing a MarkmanFN3 proceeding schedule, with a claim construction hearing scheduled for July 1, 2008.

FN1. The patents-in-suit are owned by Plaintiff BorgWarner, Inc. and exclusively licensed to Plaintiff BorgWarner Turbo Systems, Inc. [Doc. 65 at 3].

FN2. This case was reassigned to the undersigned on September 18, 2007.

FN3. Markman v. Westview Instruments, Inc., 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996).

On March 21, 2008, Honeywell moved to stay these proceedings pending reexamination of the patents-in-suit. [Doc. 48]. The Court denied this motion as premature, as the Patent and Trademark Office ("PTO") had not yet granted a reexamination. [Doc. 51]. Thereafter, the parties filed their respective motions for claim construction, in accordance with the Pretrial Order and Case Management Plan. [Docs. 57, 58]. Honeywell renewed its motion to stay on May 27, 2008, on the grounds that the PTO had granted reexamination of all three patents-in-suit. The Court held a hearing on the motion to stay on July 1, 2008. On July 7, 2008, the Court entered an Order [Doc. 72], denying the motion to stay and rescheduling the *Markman* hearing. The parties appeared before the Court for a *Markman* hearing on September 15, 2008.

Having been fully briefed and argued, the issue of claim construction is now ripe for disposition.

II. FACTUAL BACKGROUND

The patents at issue concern an investment cast titanium compressor wheel. *See* '347 Patent, Col. 1, lines 6-10.FN4 Investment casting of titanium involves: (1) creating a wax pattern of the part to be manufactured by pouring hot wax into a tool, or "die," that contains a cavity in the shape of the part to be cast, (2) forming a mold around the wax pattern, (3) removing the pattern by solvent or thermal means to form a casting mold, (4) pouring molten titanium into the mold and allowing it to solidify, and (5) removing the mold materials. Id. at Col. 3, lines 23-30.

FN4. The '556 Patent issued from a divisional application of the ' 347 Patent, and the "9 Patent issued from a continuation application of the '556 Patent. Accordingly, the specifications of each of the asserted patents are largely identical. To avoid unnecessary duplication of citations, the Court will cite only to the '347 Patent specification for those instances where the specifications are identical.

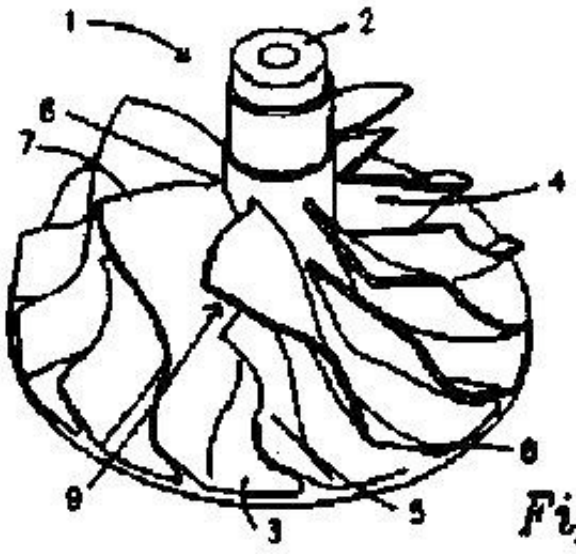


Fig. 1

Figure 1 of the '347 Patent (reproduced at right) illustrates the shape of a state of the art compressor wheel at the time that the '347 Patent was filed. The compressor wheel includes a hub (label 2) that extends radially outward at the base (label 3). Id. at Col. 7, lines 25-27. A series of evenly spaced full blades (label 4) and smaller blades, known as "splitter" blades (label 5), located on the surface of the hub (labels 2, 3) define passages through which air is conducted. Id. at Col. 7, lines 28-30. The shape of a compressor wheel's blades are highly complex, and typically contain (1) a sharp pitch helix for scooping air in and moving air axially (label 6); (2) a "hump" or angle offset from radial to change the direction of airflow from axial to radial, to spin the air centrifugally, and to accelerate the air to a high velocity (label 7); and (3) a trailing edge or "back sweep" (label 8) which propels the air radially out of the compressor wheel at high velocity and with high pressure. Id. at Col. 1, lines 29-63; Col. 7, lines 40-49. As the inventors of the patents-in-suit explain in the specification, the blades of a compressor wheel perform three functions: (1) they draw air in axially; (2) they accelerate the air centrifugally; and (3) they discharge the air radially outward at elevated pressure into the compressor housing chamber. Id. at Col. 1, lines 21-25.

The inventors explain in the specification that tighter regulation of engine exhaust emissions led to an interest in the development of higher pressure ratio boosting devices. Id. at Col. 1, lines 64-65. The inventors note that the state-of-the-art aluminum compressor wheels were not capable of withstanding repeated exposure to higher pressure ratios, as the temperature at the blade tips and the stresses resulting from increased centrifugal forces at higher RPM exceed the capability of conventionally employed aluminum alloys. Id. at Col. 1, line 66 to Col. 2, line 12.

The inventors recognized that a compressor wheel manufactured with titanium would overcome the deficiencies of aluminum, but also knew that titanium compressor wheels could not be manufactured cost-effectively in large volumes with current methods. Id., Col. 2, lines 13-20; Col. 3, lines 60-65. Accordingly, the inventors of the patents-in-suit set out to develop a economical method for mass producing titanium compressor wheels which would be comparable to the aerodynamic efficiency of the state-of-the-art compressor wheel designs. Id. at Col. 4, lines 8-23.

The inventors explain in the specification that prior to the present inventions, there were significant problems in creating wax patterns of compressor wheels due to their highly complex shape. Id. at Col. 3,

lines 31-36. As can be seen in the prior art wheel shown in Figure 1 above, prior art blade designs included various features, such as dips (label 6), humps (label 7), and recesses (label 9), that made it impossible to withdraw the inserts that surround and form such features along a simple path (*i.e.*, radially or along a curvature) as required for automation of the die assembly. Id. at Col. 7, lines 40-48.

To overcome this problem, the inventors of the patents-in-suit redesigned the compressor wheel by simplifying the blade design, so that the compressor wheel would be "aerodynamically ... comparable to that of a complex compressor wheel blade design, and yet which, from a manufacturing aspect, can be produced economically in an investment casting process (lost wax process) using a wax pattern [that is] easily producible at low cost from an automated (and "pullable") die." Id. at Col. 4, lines 47-53. As Figure 2 of the ' 347 Patent (reproduced at right) illustrates, the compressor wheel envisioned by the inventors has blades that are essentially straight, having no dips or humps which would impede radial extraction of die inserts along a straight line or a simple curve. Id. at Col. 8, lines 1-10.

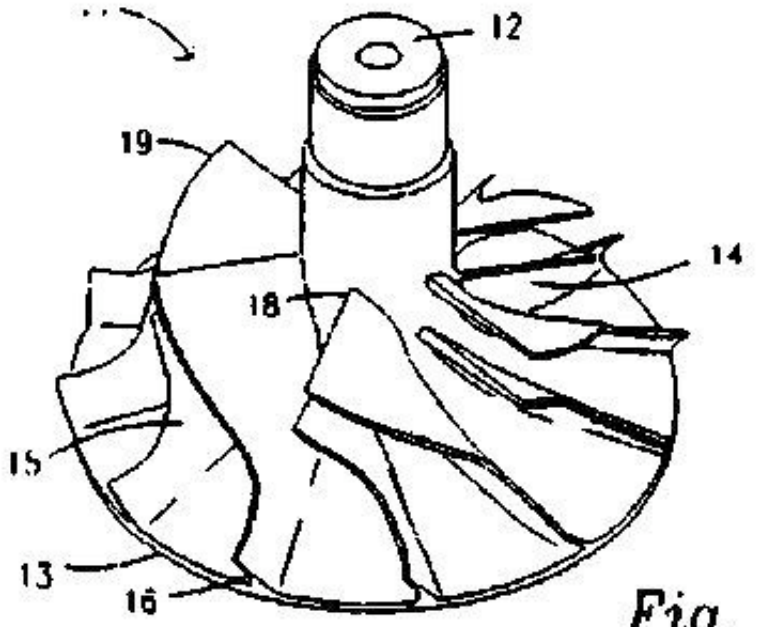


Fig. 2

The independent claims of the patents-in-suit claim both the method of making the inventive titanium compressor wheel, *see* '556 Patent, Claims 1 and 7, the wheel itself, *see* '347 Patent, Claims 1, 5, and 7, and a method for making a complete air boost device containing such a wheel, *see* "9 Patent, Claims 1 and 10. Various dependent claims recite additional details regarding, among other things, the number of die inserts used in forming air passages, *see, e.g.,* '347 Patent, Claims 2-3; the manner in which the tooling is to be actuated, *see, e.g.,* '556 Patent, Claim 3; and the particular titanium alloy to be used in casting the wheel, *see, e.g.,,* "9 Patent, Claims 12-14.

III. PRINCIPLES OF CLAIM CONSTRUCTION

"The determination of infringement is a two-step process. First, the court construes the claims to correctly determine the scope of the claims. Second, it compares the properly construed claims to the accused device." Bell Atlantic Network Services, Inc. v. Covad Communications Group, Inc., 262 F.3d 1258, 1267 (Fed .Cir.2001). The first step in this process, the construction of claims, is a question of law for the Court. Markman v. Westview Instruments, Inc., 517 U.S. 370, 372, 116 S.Ct. 1384, 1387, 134 L.Ed.2d 577 (1996); Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1456 (Fed.Cir.1998) (*en banc*). The second step, the comparison of the properly construed claims to the accused device, is typically a question of fact for the jury. *See* Bell Atlantic, 262 F.3d at 1267.

"It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, *i.e.*, the patent itself, including the claims, the specification and, if in evidence, the prosecution history. Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language." Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996) (citation omitted). The Court should give the disputed claim terms "their ordinary and accustomed meaning as understood by one of ordinary skill in the art." Bell Atlantic, 262 F.3d at 1267. A person of ordinary skill in the art is deemed to read the claim terms not only in the context of the particular claims in which the disputed terms appear, but also in the context of the entire patent, including the specification and the prosecution history. *See* Phillips v. AWH Corp., 415 F.3d 1303, 1313 (Fed.Cir.2005).

The claims of the patent "themselves provide substantial guidance as to the meaning of particular claim terms." Id. at 1314. Specifically, the context in which a term is used within the claim, as well as the usage of that term in other claims of the patent, can be valuable in ascertaining the meaning of a particular claim term. *Id*. Of course, the claims of the patent cannot be viewed in a vacuum. The Court also "must look at the ordinary meaning in the context of the written description and the prosecution history." Medrad, Inc. v. MRI Devices Corp., 401 F .3d 1313, 1319 (Fed.Cir.2005) (quoting DeMarini Sports, Inc. v. Worth, 239 F.3d 1314, 1324 (Fed.Cir.2001)).

The specification of the patent can be highly instructive in construing the patent claims. As the Federal Circuit has noted, the specification "is always highly relevant to the claim construction analysis." Vitronics, 90 F.3d at 1582. In fact, the specification is usually dispositive, as "it is the single best guide to the meaning of a disputed term." *Id.;* Standard Oil Co. v. Am. Cyanamid Co., 774 F.2d 448, 452 (Fed.Cir.1985) ("The specification is ... the primary basis for construing the claims ."). As such, the Federal Circuit has stated that it is "entirely appropriate for a court, when conducting claim construction, to rely heavily on the written description for guidance as to the meaning of the claims." Phillips, 415 F.3d at 1317. In some cases, the inventor may provide within the specification a special definition of a claim term which differs from the term's usual meaning. "In such cases, the inventor's lexicography governs." Id. at 1316. The inventor also may disclaim or disavow claim scope within the specification. Where "the inventor has dictated the correct claim scope, ... the inventor's intention, as expressed in the specification, is regarded as dispositive." *Id*.

In addition to consulting the specification, the Court also may examine the patent's prosecution history in construing the terms of the claims. Markman v. Westview Instruments, Inc., 52 F.3d 967, 980 (Fed.Cir.1995), *aff'd,* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). "Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent." Phillips, 415 F.3d at 1317. The prosecution history also may be helpful in determining whether the inventor disclaimed any particular interpretation during the prosecution of the patent. *See Chimie v. PPG Indus., Inc.,* 402 F.2d 1371, 1384 (Fed.Cir.2005). While it can be helpful in some respects, the prosecution history "often lacks the clarity of the specification and thus is less useful for claim construction purposes." Phillips, 415 F.3d at

1317.

In addition to examining the intrinsic evidence, the Court is also authorized to consider certain extrinsic evidence, "including expert and inventor testimony, dictionaries, and learned treatises." Markman, 52 F.3d at 980. Specifically with respect to expert testimony, the Federal Circuit has noted that such testimony "can be useful to a court for a variety of purposes, such as to provide background on the technology at issue, to explain how an invention works, to ensure that the court's understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field." Phillips, 415 F.3d at 1318. The Federal Circuit has cautioned, however, that "conclusory, unsupported assertions by experts as to the definition of a claim term are not useful to a court." *Id*. The Court must disregard any expert testimony "that is clearly at odds with ... the written record of the patent." Key Pharms. v. Hercon Labs. Corp., 161 F.3d 709, 716 (Fed.Cir.1998).

While extrinsic evidence may be useful in "shed[ding] ... light on the relevant art," it is "less significant than the intrinsic record in determining the 'legally operative meaning of disputed claim language.' " C.R. Bard, Inc. v. U.S. Surgical Corp ., 388 F.3d 858, 862 (Fed.Cir.2004) (quoting in part Vanderlande Indus. Nederland BV v. Int'l Trade Comm'n, 366 F.3d 1311, 1318 (Fed.Cir.2004)). "In sum, extrinsic evidence may be useful to the court, but it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence." Phillips, 415 F.3d at 1319.

With these principles of claim construction in mind, the Court now turns to the claims at issue in the patents-in-suit.

IV. CLAIM CONSTRUCTION

A. Construction of Claim Terms on Which the Parties Agree

The parties have identified the construction of several claim terms upon which they agree. [Doc. 52 at 2]. Having reviewed the language of the claims, as well as the intrinsic evidence, the Court agrees with the parties' proposed construction of these claim terms. Accordingly, the term "compressor housing" is hereby construed as a chamber that surrounds the compressor wheel of an air boost device, collects air expelled by the compressor wheel, and delivers the air to the engine intake. The term "backswept blades" is hereby construed as blades with an end portion angled backward (*i.e.*, opposite the direction of rotation) from the radial direction. The term "extracting" is construed as withdrawing. The term "lost wax process" is construed to mean investment casting using a wax pattern. The phrase "by an automated process" is construed to mean by a mechanism simultaneously and/or in an ordered sequence. The term "automatically" is construed to mean by a mechanism simultaneously and/or in an ordered sequence.

B. Disputed Claim Terms, Phrases and Clauses

1. "Titanium Centrifugal Compressor Wheel," "Titanium Compressor Wheel," and "Titanium-Aluminum Alloy"

The independent claims of the '347 Patent recite claims for a titanium centrifugal compressor wheel. Specifically, the '347 Patent provides as follows:

1. A *titanium centrifugal compressor wheel* formed by an investment casting process, and including:

a hub, defining an axis of rotation, and

a plurality of backswept aerodynamic blades carried on the surface of said hub and defining air passages between adjacent blades,

wherein each of said air passages is defined by from one to three solid die inserts which can be inserted between and pulled from between said blades without deformation of said dies or blades.

* * *

7. A cast *titanium centrifugal compressor wheel* comprising:

an annular hub defining an axis of rotation, and

a plurality of backswept aerodynamic blades, each of said blades including a leading edge, an outer edge adapted for close passage to a compressor housing, and a trailing edge,

wherein said leading edge is substantially a straight edge,

wherein said blades are designed such that a compound die insert comprising first and second solid die inserts defining one air passage between adjacent blades can be inserted between said adjacent blades, and wherein said first and second die inserts can be retracted along a radial or curved path without deformation of said blades or dies.

'347 Patent, Col. 10, lines 26-35, Col. 10, line 61 to Col. 12, line 3 (emphasis added).

The independent claims of the '556 Patent recite methods for manufacturing a "titanium centrifugal compressor wheel." These independent claims provide as follows:

1. A method for manufacturing a *titanium centrifugal compressor wheel,* said method comprising:

introducing a sacrificial material into a die comprised of a plurality of rigid die inserts (20) to form a compressor wheel pattern comprising a hub (1) defining an axis of rotation and backswept aerodynamic blades (4, 5) carried on said hub,

extracting said die inserts (20) radially or along a curve to expose said compressor wheel pattern,

forming a mold by a lost wax process around said compressor wheel pattern (21),

forming *said titanium compressor wheel* by investment casting in said mold.

* * *

7. A method for manufacturing a cast *titanium centrifugal compressor wheel* comprising:

designing a compressor wheel pattern shape with an annular hub (1) and a plurality of backswept blades (4,

5), each blade including a leading edge (18), an outer edge adapted for close passage to a compressor housing, and a trailing edge (16), wherein said leading edge (18) is substantially a straight edge, and wherein said blades (4, 5) define air passages between adjacent blades and are contoured such that each of said air passages between adjacent blades can be defined by not more than three die inserts (20) inserted between adjacent blades and respectively retractable along a radial or curved path by an automated process,

forming a pattern of said compressor wheel by introducing a sacrificial material into a die comprised of a plurality of rigid die inserts (20),

automatically extracting said rigid die inserts (20) radially or along a curve to expose said compressor wheel pattern,

forming a mold by a lost wax process around said compressor wheel pattern (21),

forming *said titanium compressor wheel* by investment casting in said mold.

'556 Patent, Col. 10, line 57 to Col. 12, line 17 (emphasis added).

The independent claims of the "9 Patent provide for methods for manufacturing an air boost device and a turbocharger. These independent claims do not refer to a "titanium centrifugal compressor wheel," but rather only to a "titanium compressor wheel" or simply "said compressor wheel":

1. A method for manufacturing an air boost device, said method comprising:

introducing a sacrificial material into a die comprised of a plurality of rigid die inserts (20) to form a compressor wheel pattern comprising a hub (1) defining an axis of rotation and backswept aerodynamic blades (4, 5) carried on said hub,

extracting said die inserts (20) radially or along a curve to expose said compressor wheel pattern,

forming a mold by a lost wax process around said compressor wheel pattern (21),

forming a *titanium compressor wheel* by investment casting in said mold, and

mounting *said titanium compressor wheel* within a compressor housing.

* * *

10. A method for manufacturing a turbocharger, comprising:

designing a compressor wheel pattern shape with an annular hub (1) and a plurality of backswept blades (4, 5), each blade including a leading edge (18), an outer edge adapted for close passage to a turbocharger compressor housing, and a trailing edge (16), wherein said blades (4, 5) define air passages between adjacent blades and are contoured such that each of said air passages between adjacent blades can be defined by not more than three die inserts (20) inserted between adjacent blades and respectively retractable along a radial or curved path by an automated process,

forming a pattern of *said compressor wheel* by introducing a sacrificial material into a die comprised of a plurality of rigid die inserts (20),

extracting said rigid die inserts (20) radially or along a curve to expose said compressor wheel pattern,

forming a mold by a lost wax process around *said compressor wheel* pattern (21),

forming a *titanium compressor wheel* by investment casting in said mold, and

mounting *said compressor wheel* within said turbocharger compressor housing.

"9 Patent, Col. 10, lines 38-53; Col. 11, line 10 to Col. 12, line 11 (emphasis added).

While the parties agree that a "titanium centrifugal compressor wheel" is a circular rotating component which (a) draws air in axially, (b) accelerates air centrifugally, and (c) discharges air radially, the parties disagree as to whether this term is synonymous with the term "titanium compressor wheel." BorgWarner contends that "titanium compressor wheel" is used interchangeably throughout the patents with the term "titanium centrifugal compressor wheel" and therefore these terms should be construed in the same manner. BorgWarner further argues that both "titanium compressor wheel" and "titanium centrifugal compressor wheel" should be limited further to a compressor wheel which (1) operates within an air boost device and (2) is made predominantly from titanium. [Doc. 52 at 3; Doc. 57-2 at 12-23; Doc. 62 at 4-6]. Honeywell argues, on the other hand, that the patents expressly distinguish the terms "titanium compressor wheel" and "titanium centrifugal compressor wheel," and therefore it would be error to construe the terms as being synonymous. Honeywell further argues that it would be improper to require the claimed compressor wheel to be operated within an air boost device, because that limitation is not recited in the claims. Additionally, Honeywell argues that BorgWarner's proposed limitation of these terms to a compressor wheel comprised predominantly of titanium is inconsistent with the specification. [Doc. 58-2 at 11-12; Doc. 63 at 16-17, 24-25].

a. Are the terms "titanium centrifugal compressor wheel" and "titanium compressor wheel" interchangeable?

Examining the language of the claims themselves, the Court notes that the terms "titanium compressor wheel" and "compressor wheel" are used throughout the claims of the '347 Patent and the '556 Patent to refer to a "titanium centrifugal compressor wheel." For example, independent Claim 1 of the '347 Patent recites a "titanium centrifugal compressor wheel." '347 Patent, Col. 10, line 26. This limitation is referenced in the following dependent claim as a "titanium compressor wheel as in claim 1...." Id. at Col. 10, line 37. In Claim 7 of the '556 Patent, a method is described for the manufacturing of "a cast titanium centrifugal compressor wheel." '556 Patent, Col. 11, line 15. In the following dependent claim, the cast titanium centrifugal compressor wheel of independent Claim 7 is referred to as "said compressor wheel." Id. at Col. 12, line 7. In the "9 Patent, however, a distinction clearly is made between the term "titanium compressor wheel" and "titanium centrifugal compressor wheel." Claim 1 of the "9 Patent describes a method for manufacturing an air boost device, "said method comprising ... forming a *titanium compressor wheel* by investment casting...." ' 949 Patent, Col. 10, lines 38-51. In the following dependent claim, a method is claimed "wherein *said compressor wheel* is a *centrifugal compressor wheel* adapted for drawing air in axially, accelerating said air centrifugally, and discharging air radially." Id. at Col. 10, lines 54-57 (emphasis added). This claim language clearly indicates that a centrifugal compressor wheel is *a type of* compressor

wheel. In other words, while a "titanium centrifugal compressor wheel" may be a "titanium compressor wheel," a "titanium compressor wheel" need not necessarily be centrifugal. Accordingly, the plain language of the claims does not support BorgWarner's contention that these terms are synonymous and interchangeable.

BorgWarner's own expert recognized the distinction between these terms, noting that the term "titanium compressor wheel" could refer to either a centrifugal compressor wheel or an axial compressor wheel:

Q. And what about the term "titanium compressor wheel" without the word "centrifugal" in there? What does that mean to you?

A. Oh, I see. Well, it's more of a generic term. That is, centrifugal is a subset of compressor wheels.

Q. So a titanium compressor wheel could be axial?

A. Yes.

[Deposition of John K. Thorne ("Thorne Dep."), Doc. 58-14 at 10].

For these reasons, the Court concludes that the terms "titanium compressor wheel" and "titanium centrifugal compressor wheel" are not synonymous.

b. Must the compressor wheel be operated within an air boost device?

In determining whether the patent claims require the subject compressor wheel to be operated within an air boost device, the Court first examines the language of the claims themselves. While the claims of the "9 Patent specifically contemplate the use of a compressor wheel within an air boost device, *see* "9 Patent, Claims 1 and 10, the claims of the '347 Patent and '556 Patent do not. The '347 Patent claims are directed to the compressor wheel itself, while the '556 Patent claims are directed to the method of manufacturing the compressor wheel. Only the claims of the "9 Patent, which are directed to the manufacture of an air boost device comprised of, among other things, a compressor wheel, can be read as requiring the use of the compressor wheel within an air boost device. The plain language of the claims therefore do not support a limitation of the terms "titanium centrifugal compressor wheel" and "titanium compressor wheel" in each of the patents-in-suit solely to compressor wheels used in an air boost device.

Turning now to the other intrinsic evidence of record, the Court notes that the specification expressly provides that "[t]he present invention concerns a titanium compressor wheel *for use in an air boost device*." '347 Patent, Col. 1, lines 5-10 (emphasis added); Id. at Col. 1, line 64 to Col. 2, line 12 (discussing use of compressor wheel in engine exhaust systems). Such statements do not, however, necessarily limit the scope of the patents to compressor wheels used in air boost devices. "Absent a clear disclaimer of particular subject matter, the fact that the inventor may have anticipated that the invention would be used in a particular way does not mean that the scope of the patent is limited to that context." Northrop Grumman Corp. v. Intel Corp., 325 F .3d 1346, 1355 (Fed.Cir.2003). The specification in the present case does not disavow any embodiment other than one operating within an air boost device, nor does it suggest that the subject invention must always be used in that fashion. Indeed, the specification explicitly provides, in pertinent part, as follows:

Although this invention has been described in its preferred embodiment with a certain [amount] of particularity with respect to an automotive internal combustion compressor wheel, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of structures and the composition of the combination may be resorted to without departing from the spirit and scope of the invention.

'347 Patent, Col. 10, lines 10-23. For these reasons, the Court concludes that, notwithstanding the repeated references to the anticipated use of the subject compressor wheel in an air boost device throughout the specification, the terms "titanium centrifugal compressor wheel" and "titanium compressor wheel" are not construed as being limited to a wheel operated within an air boost device.

c. Must the compressor wheel be "comprised predominantly of titanium"?

In the specification, the inventors explicitly defined the term "titanium compressor wheel" as "a compressor wheel *comprised predominantly of titanium, and includes titanium alloys,* preferably light weight alloys such as titanium aluminum alloy." '347 Patent, Col. 6, lines 44-47 (emphasis added). BorgWarner argues that the reference to "titanium alloys" in this passage is designed to provide the reader of an example of a composition "comprised predominantly of titanium." Thus, BorgWarner contends, this phrase requires the titanium compressor wheel to be comprised predominantly of titanium or an alloy that is comprised predominantly of titanium. [Doc. 57-2 at 12-15]. Honeywell argues, on the other hand, that this phrase should be construed to mean that the titanium compressor wheel can be comprised predominantly of titanium, but that it can also be made of alloys, and that these alloys need not necessarily be predominantly titanium. [Doc. 58-2 at 26-27; Doc. 63 at 24-25].

The inventors' use of the phrase "and includes titanium alloys" within the definition of "titanium compressor wheel" is admittedly not the model of clarity. Using basic principles of grammar and sentence construction, it appears to the Court that the phrase "and includes titanium alloys" was included to modify the term "titanium." In other words, the phrase "and includes titanium alloys" indicates a subset of "titanium," the material which must be used predominantly in the manufacture of the compressor wheel. Thus, a plain reading of this definition requires that the compressor wheel be comprised predominantly of either (1) pure titanium or (2) a titanium alloy.

The Court's construction of this term is supported by the prosecution history of the '347 Patent. The Patent Examiner initially rejected Claim 8 as being indefinite. Specifically, the Patent Examiner noted that the claim recited that the compressor wheel is "selected from titanium" when the claim already recited that the compressor wheel is titanium. In response, the inventors stated as follows:

Applicants submit that the term "titanium compressor wheel" is understood in the art as referring to a wheel formed *primarily of titanium, i.e., either a titanium alloy or pure titanium,* though overwhelmingly in practice the alloy is used. The term is so defined in paragraph 00037 of the present specification.

[Doc. 58-16 at 7-8] (emphasis added).

Having determined that the titanium compressor wheel may be comprised predominantly of (1) pure titanium or (2) a titanium alloy, the Court turns to the issue of whether the "titanium alloy" used itself must be "comprised predominantly of titanium." Examining the language of the claims, the Court notes that in each instance where the claims recite the specific titanium composition of the alloy used, the claims

expressly require a material composed predominately of titanium. For example, in both Claim 13 and Claim 14 of the ' 949 Patent, which recite methods of manufacturing a compressor wheel formed of a titanium alloy, the titanium alloy specified is one in which titanium is the element of highest concentration:

13. A method as in claim 12, *wherein said titanium alloy comprises 85-95% titanium, 2-8% aluminum, and 2-6% vanadium*.

14. A method as in claim 12, *wherein said titanium alloy comprises approximately 90% titanium, 6% aluminum, and 4% vanadium*.

"9 Patent, Col. 12, lines 16-20 (emphasis added).

Additionally, Claims 6 and 9 of the '556 Patent make reference to a "titanium-aluminum alloy." As noted by BorgWarner's expert, Dr. John K. Thorne, the fact that titanium is listed before aluminum in the naming of this alloy indicates to one of ordinary skill in the art that titanium is the element of highest concentration. [Declaration of Dr. John K. Thorne ("Thorne Decl."), Doc. 55 at para. 30 ("the first named constituent element is the element of highest concentration in the alloy")].

Dr. Thorne further explained in his deposition that the most common titanium alloys are ones in which titanium is clearly and unambiguously the dominant element-usually in excess of 90% of the composition. [Thorne Dep., Doc. 57-12 at 3]. Dr. Thorne's opinion is confirmed by *Marks' Standard Handbook for Mechanical Engineers* (9th ed.1987), which contains a table listing the typical compositions of titanium alloys. In all of these alloys, titanium is the greatest constituent ingredient by weight. [Doc. 57-14 at 4].

Honeywell urges the Court to adopt the definition set forth in *The New Oxford American Dictionary* 44 (2001), which defines "alloy" as a "metal made by combining two or more metallic elements, esp. to give greater strength or resistance to corrosion." Honeywell contends that nothing in this definition requires an alloy to be comprised predominantly of one metal. [Doc. 58-2 at 27]. Honeywell's reliance on a definition from a general usage dictionary, however, is not persuasive in light of Dr. Thorne's testimony. "[A] general-usage dictionary cannot overcome credible art-specific evidence of the meaning or lack of meaning of a claim term." Vanderlande Indus. Nederland BV v. Int'l Trade Comm'n, 366 F.3d 1311, 1321 (Fed.Cir.2004).

For the foregoing reasons, the Court concludes that the term "titanium centrifugal compressor wheel" should be construed as a centrifugal compressor wheel comprised predominantly of either pure titanium or a titanium alloy. The term "titanium compressor wheel" should be construed as a compressor wheel comprised predominantly of either pure titanium or a titanium alloy. The term "titanium alloy" is construed to mean an alloy wherein titanium is the greatest constituent ingredient by weight. The term "titanium-aluminum alloy" is construed to mean a metal alloy that is comprised of titanium and aluminum, wherein titanium is the greatest constituent ingredient by weight.

2. "Backswept Aerodynamic Blades"

The parties agree that the term "backswept blades" should be construed as blades with an end portion angled backward (*i.e.,* opposite the direction of rotation) from the radial direction. [Doc. 52 at 2]. Where the parties differ, however, is with respect to the term "aerodynamic." BorgWarner contends that the use of the term "aerodynamic" in this context should be construed to mean that a given blade design is suitable for air boost applications. [Doc. 62 at 12-17]. While Honeywell initially proposed a definition in the Joint Claim

Construction Statement defining "aerodynamic" as allowing air to flow [Doc. 52 at 3], Honeywell now contends that the term "aerodynamic" is indefinite and incapable of being defined. [Doc. 58-2 at 14-17].

Section 112 paragraph 2 of the Patent Act requires the specification of a patent to "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. s. 112, para. 2. "Because claims delineate the patentee's right to exclude, the patent statute requires that the scope of the claims be sufficiently definite to inform the public of the bounds of the protected invention, *i.e.,* what subject matter is covered by the exclusive rights of the patent." Halliburton Energy Services, Inc. v. M-I LLC, 514 F.3d 1244, 1249 (Fed.Cir.2008). As the Supreme Court has stated, "[t]he statutory requirement of particularity and distinctness in claims is met only when [the claims] clearly distinguish what is claimed from what went before in the art and clearly circumscribe what is foreclosed from future enterprise." United Carbon Co. v. Binney & Smith Co., 317 U.S. 228, 236, 63 S.Ct. 165, 87 L.Ed. 232 (1942).

The Federal Circuit has applied the definiteness requirement in a variety of circumstances. For example, the Federal Circuit has held claims to be indefinite: (1) where a claim recited a means-plus-function element but failed to disclose corresponding structure in the specification, Biomedino, LLC v. Waters Techs. Corp., 490 F.3d 946, 952 (Fed.Cir.2007); (2) where a claim included a numeric limitation but did not disclose which of several methods of measurement for that number should be used, Honeywell Int'l, Inc. v. Int'l Trade Comm'n, 341 F.3d 1332, 1340 (Fed.Cir.2003); and (3) where a claim contained a term that is "completely dependent on a person's subjective opinion," Datamize, LLC v. Plumtree Software, Inc., 417 F.3d 1342, 1350 (Fed.Cir.2005). Additionally, the Federal Circuit has stated that a claim term would be indefinite if it lacked a proper antecedent basis and such basis was not otherwise present by implication or the term's meaning was not readily ascertainable. *See* Energizer Holdings, Inc. v. Int'l Trade Comm'n, 435 F.3d 1366, 1370-71 (Fed.Cir.2006). As the Federal Circuit has noted, "[t]he common thread in all of these cases is that claims were held indefinite only where a person of ordinary skill in the art could not determine the bounds of the claims, i.e., the claims were insolubly ambiguous." Halliburton, 514 F.3d at 1249.

Of course, the requirement of definiteness "does not compel absolute clarity." Datamize, 417 F.3d at 1347. A claim is indefinite only if it is not "amenable to construction" or is "insolubly ambiguous." *See* Exxon Research and Eng'g Co. v. United States, 265 F.3d 1371, 1375 (Fed.Cir.2001). "If one skilled in the art would understand the bounds of the claim when read in light of the specification, then the claim satisfies section 112 paragraph 2." *Id*. As the Federal Circuit has noted, "a difficult issue of claim construction does not *ipso facto* result in a holding of indefiniteness." *Datamize,* 147 F.3d at 1347. "If the meaning of the claim is discernible, even though the task may be formidable and the conclusion may be one over which reasonable persons will disagree," the claim will be deemed "sufficiently clear to avoid invalidity on indefiniteness grounds." Exxon, 265 F.3d at 1375; Halliburton, 514 F.3d at 1249-50 (noting that indefiniteness standard "is met where an accused infringer shows by clear and convincing evidence that a skilled artisan could not discern the boundaries of the claim based on the claim language, the specification, and the prosecution history, as well as her knowledge of the relevant art area"). "By finding claims indefinite only if reasonable efforts at claim construction prove futile, [the court can] accord respect to the statutory presumption of patent validity, and ... protect the inventive contribution of patentees, even when the drafting of their patents has been less than ideal." *Id*. (citation omitted).

The language of the claims do not offer substantial guidance in defining the term "aerodynamic." For example, Claim 1 of the '347 Patent recites "[a] titanium centrifugal compressor wheel ... including ... a plurality of backswept aerodynamic blades carried on the surface of said hub and defining air passages

between adjacent blades." '347 Patent, Col. 10, lines 26-32. Claim 5 of the '347 Patent recites "[a] cast titanium centrifugal compressor wheel comprising ... a plurality of backswept aerodynamic blades, each of said blades including a leading edge, an outer edge adapted for close passage to a compressor housing, and a trailing edge, ... wherein said blades are designed such that a single solid die insert defining the space between adjacent blades can be inserted between adjacent blades and retracted along a radial or curved path." Id. at Col. 10, lines 45-57. The ' 556 Patent and "9 Patent recite similar limitations with respect to the aerodynamic blades of the compressor wheel. While the claims delineate where the "backswept aerodynamic blades" are located, what physical characteristics they possess, and what purpose they serve within the invention, the claims do not offer any standard by which the aerodynamic feature of these blades can be measured or otherwise ascertained.

Turning now to the specification, under the "Summary of the Invention," the inventors note that they sought to design a titanium compressor wheel which would have "aerodynamic efficiency, when operating at the high RPM at which titanium compressor wheels are capable of operating, ... *comparable to the efficiency of the complex state-of-the-art compressor wheel designs*.... " ' 347 Patent, Col. 4, lines 13-17 (emphasis added). The inventors go on to state that the prior art compressor wheels were "designed for optimum aerodynamic efficiency, and thus have narrow blade spacing and complex leading and trailing edge design (excess rake, undercutting and backsweep, complex bowing and leading edge hump and dip)." Id. at Col. 4, lines 28-32. The inventors claim that despite its simplified design, the subject compressor wheel "has an entirely satisfactory aerodynamic performance" at high RPM, and that it has a degree of aerodynamic efficiency "comparable to that of a complex compressor wheel design." Id. at Col. 4, lines 43-46, 47-50. Under the "Detailed Description of the Invention," the inventors stress that "it must be understood that the shape, contours and curvature of the blades are modified to provide a design which ... provides aerodynamically acceptable characteristics at high RPM...." Id. at Col. 6, lines 48-52.

As the specification makes clear, the purpose of the present inventions was to develop a high-strength, heat-resistant compressor wheel to achieve high RPM and high pressure ratios in turbocharging applications. '347 Patent at Col. 4, lines 8-22. The inventors specifically did not seek to improve the aerodynamic efficiency of the compressor wheel with their design; rather, the inventors intended to provide a stronger, heat-resistant titanium compressor that was *comparable* to the prior art in terms of aerodynamic efficiency. The experts presented by BorgWarner in this case agree that one of ordinary skill in the art "would have a bachelors degree in Mechanical Engineering, or related fields, with a minimum of 5 years of experience designing compressor wheels and an awareness of the processes by which compressor wheels are manufactured." [Declaration of Dr. Nicholas C. Baines ("Baines Decl."), Doc. 53 at para. 37; Thorne Decl., Doc. 55 at para. 27]. Honeywell has not offered any competing evidence of what would constitute ordinary skill in the art. Considering this level of skill, it is difficult to conceive that a mechanical engineer with five years or more of experience designing compressor wheels would be incapable of determining whether a particular compressor wheel was comparably aerodynamic to that of the prior art. Because "one skilled in the art would understand the bounds of the claim when read in light of the specification," Exxon, 265 F.3d at 1375, the Court concludes that the term "aerodynamic" is not indefinite.

Having determined that the term "aerodynamic" is not indefinite, the Court will now endeavor to construe the term. "Aerodynamic" is commonly defined as "designed to reduce or minimize the drag caused by air as an object moves though [sic] it or by wind that strikes and flows around an object." http://dictionary.reference.com/browse/aerodynamic (last visited February 20, 2009) (quoting *American Heritage Science Dictionary* (2002)). BorgWarner argues for a narrower definition, arguing that the term "aerodynamic" is used in the Patents-in-Suit to describe blades that are "shaped for use in air boost

applications." [Doc. 66 at 10]. For the reasons previously stated in this opinion, the compressor wheels which are the subject of the patents-in-suit are not limited to use in air boost devices, and thus it would be inappropriate to limit the term "aerodynamic" to describing compressor wheel blades for use in air boost applications. Accordingly, the Court construes the term "backswept aerodynamic blades" to mean blades that have an end portion angled backward (*i.e.,* opposite the direction of rotation) from the radial direction and which are designed to reduce or minimize the drag caused by air that strikes and flows around the blades.

3. "Air Passages Between Adjacent Blades"

The independent claims of the '347 Patent recite claims for a titanium centrifugal compressor wheel which has "a plurality of backswept aerodynamic blades ... defining air passages between adjacent blades." '347 Patent, Col. 10, lines 26-31, Col. 10, line 61 to Col. 11, line 4. Similarly, Claim 7 of the '556 Patent and Claim 10 of the "9 Patent recite methods for manufacturing a compressor wheel that has "a plurality of backswept blades ... wherein said blades ... define air passages between adjacent blades...." ' 556 Patent, Col. 11, line 15 to Col. 12, line 1; "9 Patent, Col. 11, lines 10-18.

As shown in Figure 1 of the Patents-In-Suit, reproduced *supra,* the compressor wheel includes two different types of blades: "full blades" (item 4), which span the full height of the wheel, and "splitter blades" (item 5), which are shorter blades in between the full blades. According to the specification, "[s]plitter blades differ from full blades mainly in that their leading edge begins further axially downstream as compared to the full blades." '347 Patent, Col. 7, lines 30-33. BorgWarner argues that "air passages between adjacent blades" refers only to the space between two full blades without regard to the presence of a splitter blade. [Doc. 57-2 at 19-23]. Honeywell asserts on the other hand that, when a splitter blade is present, a proper construction comprises the space between a full blade and a splitter blade. [Doc. 58-2 at 18-20].

Honeywell's proposed construction of this term is most consistent with the language of the claims. For example, Claim 7 of the '556 patent claims "wherein said blades (4, 5) define air passages between adjacent blades." ' 556 Patent, Col. 11, lines 22-23. The specification and the diagrams make clear that reference numbers 4 and 5 refer to full and splitter blades, respectively. Id. at Col. 7, lines 47-49 ("A series of evenly spaced thin-walled full blades 4 and splitter blades 5[ ] form an integral part of the compressor wheel."); Id. at Fig. 1 (illustrating full blades and splitter blades). The dependent claims confirm that the referenced blades are not limited to "full" blades. Id. at Col. 11, lines 10-12 ("wherein said aerodynamic blades comprise alternating full blades (4) and splitter blades (5)"); Id. at Col. 12, lines 18-19 ("A method as in claim 7, wherein said blades comprise full blades and splitter blades.").

Honeywell's proposed construction is also consistent with the ordinary meaning of "adjacent," which is "to lie near, border on; not distant or far off; relatively near and having nothing of the same kind intervening." *Webster's Third New International Dictionary* 26 (2002). The ordinary meaning of the term "adjacent" would suggest that the air passage is created by a blade and the next adjoining blade, whether that blade is a full blade or a splitter blade. Construing "air passage between adjacent blades" as the space between two full blades without regard to the presence of a splitter blade, as proposed by BorgWarner, would require omitting the "adjacent" limitation from the claim. "A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so." Merck & Co. v. Teva Pharms., USA, Inc., 395 F.3d 1364, 1372 (Fed.Cir.2005).

The specification provides further support for Honeywell's proposed construction. The specification

describes one of the inventions' preferred embodiments as using a die of twelve "simple" die inserts to define a wheel with six full-length and six splitter blades. '347 Patent at Col. 9, lines 8-18 ("the die preferably has a total of either 12 (simple) or 24 (compound) inserts for making a total of 6 full length and 6 'splitter' blades"); The specification explicitly defines "simple die inserts" as referring to one die insert per air passage. Id. at Col. 5, lines 9-11 ("the blades are designed to permit pulling of simple die inserts (*i.e.*, one die insert per passage)"). Thus, the specification makes clear that the "air passage" refers to the space between *each* blade in the compressor wheel, whether that blade is a full blade or a splitter blade.

For these reasons, the Court concludes that the phrase "air passages between adjacent blades" should be construed as the space between either a full blade and a splitter blade or two full blades.

4. "Retracted," "Retractable," "Retraction," "Pulled," and "Expose Said Compressor Wheel Pattern"

As used in the claims of the '347, '556 and "9 Patents, the terms "retracted," "retraction," "retractable," and "pulled" and the phrase "expose said compressor wheel pattern" are used to refer to the act of withdrawing the die inserts from the wax pattern. *See, e.g.,* '347 Patent, Col. 10, lines 34-36 (wherein die inserts "can be ... pulled from between said blades without deformation of said dies or blades"); Id. at Col. 12, lines 1-3 (wherein die inserts "can be retracted along a radial or curved path without deformation of said blades or dies"); '556 Patent, Col. 10, lines 64-66 (describing method of manufacturing compressor wheel which involves "extracting said die inserts (20) radially or along a curve to expose said compressor wheel pattern"); Id. at Col. 12, lines 10-12 (same); "9 Patent, Col. 10, lines 46-47, Col.. 12, lines 4-5 (same); '556 Patent, Col. 11, lines 3-4 (describing method where "die insert retraction is by an automated process"); "9 Patent, Col. 10, lines 61-62 (same).

The parties are in general agreement regarding the construction of each of these terms except in one significant respect: BorgWarner argues that each of these terms should be limited by the additional requirement that the withdrawal of die inserts "renders the pattern easily removable from the die." [Doc. 57-2 at 15-19; Doc. 62 at 20-27]. Honeywell argues that BorgWarner's inclusion of an "easily removable" limitation is improper in that (1) it attempts to import a limitation from the specification into the claims; (2) it seeks the addition of a functional limitation to a purely structural claim; and (3) it would render the terms indefinite. [Doc. 58-2 at 21-24; Doc. 63 at 6-12].

The specification makes clear that by simplifying the casting process, the inventors sought to achieve the goal of providing "a process by which titanium compressor wheels could be mass produced by a simple, low cost, economical process." '347 Patent at Col. 6, lines 37-39. To achieve this goal, the inventors re-designed the compressor wheel so as to facilitate the removal of die inserts during the investment casting process. *See* '347 Patent, Col. 5, lines 1-7 ("The compressor wheel may have curvature, and may be of any design so long as the blade leading edges have no dips and no humps, and the blades have no undercut recesses and/or back tapers created by the twist of the individual air foils with compound curves of a magnitude which would prevent *extracting* the die inserts radially or along some curve or arc *in a simple manner*."); Id. at Col. 5, lines 14-17 ("In a more advanced form, the blades are designed with some degree of rake or backsweep or curvature, but only to the extent that two or more, preferably two[,] inserts[ ] per air passage can be *easily automatically extracted*.") (emphasis added). Specifically, the inventors noted that the complexity of the blade design of the prior art "would make it impossible to cast such a shape in one piece in an automatic process, since the geometry would *impede the withdrawal of die inserts* or mold members." Id. at Col. 7, lines 45-48 (emphasis added). In comparison, the compressor wheel envisioned by the subject

patents was "designed beginning foremost with the idea of making die inserts *easily retractable*." Id. at Col. 7, lines 49-52 (emphasis added). To ensure that the die inserts remained easily retractable in the case of blades exhibiting a modest amount of backsweep, the inventors recommend the use of compound die inserts in order to "facilitate die insert removal." Id. at Col. 9, line 65 to Col. 10, line 3.

Further, the "Detailed Description of the Invention" and accompanying illustrations demonstrate a scheme for ensuring easy removal of a completed pattern. *See* id. at Col. 8, line 57 to Col. 9, line 11; Figs. 7-10. For example, Figures 7 and 8 illustrate, from a top view, a die assembly for making a wax pattern of the inventive titanium compressor wheel. Figure 7 shows the die assembly with all its inserts (label 20) in a closed condition around a wax pattern (label 21). Figure 8 shows the die assembly in an open condition, with inserts (label 20) withdrawn along radial paths to expose the pattern (label 21). Significantly, Figure 8 shows the inserts withdrawn a sufficient distance from the closed position so as to more than clear the periphery of the wax pattern.

Reading the intrinsic evidence as a whole, therefore, a person of ordinary skill would understand that withdrawing the die inserts "to render the pattern easily removable from the die" reflects a requirement that must be satisfied to render the invention operable for its intended purpose. *See* Apple Computer, Inc. v. Articulate Systems, Inc., 234 F.3d 14, 25 (Fed.Cir.2000) ("[T]he claim must be interpreted in light of the teachings of the written description and purpose of the invention described therein."); *see also* CVI/Beta Ventures, Inc. v. Tura LP, 112 F.3d 1146, 1160 (Fed.Cir.1997) ("the problem the inventor was attempting to solve, as discerned from the specification and the prosecution history, is a relevant consideration"). As BorgWarner's expert Dr. Baines noted in his deposition, to a person of ordinary skill, withdrawing the die inserts without rendering the pattern easily removable does not make any sense in terms of improving the manufacturability of the wheel:

Q. And one of those ways of withdrawing a wax pattern from the die would be in an easily removable way, correct?

A. That's one of the ways, yes.

Q. Another way would be a less easy way, correct?

A. Yes.

Q. Another way might be a difficult way of withdrawing the wax pattern from the die?

A. It's possible, *but that would not provide an economic solution to the compressor manufacturer*.

[Baines Dep., Doc. 62-5 at 6] (emphasis added). Dr. Thorne also testified that no one in the field would consider a process which would require the operator to wiggle, jiggle, or ease the wax mold out in order to remove it from the tooling. [*See* Thorne Dep., Doc. 62-7 at 3-4 (noting that for "economic removal" there is "only one way to remove the pattern from the die ... you've got to get all the insert segments clear")].

Honeywell asserts that the prosecution history demonstrates that the inclusion of an "easily removable" limitation would be improper. Specifically, Honeywell points to a single statement that the inventors made to the Patent Examiner, in which the inventors sought to distinguish the inventive compressor wheel from certain prior art by pointing out that the prior art wheel is "non-pullable" due to its complex geometry, *i.e.*,

that " *no* die inserts could be pulled from between the [wheel] blades," whereas the inventive titanium wheels have simplified wheel blade design so that the die inserts " *could be* withdrawn from between the blades." [Doc. 62-8 at 10] (emphasis added). Viewing this statement in context, it is clear that this statement was made to overcome a specific piece of prior art in which the die inserts could not be withdrawn *at all*. Such statement cannot reasonably be viewed as limiting the inventive wheel design simply to die inserts that *could be* withdrawn.

Honeywell further asserts that by incorporating "to render the pattern easily removable from the die" into the construction of "retracted" and "pulled," BorgWarner has improperly read a functional limitation into the structural claims of the '347 Patent. Honeywell's allegation is factually and legally incorrect. The asserted patents claim a compressor wheel and the process of making a compressor wheel; the die inserts are not structural components of the claimed compressor wheel. As such, words describing the operations of die inserts to make a wax pattern, such as "retracted" and "pulled," are included in the claim language not to provide additional functional limitations for the claimed compressor wheel but to help define the physical structure of the compressor wheels. A wheel whose shape cannot be produced by pulling a die insert a sufficient distance to render the wax pattern easily removable does not satisfy the requirements of the claim terms.

In any event, the law does not preclude inclusion of such functional limitations into claim construction, contrary to what Honeywell argues. The Federal Circuit has held that the functions of the various parts of an invention may serve as implicit claim limitations. Medrad, Inc. v. MRI Devices Corp., 401 F.3d 1313, 1319 (Fed.Cir.2005) ("It is therefore entirely proper to consider the functions of an invention in seeking to determine the meaning of particular claim language."). Therefore, the proper meanings of the disputed claim terms relating to how the die inserts are withdrawn can only be determined with a full understanding of what the inventors actually invented and the purpose they intend to achieve with the invention. Although the claim language does not expressly recite "easily removable," the written description states the purpose of this invention as to develop a "cost-effective manufacturing technique for manufacturing automobile or truck industry scale titanium compressor wheels." '347 Patent, Col. 2 at lines 21-27. The written description also requires the compressor wheel be designed in such a way that "the die inserts can automatically be extracted radially or along some compound curve or axis in order to expose the wax pattern for *easy removal*." '347 Patent, Col. 4, lines 61-67 (emphasis added). These statements clearly require the die insert blades to be withdrawn a sufficient distance from the completed wax pattern so it can be easily removed.

Honeywell further asserts that adding the phrase "easily removable" to the claim's construction renders the claim indefinite because a person of ordinary skill cannot quantify that phrase. Specifically, Honeywell relies upon the deposition testimony of Dr. Thorne in an attempt to show that even the Plaintiffs' expert found the term "easily removable" unable to quantify. Read more fully, however, Dr. Thorne's testimony makes clear what is required by this phrase:

Q. So if you could reach into the cavity after extracting the dies to lift the pattern out, that's easy removal?

A. Right. Sometimes that's assisted with compressed cylinders to slightly lift the wax pattern away from the bottom platen, bottom portion of the die and extraction type pins as they call them. And then it can be just lifted out.

Q. What would not be easily removed? What features would cause-

A. Well, for sure, if the inserts are interfering with the clearance of the-of this activity to remove the patterns from the die, then that's not easy. In fact, you'd probably break the wax.

[Thorne Dep., Doc. 62-7 at 4-5; *see also* Baines Dep., Doc. 62-5 at 10-12 (confirming, by reference to Figs. 9 and 10 of the asserted patents, if die inserts do not retract beyond the periphery of the pattern then the pattern cannot be easily removable)]. As confirmed by BorgWarner's experts, the phrase "easily removable" requires the inserts to be withdrawn a sufficient distance from the closed position so as to clear the periphery of the wax pattern so that the pattern may be easily removed from the die.

For all of these reasons, the Court holds that the terms "pulled," "retracted," "retraction," and "retractable" and the phrase "expose said compressor wheel pattern" are limited by the additional requirement that the withdrawal of die inserts renders the pattern easily removable from the die.

5. "Air Boost Device" and "Turbocharger"

The "9 Patent recites claims for methods for manufacturing an "air boost device" (Claim 1) and a "turbocharger" (Claim 10). "9 Patent, Col. 10, lines 38-53; Col. 11, line 10 to Col. 12, line 11. BorgWarner argues that the terms "air boost device" and "turbocharger" should be limited by the requirement that these components are for use solely in an internal combustion engine. [Doc. 57-2 at 23].FN5

FN5. The parties agree that a "turbocharger" is an air boost device driven by a turbine which is powered by exhaust gases. The parties further agree that an "air boost device" is an apparatus, such as a turbocharger, used to increase *combustion air* throughput and density. [Doc. 52 at 4]. Because the Court concludes that the patents do not limit these components to use in internal *combustion* engines, the Court does not accept the parties' apparent stipulation that an "air boost device" should be construed as an apparatus that is used to increase only *combustion* air throughput and density.

The specification makes clear that the inventors did not intend to limit the use of the inventive compressor wheel to internal combustion engines:

Although a cast titanium compressor wheel has been described herein with great detail with respect to an embodiment suitable for the automobile or truck industry, *it will be readily apparent that the compressor wheel and the process for production thereof are suitable for use in a number of other applications, such as fuel cell powered vehicles*.

"9 Patent, Col. 10, lines 23-28 (emphasis added). As BorgWarner's expert noted in his deposition, a fuel cell powered vehicle "is a very different device from the internal combustion engine, and it works on completely different principles." [Baines Dep., Doc. 63-6 at 8].

The inventors further state in the specification that the use of the subject compressor wheel within an automotive internal combustion engine is just one embodiment of the invention:

Although this invention has been described in its preferred embodiment with a certain [amount] of particularity with respect to an automotive internal combustion compressor wheel, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of structures and the composition of the combination may be resorted to without departing

from the spirit and scope of the invention.

"9 Patent, Col. 10, lines 29-36.

For these reasons, the Court concludes that the term "air boost device" should be construed as an apparatus, such as a turbocharger, used to increase air throughput and density, and that the term "turbocharger" should be construed as an air boost device driven by a turbine which is powered by exhaust gases. Neither of these terms should be limited further by adding a requirement that these components are for use solely in an internal combustion engine.

ORDER

IT IS, THEREFORE, ORDERED that the Plaintiffs' Motion for Claim Construction [Doc. 57] and the Defendant's Motion for Claim Construction [Doc. 58] are **GRANTED** to the extent that the disputed claim terms of U.S. Patent Nos. 6,663,347, 6,629,556, and 6,904,949 are hereby construed as follows:

(1) The term "compressor housing" is construed as a chamber that surrounds the compressor wheel of an air boost device, collects air expelled by the compressor wheel, and delivers the air to the engine intake.

(2) The term "backswept blades" is construed as blades with an end portion angled backward (*i.e.*, opposite the direction of rotation) from the radial direction.

(3) The term "extracting" is construed as withdrawing.

(4) The term "lost wax process" is construed to mean investment casting using a wax pattern.

(5) The phrase "by an automated process" is construed to mean by a mechanism simultaneously and/or in an ordered sequence.

(6) The term "automatically" is construed to mean by a mechanism simultaneously and/or in an ordered sequence.

(7) The term "titanium centrifugal compressor wheel" is construed as a centrifugal compressor wheel comprised predominantly of either pure titanium or a titanium alloy.

(8) The term "titanium compressor wheel" is construed as a compressor wheel comprised predominantly of either pure titanium or a titanium alloy.

(9) The term "titanium alloy" is construed to mean an alloy wherein titanium is the greatest constituent ingredient by weight.

(10) The term "titanium-aluminum alloy" is construed to mean a metal alloy that is comprised of titanium and aluminum, wherein titanium is the greatest constituent ingredient by weight.

(11) The term "backswept aerodynamic blades" is construed to mean blades that have an end portion angled backward (*i.e.*, opposite the direction of rotation) from the radial direction and which are designed to reduce or minimize the drag caused by air that strikes and flows around the blades.

(12) The phrase "air passages between adjacent blades" is construed as the space between either a full blade and a splitter blade or two full blades.

(13) The term "pulled" is construed to mean withdrawn radially or along a curvature to render the pattern easily removable from the die.

(14) The term "retracted" is construed to mean withdrawn to render the pattern easily removable from the die.

(15) The term "retraction" is construed to mean the process of withdrawing to render the pattern easily removable from the die.

(16) The term "retractable" is construed to mean capable of being withdrawn to render the pattern easily removable from the die.

(17) The phrase "expose said compressor wheel pattern" is construed as to render the pattern easily removable from the die.

(18) The term "air boost device" is construed as an apparatus, such as a turbocharger, used to increase air throughput and density.

(19) The term "turbocharger" is construed as an air boost device driven by a turbine which is powered by exhaust gases.

IT IS SO ORDERED.

W.D.N.C.,2009.
BorgWarner Inc. v. Honeywell Intern., Inc.

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