

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ABBOTT LABORATORIES,
Petitioner,

v.

MIRACOR MEDICAL SA,
Patent Owner.

IPR2025-00116
Patent 11,754,077 B1

Before ANNETTE R. REIMERS, JAMES A. TARTAL, and
JOHN D. HAMANN, *Administrative Patent Judges*.

HAMANN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Dismissing Patent Owner's Motion to Exclude Evidence
37 C.F.R. § 42.64(c)

I. INTRODUCTION

In this *inter partes* review, Abbott Laboratories (“Petitioner”) challenges the patentability of claims 1–5, 7, 10, 16–24, 26, and 28 (“the challenged claims”) of U.S. Patent No. 11,754,077 B1 (Ex. 1001, “the ’077 patent”), owned by Miracor Medical SA (“Patent Owner”). We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed herein, we determine that Petitioner does not show by a preponderance of the evidence that any of the challenged claims are unpatentable. We also dismiss as moot Patent Owner’s Motion to Exclude.

A. Procedural History

Petitioner filed a Petition requesting *inter partes* review of the challenged claims. Paper 1 (“Pet.”). Patent Owner filed a Preliminary Response. Paper 8. We instituted *inter partes* review of the challenged claims on all grounds raised in the Petition. Paper 13 (“Dec. on Inst.”), 33.

Following institution, Patent Owner filed a Response to the Petition. Paper 23 (“PO Resp.”). Petitioner filed a Reply to Patent Owner’s Response. Paper 27 (“Pet. Reply”). Patent Owner filed a Sur-reply to Petitioner’s Reply. Paper 34 (“PO Sur-reply”).

Patent Owner also filed a Motion to Exclude Evidence. Paper 35 (“Motion”). Petitioner filed a Response to the Motion (Paper 36), and Patent Owner filed a Reply for the Motion (Paper 40).

An oral hearing was held on March 5, 2026. A transcript of the hearing is in the record. Paper 54 (“Tr.”).

B. Real Parties-in-Interest

Petitioner identifies itself and Thoratec LLC as real parties-in-interest. Pet. 3. Patent Owner identifies itself as a real party-in-interest. Paper 4, 2.

C. Related Matters

The parties identify *Miracor Medical SA v. Abbott Laboratories*, 1:23-cv-16257 (the “Parallel Litigation”) as a matter that may affect, or be affected by, a decision in this proceeding. Pet. 4; Paper 4, 2. The parties also submit that IPR2025-00096 and IPR2025-00112–IPR2025-00115 are directed to patents related to the challenged patent. Pet. 3–4; Paper 4, 2.

D. The Challenged Patent

The ’077 patent provides “[a] device to assist the performance of a heart with at least one pump that is formed as a rotary pump and driven via a magneto coupling.” Ex. 1001, code (57). The ’077 patent explains that conventional external pumps that assist the performance of a heart do not provide the desired pressure at particular locations due to fluid flow of blood being affected by mechanical stress. *Id.* at 1:64–2:24. In response, the ’077 patent teaches improving fluid flow by providing “[a] completely impervious separation of [a] rotor from [a] drive wheel” via “a magneto coupling” to “eliminate[] axial passages between the drive wheel and the rotor lying distally on the outside.” *Id.* at 2:24–28.

The ’077 patent states that “[t]he rotor itself can follow design principles such as described for example in WO 01/70300 A1.” *Id.* at 2:29–30. According to the ’077 patent, “[t]he rotary pump shown and described there for conveying blood and other highly sensitive fluids is formed as an external electromagnetically driven pump which is not directly suitable for incorporation into a catheter.” *Id.* at 2:30–34. The ’077 patent discloses that for the desired conveying capacity with the axial pump, the rotor needs to have “guide surfaces to produce centrifugal flow components.” *Id.* at 2:34–38.

Figure 1 “shows a diagrammatic illustration of the arrangement of the pump and of the drive” of the '077 patent and is reproduced below. *Id.* at 3:1–3.

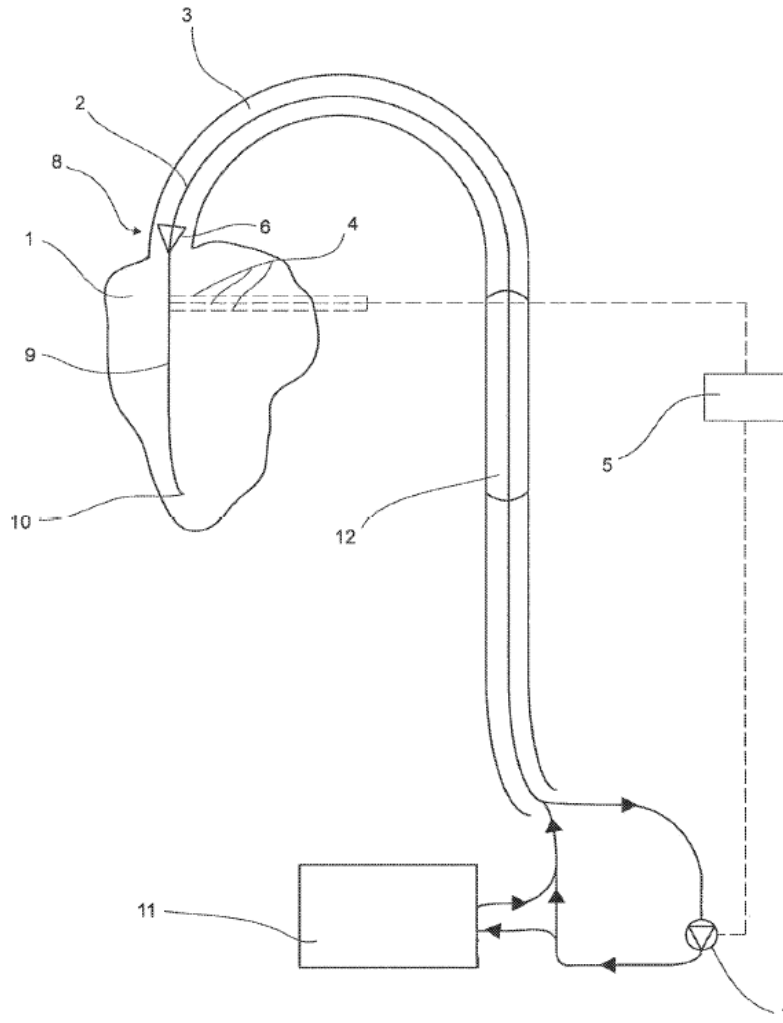


Fig. 1

Figure 1 illustrates heart ventricle catheter 2 introduced into heart 1 via aortic arch 3. *Id.* at 3:10–13. Catheter 2 carries into heart 1 sensors 4 “via which the volume can be determined” such that measurement signals are passed to control arrangement 5. *Id.* at 3:11–15. Catheter 2 has several lumina that supply fluid to drive a rotor at its distal end, which forms pump 6 to assist the blood circulation at position 8. *Id.* at 3:15–23. “The driving

medium for the rotor or the pump is guided in a circular flow by means of . . . fluid pump 7 which can be regulated in a synchronized manner as a function of the control signals generated in control arrangement 5.” *Id.* at 3:23–26. Catheter 2 has at its distal end tube 9 that leads to suction end 10. *Id.* at 3:26–29. Reservoir 11 for driving fluid provides additional driving medium for filling balloon 12 that serves for an occlusion of the artery, “and which receives again the volume of driving medium occurring on deflation of the balloon.” *Id.* at 3:29–34. Control arrangement 5 provides corresponding fixed values, “such as for example a defined cardiac output, which is referred to on deviation of the measured cardiac output to control the pump.” *Id.* at 3:39–43. The ’077 patent discloses that “[a] retroperfusion can take place via a conventional balloon catheter which is occluded in a correspondingly synchronized manner, so that the directed return is in fact guaranteed during the diastole.” *Id.* at 3:44–47.

Figure 2, reproduced below, “shows a diagrammatic illustration of the distal end of a catheter” in accordance with the ’077 patent. *Id.* at 3:3–4.

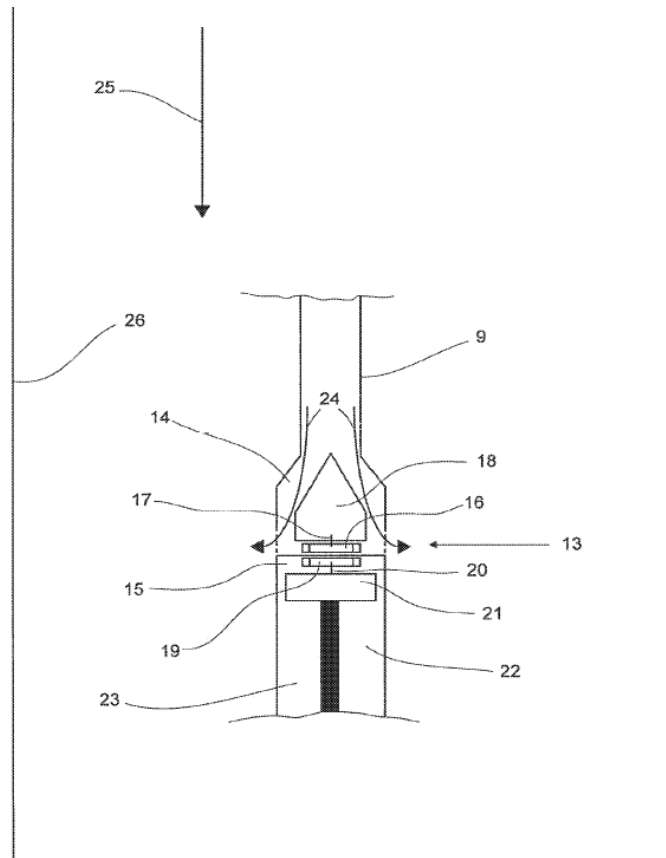


Fig. 2

Figure 2 shows the distal end of catheter 2 having end side 13 with two pocket-shaped chambers 14 and 15, “in which bar magnets [16 and 19] are respectively arranged.” *Id.* at 3:50–53. Bar magnet 16 “is connected here at the distal end outwards” via shaft 17 with rotor 18, whereas bar magnet 19 “lying on the inside is connected” via shaft 20 with drive wheel 21. *Id.* at 3:53–56. Drive wheel 21 “is formed here as a paddle wheel and is acted upon with fluid via lumen 22,” in which “this fluid flows off again via . . . lumen 23 of the catheter.” *Id.* at 3:56–59. The rotation of paddle wheel 21 “is regulated here accordingly by corresponding control of the fluid pressure” in lumen 22 serving for the supply of fluid, in which magnet 19, “which is connected so as to be locked against relative rotation” with drive

wheel 21, “is set into corresponding rotation.” *Id.* at 3:59–64. The ’077 patent discloses that “[a]t the outer side, which is completely sealed with respect to the lumina 22 and 23, the magnet 16 is subsequently entrained accordingly and drives the rotor 18 via the shaft 17, whereby a flow is formed in the region of the tube 9, as is indicated by the arrows 24, and which assists the natural blood flow in the vessel 26, illustrated by the arrow 25.” *Id.* at 3:64–4:3.

E. The Challenged Claims

Petitioner challenges claims 1–5, 7, 10, 16–24, 26, and 28 in this proceeding. Claims 1 and 16 are independent claims. Claim 1 is illustrative of the challenged claims and is reproduced below:

1. A system for assisting the blood circulation of a heart, comprising:

a heart assist pump device deliverable to the heart and comprising:

an inflow tube defining a blood inflow path and having a suction end insertable into a ventricle of the heart;

a magnetically driven rotor assembly configured to be axially aligned with the inflow tube and to be spaced apart from the suction end when the suction end of the inflow tube is inserted into the ventricle, the magnetically driven rotor assembly comprising a first magnetic device that is rigidly coupled to and axially adjacent to a rotor having guide surfaces to produce centrifugal flow components, the magnetically driven rotor assembly being rotatable about a central axis within a surrounding stationary housing to act upon blood flowing from the inflow tube to the rotor while the magnetically driven rotor assembly is entirely spaced apart from the stationary housing by a gap sized for passage of the blood;

a second magnetic device axially aligned with the inflow tube and positioned to magnetically drive rotation of the magnetically driven rotor assembly via a magneto coupling with the first magnetic device while being spaced

apart and sealed from both the rotor and the first magnetic device of the magnetically driven rotor assembly, the second magnetic device being positioned axially spaced apart from the guide surfaces of the rotor;

a blood outflow port positioned radially adjacent the guide surfaces of the rotor such that, when the blood is driven by the magnetically driven rotor assembly, the blood exits the surrounding stationary housing in a direction substantially perpendicular to the central axis of the magnetically driven rotor assembly, wherein the magneto coupling is configured to both drive rotation of the magnetically driven rotor assembly and orient the magnetically driven rotor assembly such that the magnetically driven rotor assembly remains entirely spaced apart from the surrounding stationary housing by the gap sized for passage of the blood; and

an external control unit configured to regulate operation of the second magnetic device based upon a control value indicative of cardiac output, wherein the external control unit is connectable to the heart assist pump device for controlling the second magnetic device to thereby magnetically drive the rotation of the magnetically driven rotor assembly via the magneto coupling with the first magnetic device.

Ex. 1001, 4:29–5:11.

F. Instituted Grounds of Unpatentability

We instituted trial based on the following grounds of unpatentability, which are all the grounds of unpatentability raised in the Petition:

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
1–5, 7, 10, 16–24, 26, 28	103(a)	Wampler, ²
1–5, 7, 10, 16–24, 26, 28	103(a)	Wampler, Bourque ³
1–5, 7, 10, 16–24, 26, 28	103(a)	Akamatsu ⁴
1–5, 7, 10, 16–24, 26, 28	103(a)	Akamatsu, Schima ⁵

Pet. 6, 16–145. Petitioner submits in support of its arguments the Declaration of Peter Crosby (Ex. 1003), the Reply Declaration of Peter Crosby (Ex. 1042), and the Declaration of Dr. Georg Wieselthaler (Ex. 1041). Petitioner submits in support of its arguments the Declaration of Boris Leschinsky (Ex. 2015) and the Declaration of Dr. Robert Gallegos (Ex. 2017).

II. LEVEL OF ORDINARY SKILL IN THE ART

To determine whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are

¹ The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the ’077 patent issued from an application claiming an effective filing date before March 16, 2013, we apply the pre-AIA version of the statutory basis for unpatentability.

² US 2002/0102169 A1, published Aug. 1, 2002 (Ex. 1008, “Wampler”).

³ Kevin Bourque et al., HeartMate III: Pump Design for a Centrifugal LVAD with a Magnetically Levitated Rotor, *ASAIO J.* 401–05 (2001) (Ex. 1007, “Bourque”).

⁴ Chisato Nojiri et al., Development of Terumo Implantable Left Ventricular Assist System (T-ILVAS) with a Magnetically Suspended Centrifugal Pump, *J. Artif. Organs* 2:3–7 (1999) (Ex. 1006, “Akamatsu”).

⁵ US 2003/0124007 A1, published July 3, 2003 (Ex. 1005, “Schima”).

made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citing *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962–63 (Fed. Cir. 1986)). “[O]ne or more factors may predominate.” *Id.*

In our Decision on Institution, we adopted the definition Petitioner proposes for one having ordinary skill in the art at the time of the invention of the ’077 patent. Dec. on Inst. 10. Namely, we found that one of ordinary skill in the art “would have at least a bachelor’s degree in engineering; knowledge and experience in human circulatory system anatomy and physiology; and at least five years’ experience designing and developing implantable medical devices.” *Id.* (citing Pet. 6 (citing Ex. 1003 ¶ 18)).

Patent Owner argues that one of ordinary skill in the art would have possessed “at least a bachelor’s degree in engineering, knowledge and experience in human circulatory system anatomy and physiology, and at least five years’ experience designing and developing implantable cardiac assist devices in particular.” PO Resp. 3–4. Patent Owner argues that its proposed level of skill “reflects the complicated and critical nature of cardiac assist devices” in a field that is “high risk due to the level of complication involved in device development and the critical, life-supporting nature of the heart and associated circulatory system.” *Id.* at 4 (citing Ex. 2015 ¶ 59; Ex. 2017 ¶ 34).

During oral argument, Petitioner addressed Patent Owner’s proposed level of ordinary skill, arguing that Patent Owner’s more narrow definition fails to consider the educational level of active workers in the field, and specifically the experience of the author of one of the asserted references, and that it was inconsistent with the position taken by Mr. Leschinsky in other cases. Tr. 105:14–107:17; *see also* Pet. Reply 1–2 (citing Ex. 1042

¶¶ 11–19) (arguing that the distinction in Patent Owner’s proposed level of skill is “inconsequential” and that Mr. “Crosby possesses the experience that [Patent Owner’s] definition requires, and his opinions remain the same under either definition”). Patent Owner acknowledges that it does “not seek to exclude anyone” based on Patent Owner’s proposed level of skill, states that “the difference between our definition as to theirs is we say implantable cardiac assist devices, and they say implantable medical devices,” and maintains that its proposed level of skill does not exclude the author of the asserted reference and reflects “that the subject matter is specifically technical” and “drives how that person would see the requirements for building this heart assist pump device.” Tr. 116:3–117:12. Patent Owner states that “[a]natomy has to matter,” but there is no evidence to suggest that a person with five years of experience in implantable medical devices would not have been aware of or understood the relevant anatomy as compared to a person with five years of experience in implantable cardiac assist devices. *See id.* at 114:2–115:2.

We find that the ’077 patent and the cited prior art references reflect the appropriate level of skill at the time of the claimed invention and that the level of skill reflected in these references and in the ’077 patent is consistent with the definition of one of ordinary skill in the art proposed by Petitioner, which we adopt. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). We further find that our determinations in this Decision would be the same if we were to instead adopt the level of skill proposed by Patent Owner.

III. CLAIM CONSTRUCTION

Because the Petition was filed after November 13, 2018, we apply the same claim construction standard that would be used in a civil action under

35 U.S.C. § 282(b), following the standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b); 83 Fed. Reg. 51,340, 51,340–41, 51,343 (Oct. 11, 2018). In applying such standard, claim terms generally are given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

The parties dispute the construction of “axially adjacent,” as well as the constructions of “magneto coupling,” “by a gap sized for passage of the blood,” and “axially closer.” Pet. 7–9; PO Resp. 5–10; Pet. Reply 2–14; PO Sur-reply 2–11.

First, we address the construction for “axially adjacent.” Petitioner argues that “axially adjacent” includes being “a magnetic element sealed within a rotor,” or “components that ‘overlap or occupy the same portion of an axis.’” *See, e.g.*, Pet. 20–22; Pet. Reply 3, 7. Petitioner’s support for its construction is that Patent Owner allegedly argued in infringement contentions from the Parallel Litigation that “axially adjacent” includes these meanings. Pet. 20 n.6 (citing Ex. 1019,⁶ 5–7); Pet. Reply 3–7 (citing Ex. 1036,⁷ 5, 8–9). That, however, is not how we construe claims under

⁶ Exhibit 13 of Complaint, dated November 27, 2023.

⁷ Miracor’s Supplemental Infringement Contentions, Ex. D - Claim Chart for U.S. Patent No. 11,572,879, dated May 28, 2024.

Philips. And we reject Petitioner’s assertion that a claim term may be defined based solely on an alleged infringement contention of Patent Owner in district court.

Moreover, we find that Petitioner’s contentions of what Patent Owner purportedly asserts in the Parallel Litigation to be unsupported. Exhibit 1019 depicts a device with parts labeled “First Magnetic Device” and “Magnetically Driven Rotor” along a “Central Axis.” Ex. 1019, 8. We find nothing in Exhibit 1019 that defines “axially adjacent” to include “a magnetic element sealed within a rotor,” as Petitioner alleges in the Petition.

Petitioner’s remaining assertions concerning infringement contentions appear to be based on what Patent Owner identifies as an erroneous arrow in a single figure pertaining to a filing in the Parallel Litigation. *See* PO Sur-reply 6 (stating that “Petitioner, however, points to one erroneously placed arrow on one half of the figure on page 20 of the Exhibit [1036] (while not recognizing the 16 correct figures in that document alone) and announces that Patent Owner has taken a position on axially adjacent in the co-pending litigation that is different than the position it takes here”); Tr. 57:14–60:2. We agree with Patent Owner that the contentions instead identify a magnetically driven rotor and a first magnet that are adjacent along the central pump axis. PO Sur-reply 6 (citing Ex. 1036, 6–12, 16–18, 21).

Mr. Crosby’s testimony also does not support Petitioner’s argument to construe “*axially adjacent*” to include components that overlap or occupy the same portion of an axis. Mr. Crosby’s testimony simply mirrors Petitioner’s arguments and states that he relies “on [Patent Owner’s] position from its infringement contentions (Ex. 1036), which show ‘axially adjacent’ as including components that overlap or occupy the same portion of an

axis.” Ex. 1042 ¶ 37; *see also id.* ¶ 45 (Mr. Crosby stating that “I apply [Patent Owner’s] claim construction from its infringement contentions that “*axially adjacent*” includes components that “overlap or occupy the same portion of an axis”). We find Mr. Crosby’s testimony in this regard unreliable for the same reasons, that is, because it is not sufficiently supported by the infringement contentions upon which it purports to rely.

We agree with Patent Owner that “axially adjacent” should be given its plain and ordinary meaning of “adjacent to one another as measured along a central axis.” PO Resp. 5–6; *see also* Ex. 2015 ¶¶ 73–79 (Mr. Leschinsky addressing the claim term “axially adjacent” and explaining that a person of ordinary skill would have understood it to mean that the “first magnetic device and the rotor are ‘adjacent’ to one another, i.e., disposed next to one another, as measured along the central axis about which the rotor spins”). Patent Owner’s construction also is supported by Petitioner’s expert, Mr. Crosby, who agrees that “adjacent to one another as measured along a central axis,” could be “one meaning,” along with “many other meanings.” Ex. 2014,⁸ 19:13–20:11.

In sum, consistent with our Institution Decision, we conclude that the plain and ordinary meaning of “axially adjacent” is “at a position adjacent to one another as measured along a central axis.” *See* Dec. on Inst. 12.

Second, for the reasons below, we determine that we do not need to construe any other claim terms to resolve the disputes between the parties. *See, e.g., Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)) (“[W]e need only construe

⁸ Transcript of Deposition of Peter Crosby (September 4, 2025).

terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’”).

IV. PRINCIPLES OF LAW

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner except in limited circumstances not present here. *See Dynamic Drinkware*, 800 F.3d at 1378 (discussing the burden of proof in *inter partes* review).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *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 ordinary skill in the art; and (4) objective evidence of non-obviousness, if present.⁹ *See Graham*, 383 U.S. at 17–18. When evaluating a claim for obviousness, we also must “determine whether there was an apparent reason to combine the known elements in the fashion

⁹ Patent Owner does not present arguments or evidence of such objective evidence of non-obviousness. *See generally* PO Resp.

claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

V. SUMMARY OF ASSERTED PRIOR ART REFERENCES

A. *Summary of Wampler*

Wampler, titled “Sealless Rotary Blood Pump,” relates “to continuous flow pumps of rotary design, suitable for permanent implantation in humans for use as chronic ventricular assist devices.” Ex. 1008, code (54), ¶ 2.

Wampler explains that left ventricular assist devices (LVADs) using rotary pumps to provide continuous flow are “smaller, simpler, and less expensive” than prior art designs that used pumps to provide cyclic or pulsating blood flow. *Id.* ¶ 4. According to Wampler, the prior art did not disclose “a durable rotary blood pump” due to the “unique problems with the rotary pump’s driveshaft seal.” *Id.* ¶ 5. To address this issue, Wampler discloses an improved rotary blood pump that eliminates the need for a driveshaft seal. *Id.* ¶ 6.

Figure 3 of Wampler, reproduced below, is a partial cross-sectional view of a first embodiment of a sealless rotary blood pump. *Id.* ¶ 50.

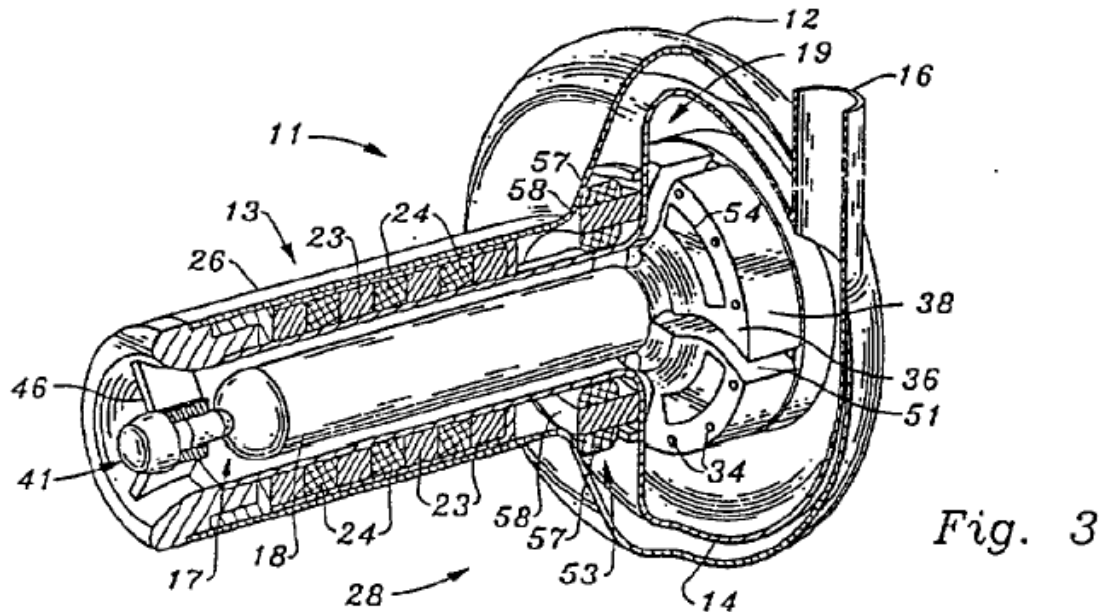


Figure 3 depicts pump 11 including housing 12 with elongated inlet tube 13 and discharge tube 16. *Id.* ¶ 50. Casing 14 encloses rotor 17, which includes spindle 18 and attached impeller 19. *Id.* ¶ 51. Forward magnetic bearing 21 and rearward magnetic bearing 22 “levitate rotor 17 and maintain it in proper radial alignment with respect to its longitudinal axis.” *Id.* ¶ 52; *see also id.* ¶ 54 (explaining that “magnetic polarizations and repulsive forces produced by the magnets and the pole pieces of forward magnetic bearing 21 are such that magnetic levitation of support shaft 18 results”). Motor 53 includes arcuate magnetic segments 54 imbedded in upper face portion 36 of impeller 19. *Id.* ¶ 70. Magnetic segments 54 have alternating polarity orientations and are directed toward motor stator 56 mounted on the outer surface of impeller casing 14. *Id.* Motor stator 56 includes pole piece 58 and windings 57, which are energized to generate an electromagnetic field that drives magnets 54 to rotate impeller 19 of

rotor 17. *Id.* ¶¶ 70, 72. According to Wampler, “[m]otor 53, with windings 57 and pole piece 58, together with magnets 54, function not only to transmit torque but also provide a restoring radial magnetic force that acts as a radial bearing.” *Id.* ¶ 73.

Figure 13 of Wampler, reproduced below, illustrates a second embodiment of a rotary blood pump. *Id.* ¶¶ 34, 37.

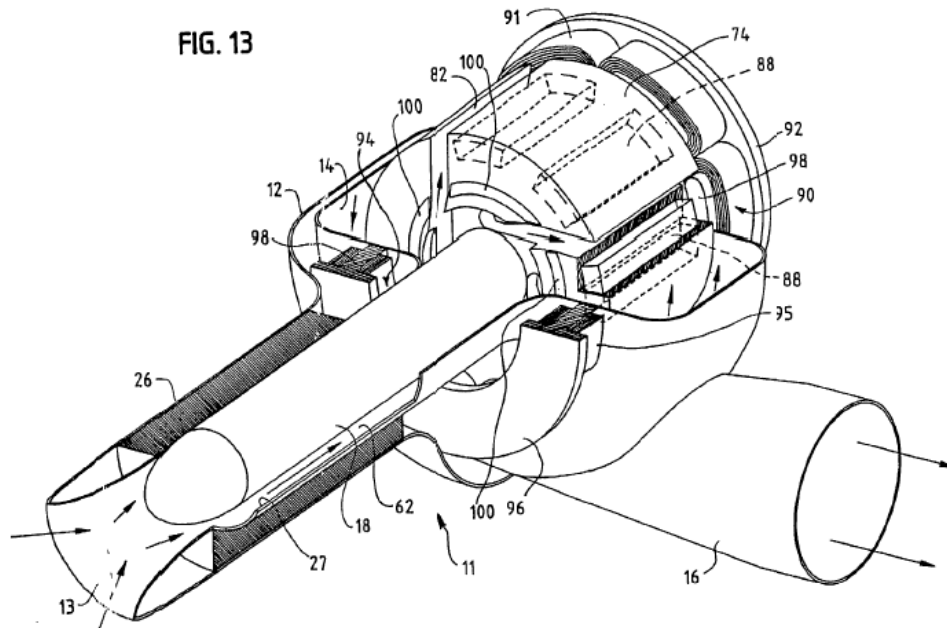


Figure 13 shows a second embodiment of pump 11 that includes first motor stator 90 comprising windings 91 and back iron 92 located at the rear side of impeller 74, between housing 12 and casing 14. *Id.* ¶ 83. Second motor stator 94 comprises windings 95 and back iron 96 fixed to casing 14 on the forward side of impeller 74. *Id.* ¶ 84. Motor stators 90 and 94 are positioned on opposite sides of casing 14 so that each is adjacent to the pole faces of rotor magnets 88. *Id.* ¶ 85.

Wampler explains that one of several advantages to the arrangement described in the second embodiment is that “hydrodynamic bearings can be located on the surface of the impeller to constrain axial motion and to provide radial support in the case of eccentric motion or shock on the

device.” *Id.* ¶ 89. The hydrodynamic bearings may take the form of raised pads 100 symmetrically located about impeller 74 that are spaced from a contact surface by a gap. *Id.* ¶¶ 89, 92. According to Wampler, once impeller rotation begins, the relative movement between the raised pads and the contact surfaces produces increased pressure within the gaps that forces the raised pads and contact surfaces apart to aid in axial and/or radial support. *Id.* ¶¶ 92–93.

B. Summary of Bourque

Bourque is titled “HeartMate III: Pump Design for a Centrifugal LVAD with a Magnetically Levitated Rotor” and relates to a “long-term, compact left ventricular assist device (LVAD) . . . featuring a centrifugal pump with a magnetically levitated rotor.” Ex. 1007, 1. Bourque explains that second generation LVAD research focused on continuous flow pumps over positive displacement pumps because continuous flow pumps have fewer mechanical parts, are smaller, and have lower cost. *Id.* According to Bourque, the HeartMate III further improves upon second generation LVADs because the pump has no mechanical bearings. *Id.* Instead, “[t]he rotor is magnetically suspended, eliminating contact between moving parts and consequently extending wear life indefinitely.” *Id.*

Figure 1B of Bourque, reproduced below, is a cross-sectional view of a model representing a HeartMate III pump. *Id.* at 2.

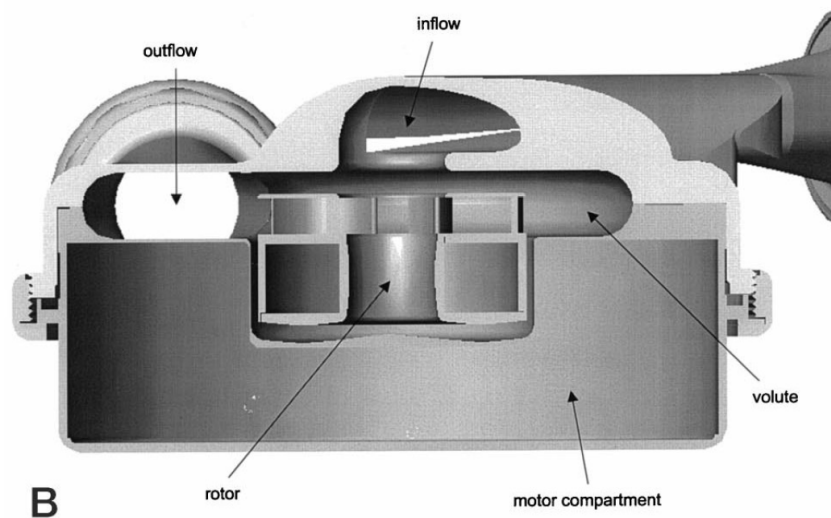


Figure 1B depicts a HeartMate III pump including an upper housing and a lower housing clamped together by a screw ring. *Id.* at 1–2. The upper housing includes an inflow channel, an outflow channel, and an upper half of a volute. *Id.* The lower housing includes a lower half of the volute and a cavity for a rotor, which encloses a motor. *Id.* The rotor includes an impeller and passive magnetic elements. *Id.*

Figure 4 of Bourque, reproduced below, is a cross-sectional diagram of the HeartMate III motor. *Id.* at 2.

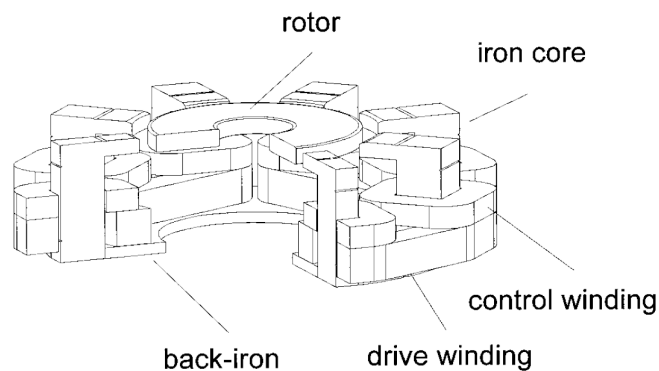


Figure 4 depicts a single magnetic structure including a back-iron, a drive winding, an iron core, and a control winding. *Id.* at 3. The magnetic

structure drives the rotor and controls rotor levitation. *Id.* at 2. Bourque explains that “[t]he rotor is passively magnetically levitated in the axial-translational and transverse-rotational degrees of freedom . . . and actively magnetically levitated in the remaining degrees of freedom.” *Id.* at 2–3; *see also id.* at 2 (explaining that “the magnetic suspension (passive in the axial direction, actively controlled in the radial direction) . . . describes the levitation system’s capacity to counteract imposed deviations of rotor position”).

C. Summary of Akamatsu

Akamatsu, titled “Development of Terumo Implantable Left Ventricular Assist System (T-ILVAS) with a Magnetically Suspended Centrifugal Pump [(MSCP)],” relates to a “study describ[ing] recent progress in the development of the T-ILVAS, focusing on ex vivo and in vivo evaluations of the prototype MSCP.” Ex. 1006, 1. Akamatsu explains that “the MSCP is a sealless rotor pump providing contact-free rotation of the impeller without any material wear,” making it “expected to be one of the most durable blood pumps.” *Id.*

Figure 2 of Akamatsu, reproduced below, is a schematic cross-sectional view of a MSCP. *Id.* at 2.

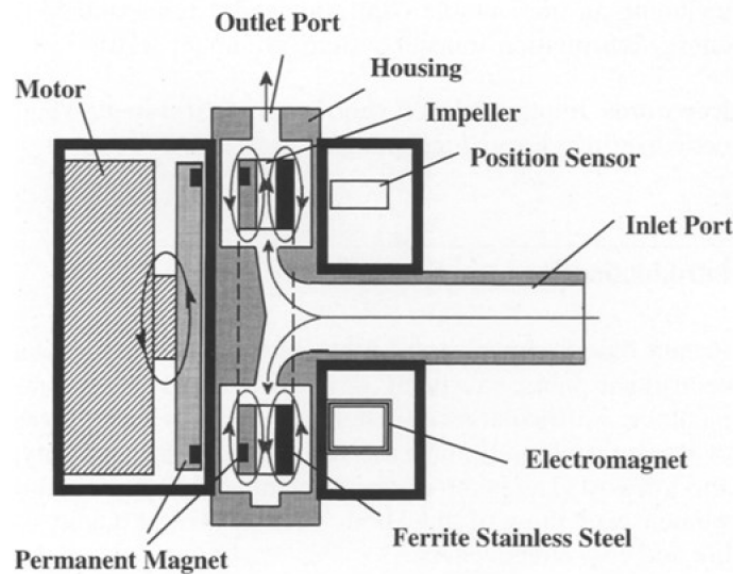


Figure 2 depicts a MSCP with its main components including a housing with an inlet port and an outlet port, an impeller suspended by a magnetic bearing, and a DC brushless motor. *Id.* The magnetic bearing comprises electromagnets and position sensors that are used to control the electric current in the electromagnets in order to suspend and “maintain the impeller free-floating at the center of the pump housing.” *Id.* The motor rotates the impeller via a magnetic coupling. *Id.* The impeller is suspended in the housing by the magnetic bearing, which comprises three electromagnets. *Id.*

D. Summary of Schima

Schima is titled “Rotary Pump Comprising a Hydraulically Mounted Rotor” and “relates to a rotary pump for moving blood and other shear-sensitive liquids with a rotor journaled hydraulically and, if necessary, magnetically in a housing.” Ex. 1005, code (54), ¶ 1. Schima explains that an object of the disclosed invention is to provide a pump with a small number of parts and a simple construction that avoids mechanical

depositions, dead-water zones, zones of reduced flow velocity, and small gaps. *Id.* ¶ 9

Figure 1 of Schima, reproduced below, is a cross-sectional view of a pump according to one embodiment. *Id.* ¶ 11.

Fig.
Abb. 1

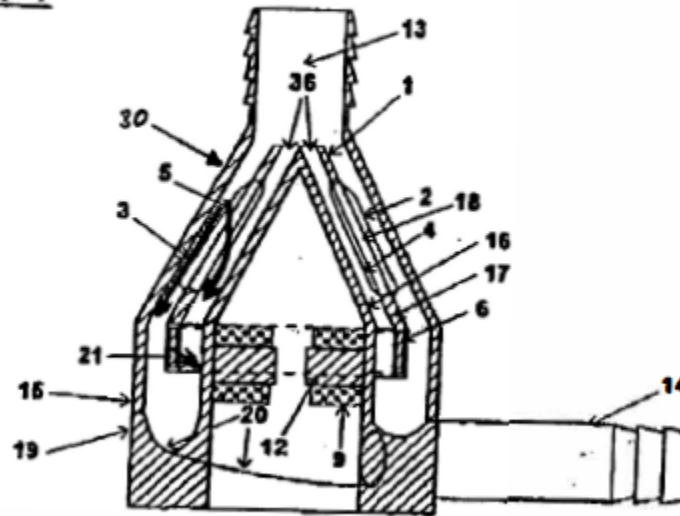


Figure 1 depicts hollow conical rotor 1 having vanes 2 and 4 that produce flow components 3 and 5, and rotor magnets 6. *Id.* ¶ 12. Rotor 1 rotates in housing 30, which comprises hollow conical upper part 15 with inlet 13, and lower part 19 with conical middle part 16 and outlet 14. *Id.* Rotor 1 also includes inlet opening 36 that distributes incoming liquid between the rotor and middle part 16. *Id.* Flow components 5 are directed axially against the conical surface of middle part 16 to effect centering of rotor 1. *Id.* Housing lower part 19 also includes stator 12 with coils 9 for generating a rotating magnetic field. *Id.* Rotor magnets 6 and stator 12 work together and are axially offset so that coupling force 21 is “effective at an angle and provide[s] an axial component for additional stabilizing of the rotor 1.” *Id.*

Figure 2 of Schima, reproduced below, is a cross-sectional view of a second pump embodiment with a different drive arrangement. *Id.* ¶ 13.

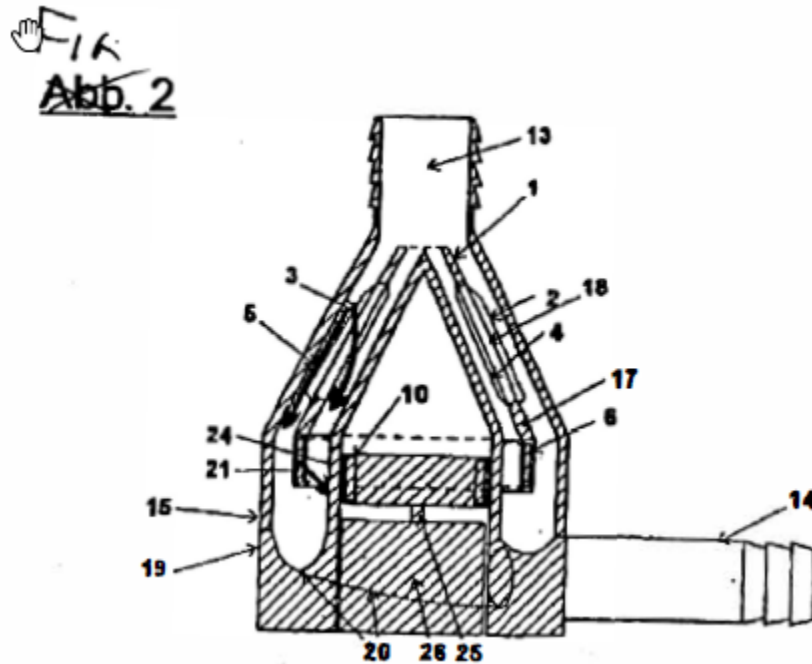


Figure 2 depicts electric motor 26 driving rotating disk 24 with magnets 10 via shaft 25. *Id.* According to Schima, “[t]his embodiment has the advantage that no electrical energy is used to journal the rotor and as a result the axial offset of the disk 24 ensures an axial component for the magnetic force 21.” *Id.*

VI. ALLEGED OBVIOUSNESS OVER WAMPLER

Petitioner argues that the challenged claims would have been obvious over Wampler. Pet. 16–52; Pet. Reply 14–20. Patent Owner argues, among other things, that Petitioner fails to show that Wampler teaches “a first magnetic device” and “a rotor” that are “axially adjacent,” as required by independent claims 1 and 16. PO Resp. 11–14; PO Sur-reply 8–9.

We agree with Patent Owner. As we discuss above, we find “axially adjacent” to mean “adjacent to one another as measured along a central

axis.” *See supra* Section III. Thus, we find unavailing Petitioner’s arguments that rest on Petitioner’s assertion that in the Parallel Litigation, Patent Owner “asserts that a magnetic element sealed within a rotor is . . . ‘*axially adjacent*.’” *Id.* at 20–21, n.6 (citing Ex. 1019, 5–7). In particular, we find unavailing Petitioner’s argument that Wampler teaches that magnetic pieces 88 (“a first magnetic device”) “are inserted [‘*axially adjacent*’] in...the **impeller**.” *Id.* at 20–21 (citing Ex. 1008 ¶ 80, Fig. 13; Ex. 1003 ¶ 174).

We also find unavailing Petitioner’s reliance on Wampler’s Figure 13 and Mr. Crosby’s cited testimony that “the ‘impeller’ and ‘magnetic pieces’ are *axially adjacent*—situated next to each other on the same axis.” *Id.* at 21–22 (annotating Ex. 1008, Fig. 13; citing Ex. 1003 ¶¶ 174–176). Petitioner does not sufficiently explain this argument, but appears to conflate being adjacent along a central axis with about an axis. *Id.*

We also find unavailing Petitioner’s argument that under Patent Owner’s construction, Wampler also teaches this limitation, because Patent Owner “concedes that ‘*axially adjacent*’ components ‘have positioning that is next to one another, perhaps touching or sharing a common side, when measured along the axis.’” Pet. Reply 14–15 (citing PO Resp. 14). Petitioner mischaracterizes Patent Owner’s arguments and ignores Patent Owner’s showing that “axially adjacent” components are “distinct from components that are aligned with one another such that they overlap or occupy the same portion of an axis upon which they are positioned.” PO Resp. 14 (citing Ex. 2015 ¶ 78).

For the preceding reasons, Petitioner fails to show by a preponderance of the evidence that independent claims 1 and 16, as well as

the challenged, dependent claims which incorporate claims 1 and 16's limitations, would have been obvious over Wampler.

VII. REMAINING GROUNDS

Petitioner argues that independent claims 1 and 16, as well as dependent claims 2–5, 7, 10, 17–24, 26, and 28, would have been obvious over (i) the combination of Bourque and Wampler, (ii) Akamatsu, and (iii) the combination of Schima and Akamatsu. Pet. 53–145.

Claim 1 recites “an external control unit configured to regulate operation of the second magnetic device based upon a control value indicative of cardiac output.” Ex. 1001, 5:4–6. Claim 16 recites, in substance, the same limitation. *Compare id.*, with *id.* at 6:26–28. We focus on the latter part of this limitation—“a control value indicative of cardiac output.”

For the reasons we discuss below, we find that Petitioner does not show by a preponderance of the evidence that any of these three remaining grounds teaches this limitation of independent claims 1 and 16, as well as the challenged, dependent claims.

A. *Alleged Obviousness Over Bourque and Wampler*

For the combination of Bourque and Wampler, Petitioner argues that Bourque teaches “a control value indicative of cardiac output.” See Pet. 71–73, 79. In particular, Petitioner argues that “[i]n Parallel Litigation, [Patent Owner] asserts that a fixed speed or lower speed limit (*e.g.* output as measured in liters of blood per minute) is a ‘*control value indicative of cardiac output.*’” *Id.* at 71 (citing Ex. 1019, 15¹⁰). Petitioner then argues

¹⁰ Petitioner incorrectly cites to page 12, but from context we discern page 15 was meant.

that “[a]ssuming that interpretation,” Bourque teaches “that ‘[s]peed and motor parameters [to be] set and controlled’ for example, to be ‘gradually adjusted to maintain volume flow rates’ including at ‘desired maximum flow (10 L/min at 135 mm Hg)’ and ‘prescribed to run at 3,500 rpm’ (‘*control value*’).” *Id.* at 71–72 (citing Ex. 1003 ¶¶ 493–495).

We find that Petitioner fails to show by a preponderance of the evidence that a pump’s run rate is “a control value indicative of cardiac output.” Rather, the run rate indicates the output of the pump, rather than the heart. The pump assists the blood circulation of the heart, rather than replacing it, and cardiac output fluctuates depending on the heart. Petitioner offers no support for its argument that a pump’s run rate teaches a control value indicative of cardiac output, other than pointing to Patent Owner’s infringement contentions, which is insufficient. Nor does Petitioner show that the speed of the pump is a proxy of cardiac output given that cardiac output includes the output from the functioning of the heart in addition to the pump.

In sum, we find that Petitioner has not shown by a preponderance of the evidence that claims 1 and 16 would have been obvious for this ground. Petitioner’s arguments for the challenged, dependent claims do not address cardiac output, and thus Petitioner also has not shown by a preponderance of the evidence that claims 2–5, 7, 10, 17–24, 26, and 28 would have been obvious.

B. Alleged Obviousness Over Akamatsu

Petitioner argues that Akamatsu teaches “a control value indicative of cardiac output.” *See* Pet. 105–107, 113. As above, Petitioner argues that “[i]n Parallel Litigation, [Patent Owner] asserts that a fixed speed or lower speed limit is a ‘*control value indicative of cardiac output*,’” and

“[a]ssuming that interpretation, Akamatsu[] discloses that “[t]he pump was operated at a fixed rotational speed,” which teaches a control value indicative of cardiac output. *Id.* at 106 (citing Ex. 1006, 2).

As we discuss above (*supra* Section VII.A), Petitioner has not shown that a pump’s run rate is “a control value indicative of cardiac output.” Again, the run rate indicates the output of the pump, and not the heart. This distinction is even more clear when the pump operates at a fixed speed, as taught by Akamatsu.

In sum, we find that Petitioner has not shown by a preponderance of the evidence that claims 1 and 16 would have been obvious. Petitioner’s arguments for the challenged, dependent claims do not address cardiac output, and thus Petitioner also has not shown by a preponderance of the evidence that claims 2–5, 7, 10, 17–24, 26, and 28 would have been obvious.

C. Alleged Obviousness Over Akamatsu and Schima

Petitioner argues that the combination of Akamatsu and Schima teaches “a control value indicative of cardiac output.” *See* Pet. 133–135, 142. Here, Petitioner relies on its arguments for the asserted Akamatsu ground. *See id.* at 135 (citing Ex. 1006, 3–4; Ex. 1003 ¶¶ 983–984).

Accordingly, for the reasons we discuss above, (*supra* Section VII.B), we find that Petitioner has not shown by a preponderance of the evidence that claims 1 and 16 would have been obvious for this ground, as well as claims 2–5, 7, 10, 17–24, 26, and 28.

VIII. PATENT OWNER’S MOTION TO EXCLUDE

Patent Owner seeks to exclude portions of Dr. Wieselthaler’s Declaration (paragraphs 50–83 of Exhibit 1041), portions of Mr. Crosby’s Reply Declaration (paragraphs 88 and 101–114 of Exhibit 1042), portions of the deposition transcript of Dr. Wieselthaler (Exhibit 2028 at 73:3–16, 78:2,

78:5–19, 79:15–19, 80:6–81:3, 81:24–82:6, 82:18–83:19, and 84:15–85:7), and the exhibits “upon which that testimony is based” (Exhibits 1015, 1038, 1044, 1046, 1049, and 1050). Mot. 1.

We do not rely on any of these items in this Final Written Decision. Accordingly, we dismiss as moot Patent Owner’s Motion to Exclude.

IX. CONCLUSION

Based on the full record, we determine that Petitioner does not show by a preponderance of the evidence that any of the challenged claims would have been obvious.

Claim(s)	35 U.S.C. §	Reference(s) /Basis	Claim(s) Shown Unpatentable	Claims Not Shown Unpatentable
1–5, 7, 10, 16–24, 26, 28	103(a)	Wampler		1–5, 7, 10, 16–24, 26, 28
1–5, 7, 10, 16–24, 26, 28	103(a)	Wampler, Bourque		1–5, 7, 10, 16–24, 26, 28
1–5, 7, 10, 16–24, 26, 28	103(a)	Akamatsu		1–5, 7, 10, 16–24, 26, 28
1–5, 7, 10, 16–24, 26, 28	103(a)	Akamatsu, Schima		1–5, 7, 10, 16–24, 26, 28
Overall Outcome				1–5, 7, 10, 16–24, 26, 28

X. ORDER

In consideration of the foregoing, it is hereby

ORDERED that Petitioner does not show by a preponderance of the evidence that claims 1–5, 7, 10, 16–24, 26, and 28 of the ’077 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Exclude (Paper 35) is *dismissed* as moot; and

FURTHER ORDERED that parties to the proceeding seeking judicial review of this Final Written Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2025-00116
Patent 11,754,077 B1

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