Appeal No. 16-2321

IN THE

United States Court of Appeals

FOR THE FEDERAL CIRCUIT

NIDEC MOTOR CORPORATION

Appellant,

v.

ZHONGSHAN BROAD OCEAN MOTOR CO., LTD.,
BROAD OCEAN MOTOR, LLC,
BROAD OCEAN TECHNOLOGIES, LLC,

Appellees.

APPEAL FROM THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT TRIAL AND APPEAL BOARD IPR2014-01121
Sally C. Medley, Justin T. Arbes, Benjamin D.M. Wood,
James A. Tartal, and Patrick M. Boucher
Administrative Patent Judges

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BROAD OCEAN TECHNOLOGIES, LLC

Dated: January 10, 2017

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

NIDEC MOTOR CORPORATION v. ZHONGSHAN BROAD OCEAN MOTOR CO., LTD.; BROAD OCEAN MOTOR, LLC; and BROAD OCEAN TECHNOLOGIES, LLC

Appeal No. 16-2321

CERTIFICATE OF INTEREST

Counsel for the Appellees Zhongshan Broad Ocean Motor Co., Ltd.; Broad Ocean Motor, LLC; and Broad Ocean Technologies, LLC certifies the following (use "None" if applicable; use extra sheets if necessary):

1. The full name of every party represented by me is:

Zhongshan Broad Ocean Motor Co. Ltd.
Broad Ocean Motor, LLC
Broad Ocean Technologies, LLC

2. The name of each real party in interest represented by me is:

Zhongshan Broad Ocean Motor Co. Ltd.
Broad Ocean Motor, LLC
Broad Ocean Technologies, LLC

3. All parent corporations and any publicly held companies that own 10 percent or more of the stock of the party represented by me are:

Zhongshan Broad Ocean Motor Co. Ltd. is the parent company of Broad Ocean Motor LLC and Broad Ocean Technology, LLC. No publicly held company owns ten percent or more of the named Appellees.

4. The names of all law firms and the partners or associates that appeared for the party or amicus now represented by me in the trial court or agency or are expected to appear in this court **(and who have not or will not enter an appearance in this case)** are:

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Parties

Appellant:	Patent Owner -- Nidec Motor Corporation ("Nidec")
Appellees:	Petitioner Zhongshan Broad Ocean Motor Co., Ltd., Broad Ocean Motor LLC, and Broad Ocean Technologies, LLC (collectively "Broad Ocean")

Defined Terms

'349 patent	Challenged U.S. Patent No. 7,626,349 to Marcinkiewicz et al.
'379 patent	U.S. Patent No. 7,342,379 to Marcinkiewicz et al.
Appx____	Joint Appendix at page(s)
Board	Patent Trial and Appeal Board
Bessler	Bessler U.S. Patent No. 5,410,230
Hideji	English translation of Hideji Japanese Published Application JP 2003-348885 (with attesting affidavit)
IPR	*Inter Partes* Review
Kocybik	Peter Franz Kocybik, *Electronic Control of Torque Ripple in Brushless Motors* (University of Plymouth, July 2000).

STATEMENT OF RELATED CASES

Appellant Nidec Motor Corporation ("Appellant") sued Appellees Zhongshan Broad Ocean Motor Co., Ltd., Broad Ocean Motor LLC and Broad Ocean Technologies, LLC (collectively, "Appellees") for infringement of, inter alia, U.S. Patent No. 7,626,349 ("the '349 patent") and U.S. Patent No. 7,208,895 ("the '895 patent") in *Nidec Motor Corporation v. Broad Ocean Motor LLC, et al.*, Civil Action No. 4:13-cv-01895-JCH in the United States District Court for the Eastern District of Missouri.

Appellees filed two petitions for *Inter Partes* Review of claims 1, 2, 3, 8, 9, 12, 16 and 19 of the '349 patent, IPR2014-01121 and IPR2015-00762, which were joined. The Board's Final Written Decision invalidating claims 1, 2, 3, 8, 9, 12, 16 and 19 is the subject of this appeal, Appeal No. 2016-2321.

Appellees also filed a Petition for *Inter Partes* Review of claims 9 and 21 of the '895 patent, IPR2014-01122. The Board's Final Written Decision invalidating claims 9 and 21 of the '895 patent is the subject of Appeal No. 2016-1900, now pending before this Court.

JURISDICTIONAL STATEMENT

Appellees do not disagree with Appellant's Statement of Jurisdiction.

PRELIMINARY STATEMENT

Appellant Patent Owner admittedly did not invent sinewave commutation. Appellant also did not conceive of using prior art specialized computer chips known as digital signal processors ("DSPs") to perform sinewave commutation. Cf. Appx000267. Rather, Appellant claims to have invented the application of sinewave commutation to electric motors used in heating, ventilating and/or air conditioning ("HVAC") systems. However, the Board correctly found that the challenged claims of the '349 patent are unpatentable under 35 U.S.C. §102 based on Hideji, as well as under §103 based on Bessler and Kocybik.

Brushless motors are driven by an electric current supplied to the motor in the form of a commutation wave, which can be either a square-wave, a trapezoidal-wave or a sine-wave. See Appx000257-000258; Appx000262-000263; Appellant's Br. 6. Hideji discloses an HVAC motor that performs sinewave commutation "using independent values of Q and d axis currents", as recited in the challenged claims. Appellant's attempt to distinguish between independent ***demand*** values of Q and d axis currents and independent ***actual*** values of Q and d axis currents is inconsequential because Hideji discloses both sets of independent values.

Appellant does not dispute that all of the limitations of the challenged claims are disclosed by Bessler and Kocybik. The Board found that "Petitioner has

provided adequate reasoning why a person of ordinary skill in the art would have effected the combination proposed (i.e., configuring the system of Bessler to perform sinewave commutation in the manner described in Kocybik)". See Appx0029. Based on substantial evidence, the Board properly rejected Patent Owner's teaching-away counterarguments that Appellant repeats here. See Appx0030-0031.

STATEMENT OF THE ISSUES

1. Whether the Board's findings made in determining claims 1-3, 8, 9, 16 and 19 of the '349 patent are unpatentable under §103 in view of Bessler and Kocybik, are supported by substantial evidence?

2. Whether the Board's IPR2015-00762 Institution Decision, which joined the Hideji ground to the already instituted IPR2014-01121 under 35 U.S.C. §315(c), is nonappealable under §314(d)?

3. Whether the Board's findings made in determining claims 1-3, 8, 9, 16 and 19 of the '349 patent are unpatentable under §102 based on Hideji, are supported by substantial evidence?

STATEMENT OF THE CASE

A. Rotating Frame of Reference: d-axis and Q-axis

Figure 4 of the '349 patent depicts a permanent magnet ("PM") electric motor 406 that comprises a rotor 414 that rotates within a stationary stator 412, around which three energizable phase windings are wound [Appx0052 at col. 3, ln. 50-58 & col. 4, ln. 48-51].

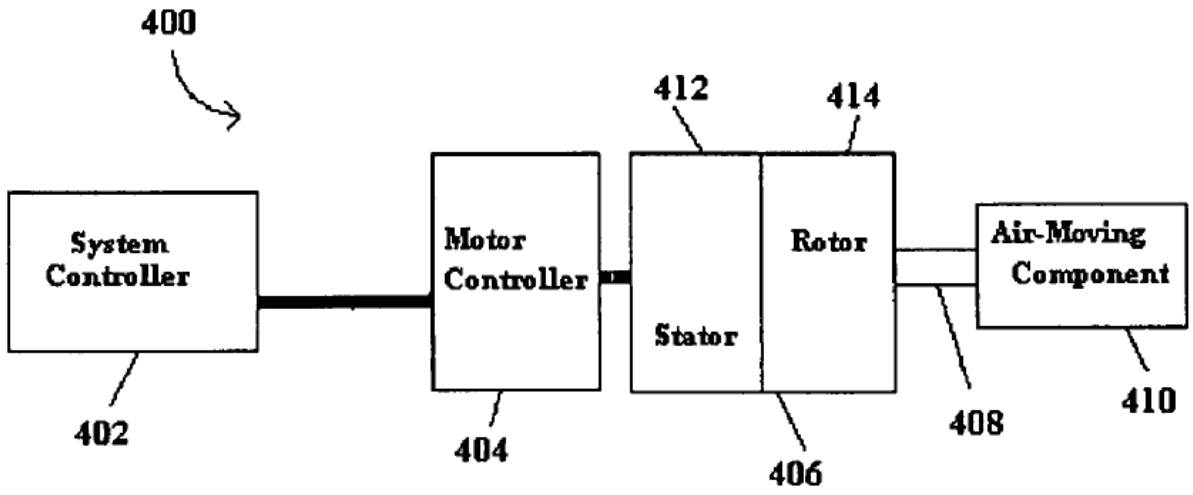


Figure 4

For such an electric motor, there are two alternative frames of reference that the motor controller 404 uses for assessing the electric current ("I") and voltage ("V"): the rotating d-q frame of reference and the stationary abc frame of reference. See Appx1295 at ln. 6-18. A value for the current I that is measured in the stationary abc frame of reference can be transformed to the rotating d-q frame of reference by a set of known equations. See Appx1254-1255 at ¶26. Similarly, a value for the

current I in the rotating d-q frame of reference can be transformed to the stationary abc frame of reference by a set of known equations. See Appx1255 at ¶27.

Independent claims 1, 16 and 19 of the '349 patent each recite "using independent values of Q and d axis currents". Appx0053. While not expressly recited in these claims, these parameters are recognized as being in the rotating d-q frame of reference. See Appx0015-0017; Appx0481-0482 at ¶¶16-17.

The control scheme employed within the motor controller 404 to control the PM motor 406 relies on "vector control".

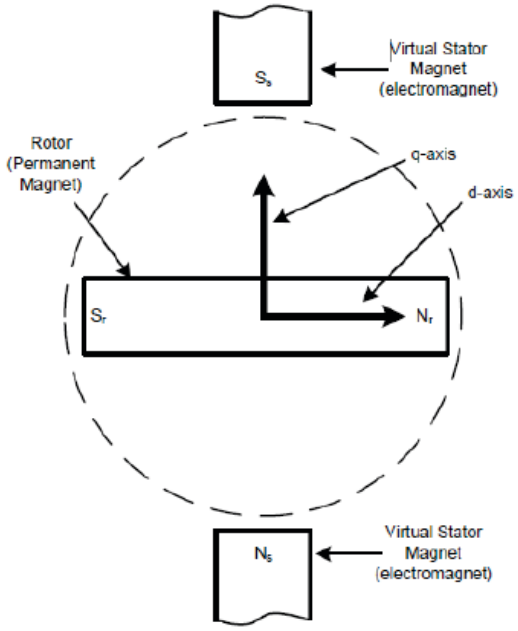
> For the particular embodiment shown in FIG. 4, the motor controller 404 is configured for performing sinewave commutation using vector control to ensure the continuous phase currents produced in the permanent magnet motor are substantially sinusoidal. As appreciated by those skilled in the art, using ***vector control techniques (which involve transformation(s) to different frame(s) of reference)*** typically requires determining the rotor position.

Appx0052 at col. 4, ln. 3-10 (emphasis added). Appellees' expert, Dr. Ehsani, explained that this vector control uses the rotating frame of reference.

"The rotating frame simplifies the mathematical representation of the motor control and allows for precise control of the motor." Appx0479 at ¶12.

"The concept of vector control, which typically uses d and [Q] current components, arises from [a] principle [in which] torque arrives from the interaction of two magnetic fields, one originating from the stator and one originating from the rotor." Appx0479 at ¶13. Under ideal conditions, these two magnetic fields are orthogonal with each other. See Id. "Under these conditions one of these fields is designed and designated to be the magnetizing field, with its associated flux, (i.e., the direct, or 'd,' axis field and flux). The other field, and its associated flux, is designed and designated to be the armature field and flux (quadrature, or '[Q],' axis field and flux)." See id.

The illustration from Dr. Ehsani's Declaration is reproduced below:



Appx0480. This drawing shows a rotor, which has a permanent magnet having north and south poles N_r and S_r, respectively, and a stator, which includes electromagnets that result in a virtual stator magnet having north and south poles N_s and S_s, respectively. See Appx0481 at ¶15. The d-axis is aligned with the rotor and the Q-axis[1] is offset 90° from the d-axis. See Id. at ¶16.

B. The '349 Patent

Figure 4 of the '349 patent depicts an HVAC system 400 that includes a system controller 402, a motor controller 404, a PM motor 406 and an air-moving component 410 [Appx0052 at col. 3, ln. 50-52].

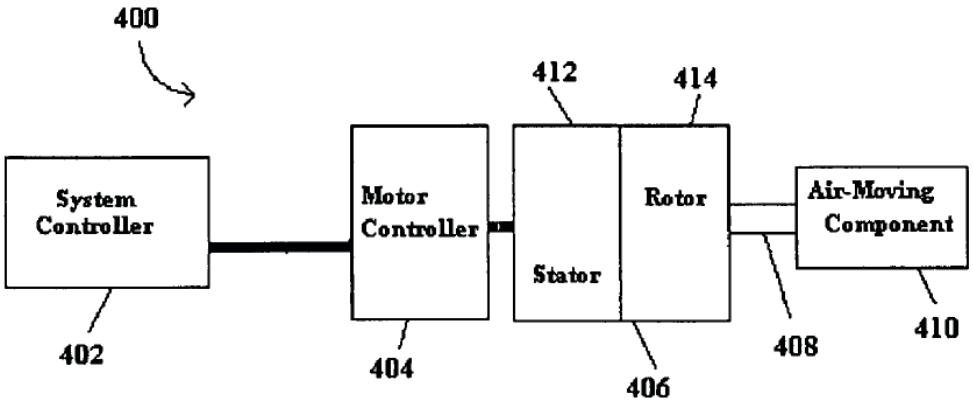


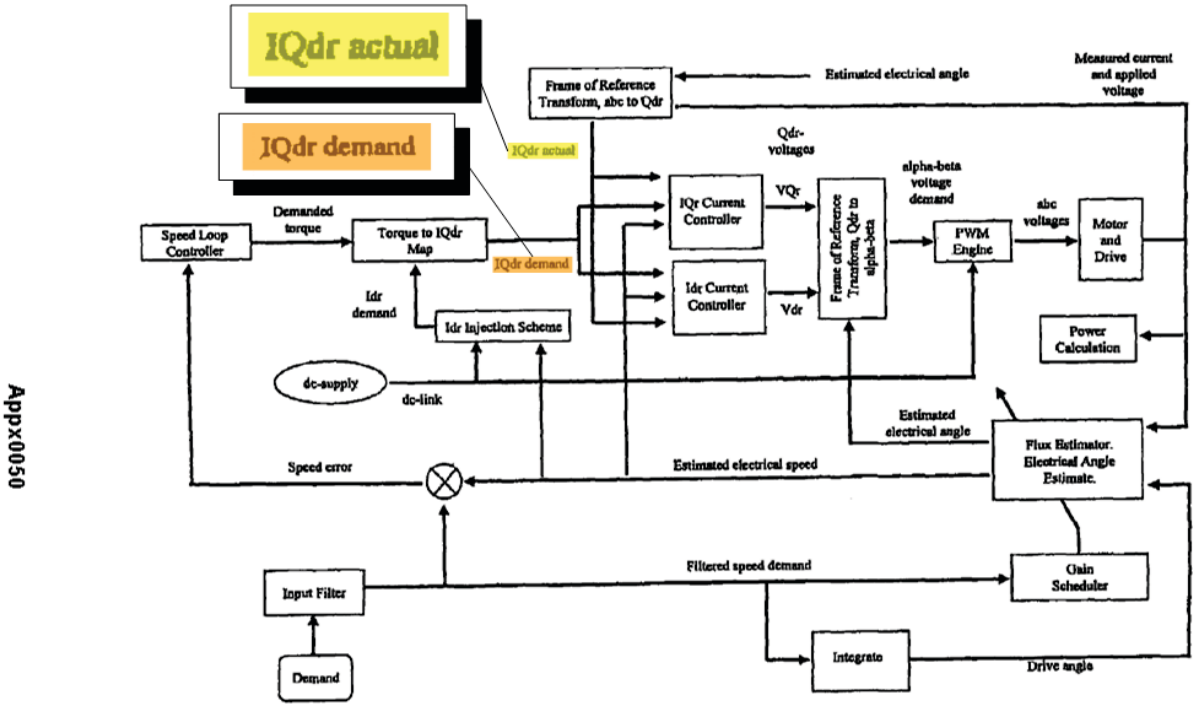
Figure 4

[1] Dr. Ehsani and Appellant's expert, Dr. Blank, used a lower case letter q to refer to this axis. See Appx0479-0483 at ¶¶13-20; Appx1254-1255 at ¶¶26-28. The Board used an upper-case letter Q for consistency with the challenged claims. See Appx0017 at n.5.

"The motor controller 404 is configured for performing sinewave commutation in response to one or more (***analog*** or digital) control signals received from the system controller 402 to produce continuous phase currents in the permanent magnet motor 406 for driving the air-moving component 410." Appx0052 at col. 3, ln. 59-63 (emphasis added). "[T]he motor controller 404 is configured for performing sinewave commutation using vector control to ensure the continuous phase currents produced in the permanent magnet motore are substantially sinusoidal." Appx0052 at col. 4, ln. 3-7.

Thus, in the '349 patent's system 400, sinewave commutation using vector control is performed within the motor controller 404, not within the system controller 402. See Appx1283, ln. 16 - Appx1284, ln. 13. The '349 patent specification expressly states that "the system controller 402 may be a thermostat", even a thermostat that sends one or more ***analog*** control signals to the motor controller 404. Appx0052 at col. 4, ln. 35-36, & col. 3, ln. 59-63.

Figure 8 of the '349 patent, which is reproduced below, is a block diagram of the vector control performed by the motor controller 404 [see Appx0052 at col. 3, ln. 16-17 & Appx0053 at col. 5, ln. 20-25; Appx1289 at ln. 6-22; Appx1348 at ln. 4-6].

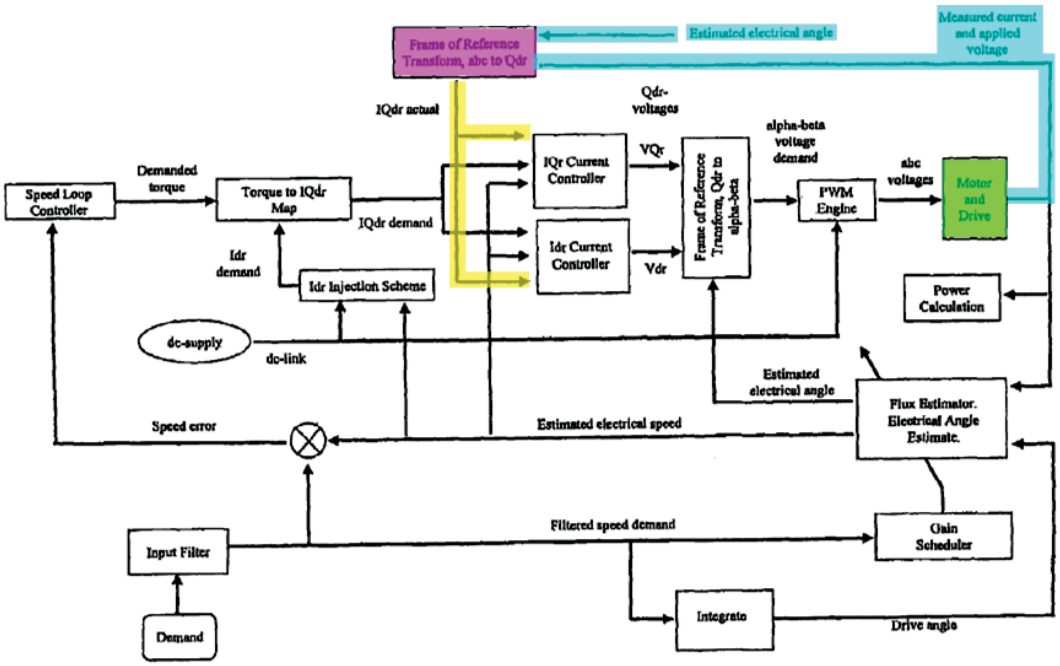


Appx0050

Figure 8

Appx0050 (annotations added). This reproduction has been highlighted to show that two *different* sets of Q and d axis current values are depicted in Figure 8 -- IQdr *actual* (highlighted in yellow) and IQdr *demand* (highlighted in orange).

First, Patent Owner's expert, Dr. Blank, explained that the IQdr *actual* signal is a current signal that has two components -- IQr *actual* which is a Q-axis current and Idr *actual* which is a d-axis current. See Appx1296 at ln. 4-12 & Appx1303 at ln. 5-9. Figure 8 of the '349 patent is reproduced below with highlighting by Appellee to show the development of the IQdr *actual* signal.

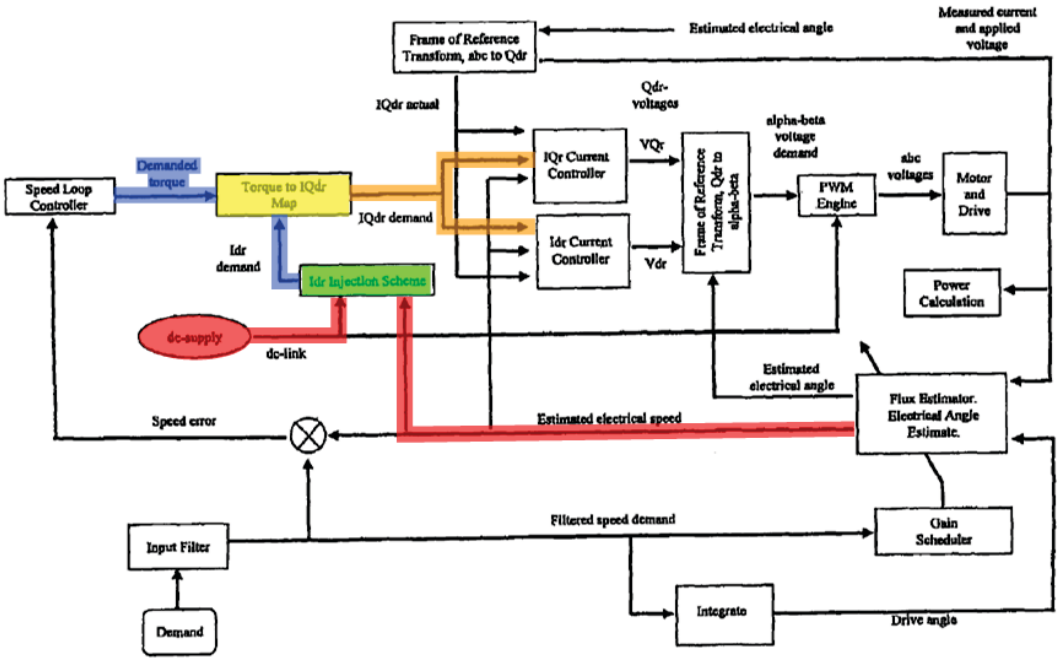


Appx0050

Figure 8

The IQdr *actual* signal is determined by the "frame of reference transform, abc to Qdr" box based on three inputs: measured current, applied voltage, and the estimated electrical angle. See Appx0050; see also Appx0019. The IQdr *actual* signal is then sent to the "IQr Current Controller" box and to the "Idr Current Controller" box. See Appx1295, ln. 20 - Appx1296, ln. 3; Appx0019. Dr. Blank further explained that the two components of the IQdr *actual* signal -- IQr *actual* which is a Q-axis current and Idr *actual* which is a d-axis current -- could be independent of each other. Appx1303, ln. 6 - Appx1304, ln. 9.

Second, Figure 8 of the '349 patent is reproduced below with highlighting to show the development of the IQdr *demand* signal.



Appx0050

Figure 8

The dc voltage and "estimated electrical speed" signals (highlighted in red) are input to the "Idr Injection Scheme" (highlighted in green) which outputs an "Idr demand" signal (highlighted in blue). Then, the "Idr demand" and "Demanded torque" signals (highlighted in blue) are input to the "Torque to IQdr Map" (highlighted in yellow) which determines an "IQdr *demand*" signal (highlighted in orange). Appx1296 at ln. 13-24. Dr. Blank testified that there is not enough information presented in Figure 8 to definitively determine whether the IQdr

demand signal represents independent values of Q and d axis currents. See Appx1307 at ln. 5-12.

As depicted in Figure 8, the "IQr Current Controller" box within the motor controller 404 uses the IQdr *actual* signal, the IQdr *demand* signal and an estimated electric speed signal to calculate the VQr signal which, according to Dr. Blank, is indicative of sinewave commutation. See Appx1289 at ln. 10-22; Appx1295, ln. 20 - Appx1296, ln. 3; Appx1297 at ln. 4-18. Likewise, the "Idr Current Controller" box within the motor controller 404 uses the IQdr *actual* signal, the IQdr *demand* signal and the estimated electrical speed signal to calculate the Vdr signal which, according to Dr. Blank, is indicative of sinewave commutation. See Appx1289 at ln. 10-22; Appx1298 at ln. 8-17; Appx0019.

C. Prior Art

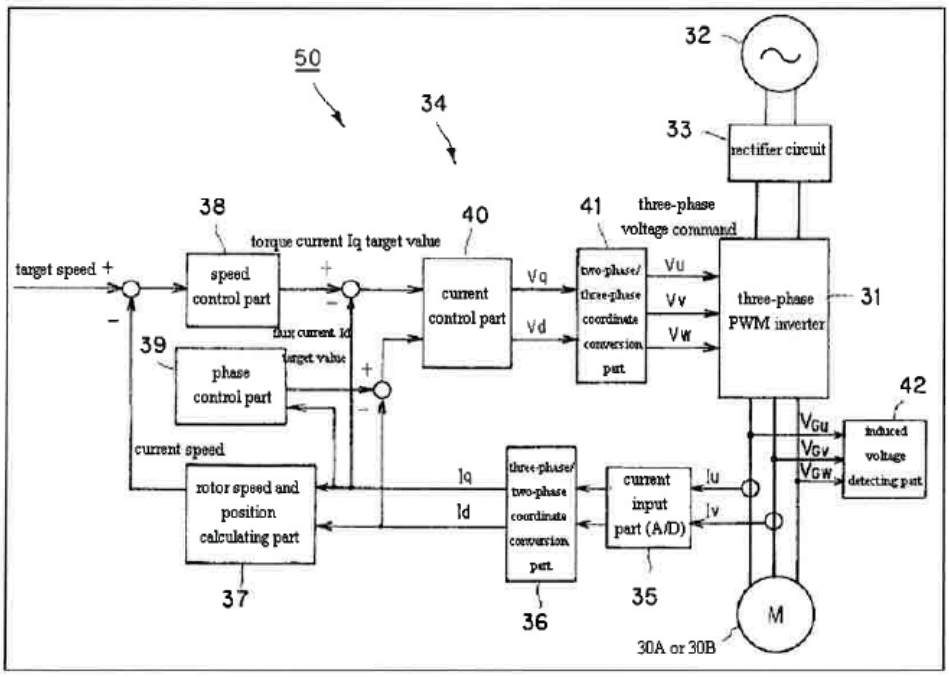
1. Hideji

According to Appellant, Hideji is "the closest prior art". See Appx1439 at ln. 21-25. Indeed, during the Oral Hearing, Appellant also agreed that Hideji discloses sinewave commutation. See Appx1418 at ln. 9-11.

Hideji discloses a method and device for controlling a permanent magnet synchronous motor in an HVAC system using sinewave commutation. See Appx1173 at ¶0001; Appx1178 at ¶0033; Appx0758 at ¶19; Appx0488 at ¶33. Figure 2 of Hideji, which is reproduced below, is a block diagram of a driving

device 50 for driving the brushless DC motors 30A and 30B [see Appx1178 at ¶¶0028-0029].

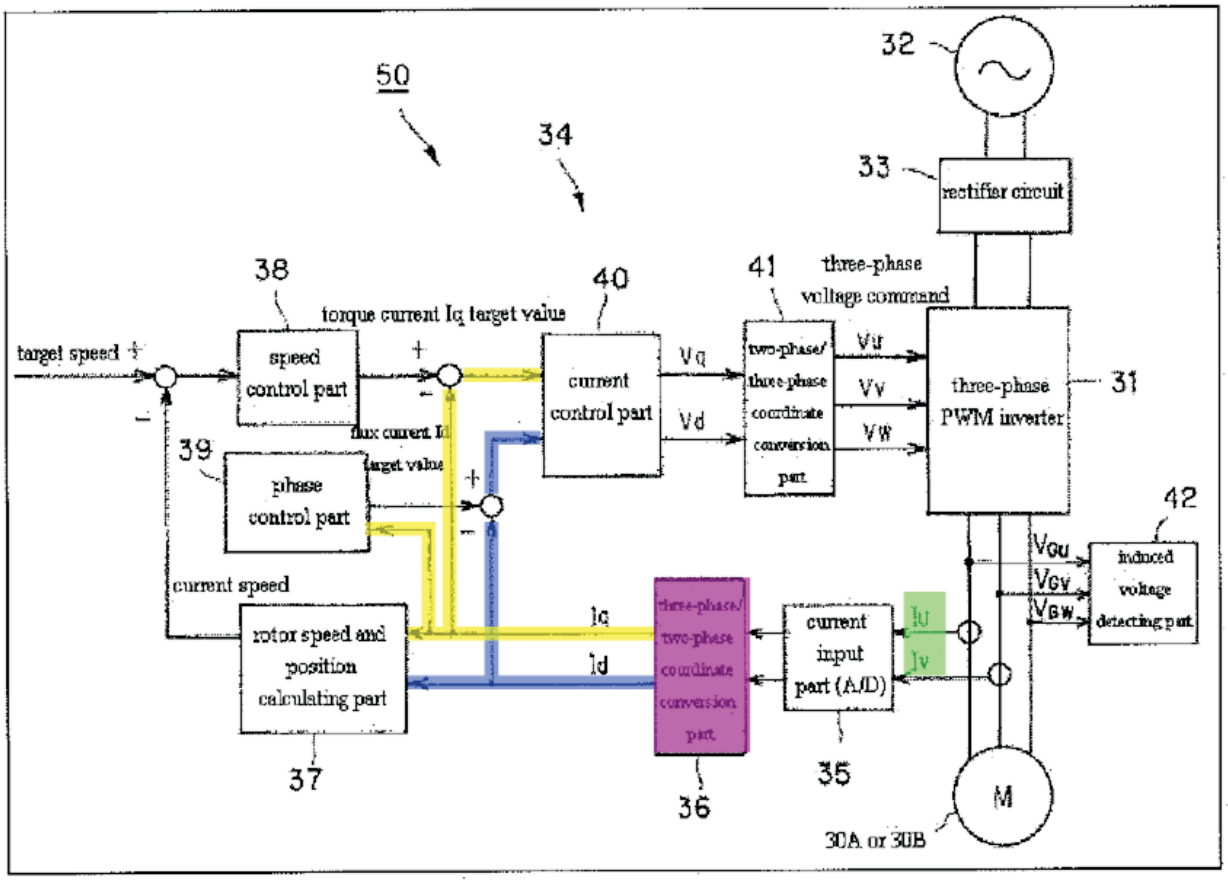
【Fig. 2】



The driving device 50 includes a control device 34, which, in turn, includes a power input part 35, a three-phase/two-phase coordinate conversion part 36, a rotor speed and position calculating part 37, a speed control part 38, a phase control part 39, a current control part 40, a two-phase/three-phase coordinate conversion part 41, and an induced voltage detecting part 42. See Appx1178 at ¶¶0030 & 0032. Patent Owner's expert, Dr. Blank, testified that Hideji's control device 34 is a motor controller. See Appx1335; ln. 14 - Appx1336, ln. 10.

Figure 2 of Hideji, which is reproduced below with highlighting, illustrates that the three-phase/two-phase coordinate conversion part 36 (highlighted in purple) outputs separate values for I_q (highlighted in yellow) and I_d (highlighted in blue), which are the rotating Q and d axis currents, respectively, based on actual current measurements (highlighted in green) taken in the stationary frame of reference [see Appx1179, ¶0035].

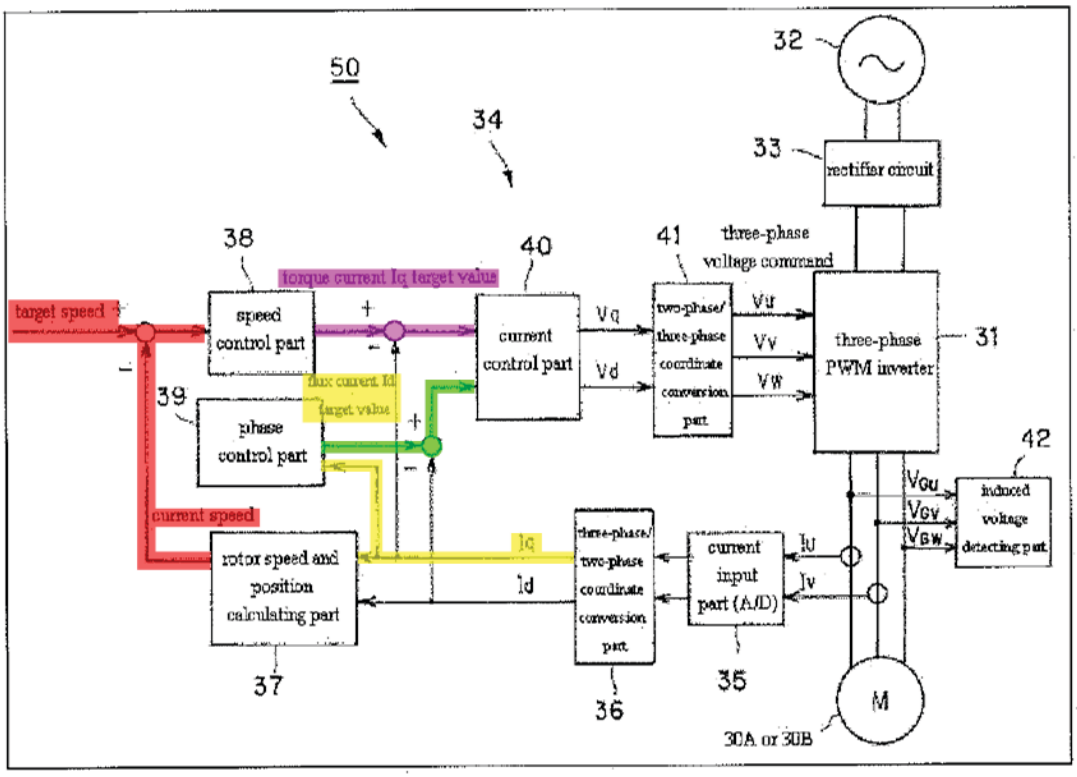
【Fig. 2】



During the Oral Hearing, both parties told the Board that the I_q and I_d values outputted by Hideji's three-phase/two-phase coordinate conversion part 36 correlate with the components of the '349 patent's IQdr *actual* signal. See Appx1391, ln. 14 - Appx1392, ln. 4; Appx1409, ln. 7-16. The Board held that the flux current I_d (d-axis current) value and the torque current I_q (Q-axis current) value calculated and separately outputted by the three-phase/two-phase coordinate conversion part 36 are independent of each other. See Appx0037-0039.

Figure 2 of Hideji is reproduced with highlighting to illustrate the development of the Iq *target* signal and the Id *target* signal, which correlate with the components of the '349 patent's IQdr *demand* signal.

【Fig. 2】



The speed control part 38 generates an I_q *target* value (highlighted in purple) based on speed signals (highlighted in red). Appx1179, ¶0037. The speed control part 38 and the rotor speed and position calculating part 37 are part of Hideji's motor controller (i.e., the control device 34). See Appx1178 at ¶0032.

Hideji further discloses that the phase control part 39 generates an I_d *target* signal (highlighted in green) that is a function of the *actual* I_q signal (highlighted in yellow). Appx1179 at ¶¶0038-39. The phase control part 39 is part of Hideji's motor controller (i.e., control device 34). See Appx1178 at ¶0032.

The *actual* I_q and *actual* I_d values and the I_q *target* and I_d *target* values are used by Hideji's current control part 40 to calculate the V_q and V_d signals which control the sinewave commutation. See Appx1180 at ¶¶0040-0041. This current control part 40 is part of Hideji's motor controller (i.e., control device 34). See Appx1178 at ¶0032.

2. Bessler

Bessler discloses an HVAC system that uses an electronically *commutated* motor ("ECM"). See, e.g., Appx000223 at col. 4, ln. 11-13. Bessler does not explicitly disclose the shape of the *commutation* wave used to drive its ECM, whether square-wave, trapezoidal-wave or sine-wave, but every ECM must be driven by some type of commutation wave. See Appx0648, ln. 1 - Appx0649, ln. 10; Appx000257-000258; Appx000262-000263; Appx0051 at col. 1, ln. 30-33

(square-wave); Appx0744 at col. 1, ln. 22-26 (sinewave and trapezoidal wave); Appx1178 at ¶0033 (sinewave). Bessler also does not explicitly disclose the use of independent Q and d-axis currents.

The Board and Appellee both relied upon the prior art embodiment depicted in Figure 1 of Bessler or the inventive embodiment depicted in Figures 2 and 3 of Bessler as alternative bases for the Bessler - Kocybik combination under §103. See Appx0028; Appx1477-1480; Appx0148-0152 & Appx0163-0167. That is, each of the prior art embodiment depicted in Figure 1 and the inventive embodiment depicted in Figures 2 and 3 satisfy every limitation recited in the challenged claims of the '349 patent except for the "motor controller is configured for performing sinewave commutation, using independent values of Q and d axis currents" limitations.

First, Figure 1 of Bessler, which is reproduced below, is a block diagram of prior art HVAC variable speed control system [Appx000223 at col. 3, ln. 8-11]:

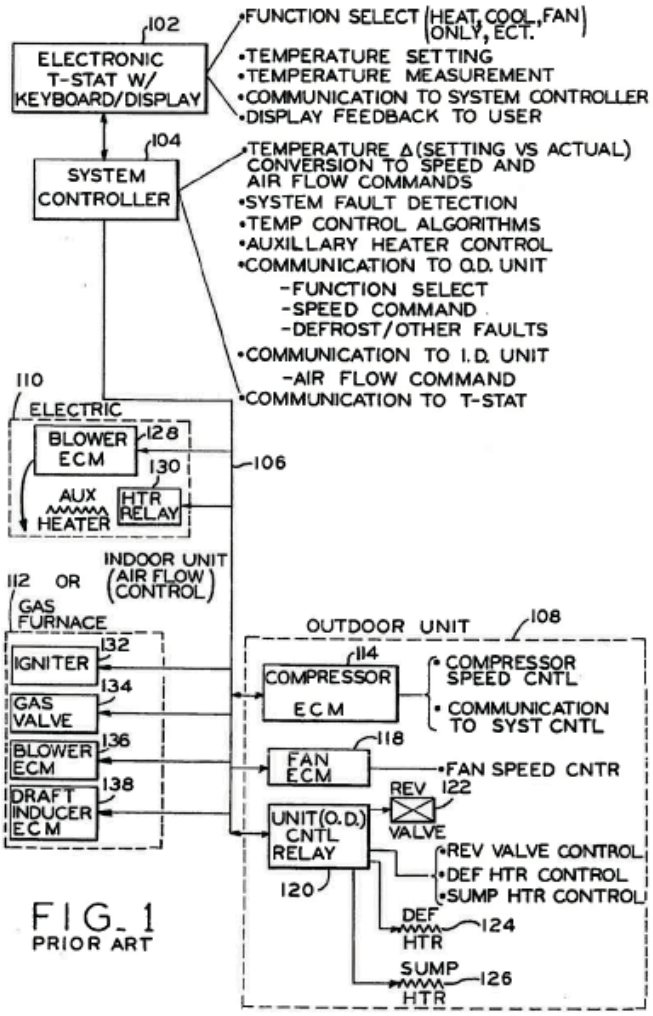


FIG. 1
PRIOR ART

In this prior art embodiment, the electronic thermostat 102 and/or the system controller 104 correlate(s) with the "system controller" recited in the challenged claims, which the '349 patent specification explains "may be a thermostat, an additional control module in communication with a thermostat, or a standalone controller for the HVAC system 400." Appx0052 at col. 4, ln. 35-38. Control signals are sent, via bus 106, to an indoor elective blower ECM 128 and an indoor gas blower ECM 136. See Appx000223 at col. 4, ln. 6-30. Each of blower ECM

128 and blower ECM 136 correlates with the permanent magnet motor and motor controller that receives one or more control signals from the system controller, as recited in the challenged claims. See Appx0491-0492 at ¶49.

Second, Figure 2 of Bessler is a block diagram of the inventive embodiment of the HVAC variable speed control system.

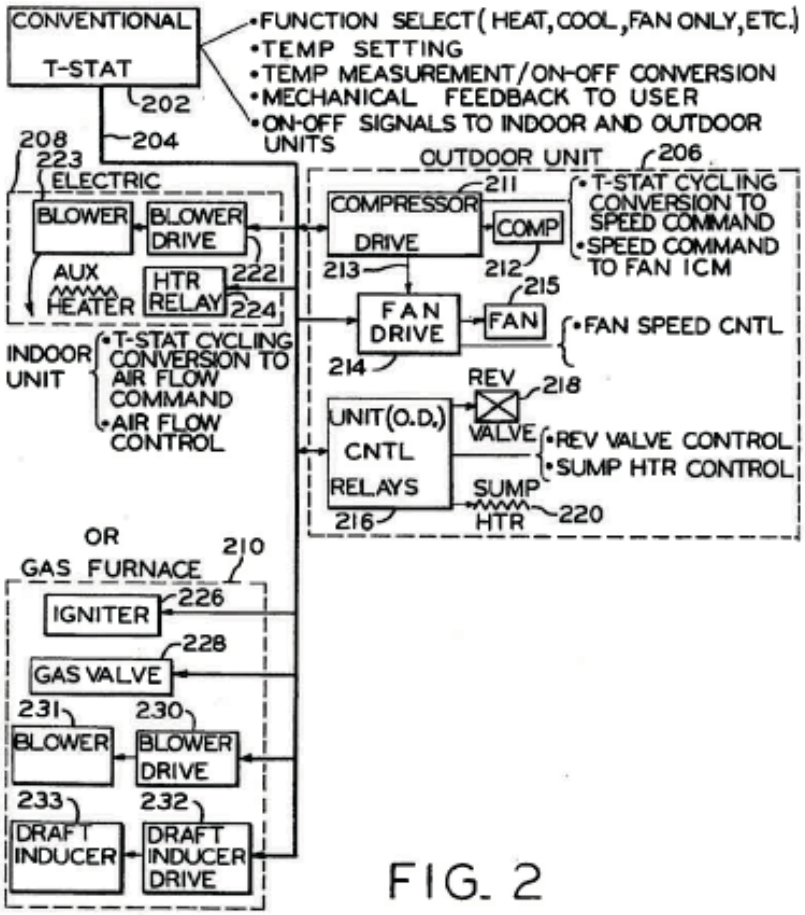


FIG. 2

Appx000218. Bessler discloses that the conventional thermostat 202 depicted in Figure 2 sends one or more control signals to the indoor blower drive 222 and the indoor blower driver 230 via bus 204. See Appx000223 at col. 4, ln. 52-57.

Figure 3 of Bessler is "a block diagram of an ECM drive system 300 that may be used for driving a compressor motor, fan motor, blower motor, or draft inducer fan motor as employed in the system illustrated in FIG. 2" [Appx000224 at col. 5, ln. 37-40].

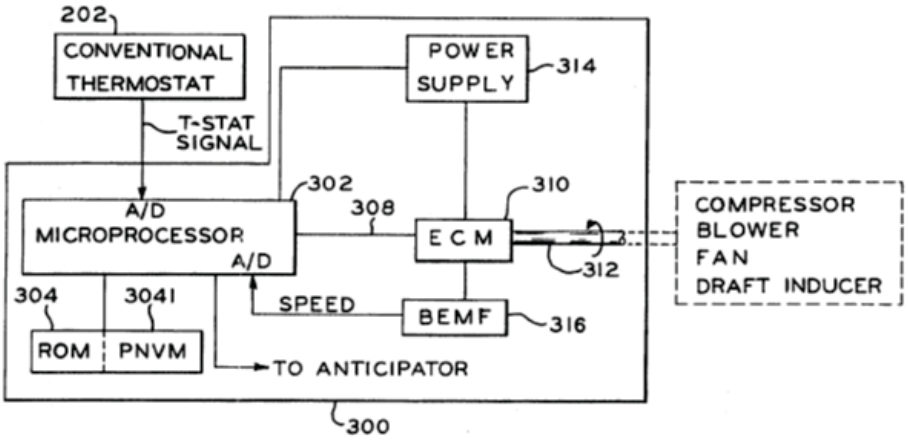


FIG. 3

Appx000219. Bessler's microprocessor 302 controls the speed or torque of the electronically commutated motor 310 in response to one or more control signals received from the thermostat 202. Appx000224 at col. 5, ln. 40-48.

Below, Appellant Patent Owner recognized that Bessler's microprocessor 302 is the motor controller for generating the commutation waves that drive the electronically commutated motor 310, in response to signals received from the thermostat 202. See Appx1515-1516. Appellees Petitioner showed that it would have been obvious to either program Bessler's microprocessor 302 to use the sinewave commutation disclosed in Kocybik or replace microprocessor 302 with a

digital signal processor ("DSP") chip that implements the sinewave commutation disclosed in Kocybik. See Appx1480-1481.

3. Kocybik

Although Bessler does not explicitly disclose the use of sinewave commutation and independent Q- and d-axis currents, such motor control methods are well known, as evidenced by Kocybik. In its Institution Decision, the Board found that Kocybik discloses these limitations recited in the challenged claims that are not explicitly disclosed in Bessler.

> Kocybik is a doctoral thesis that includes a survey of electric motor control schemes for permanent magnet motors. Ex. 1007, iii. Among Kocybik's various teachings are disclosures of sine wave commutation and the use of a d-Q reference frame. *Id*. at 11-12, 17, 37, 40. Of particular relevance, equation 4.3 on page 39 of Kocybik provides an expression of the torque equation that Petitioners contend uses independent values of Q- and d-axis currents.

Appx0184-0185; see also Appx0492-0493 at ¶¶51-54.

In its Final Written Decision, the Board noted the "Patent Owner does not dispute that Kocybik teaches sinewave commutation using vector control with

independent Q and d axes to produce continuous phase currents." Appx0029. Likewise, here on appeal, Appellant does not dispute that Kocybik makes these teachings. See Appellant's Br. 13 & 31-32.

In its Institution Decision, the Board determined that Kocybik was properly within the scope of the prior art for an obviousness challenge to the '349 patent claims, because Kocybik is analogous prior art under the *Clay* test. See Appx0185-0186. Appellant Patent Owner never disputed below that Kocybik is analogous prior art, and does not dispute that here on appeal. See Appx1509-1523; Appx1404 at ln. 18-25; Appx0034 at n. 10; Appellant's Br. 13 & 26-35.

D. Board Proceeding

On September 25, 2013, Patent Owner Nidec filed a patent infringement suit asserting, inter alia, the '349 patent against Appellees Broad Ocean. Appx1044-1093 at Appx1052-1058. Less than one year later, on July 3, 2014, Broad Ocean timely filed its original petition (which was designated IPR2014-01121) seeking an *inter partes* review of claims 1-3, 8-9, 16 and 19 of the '349 patent. See 35 U.S.C. §315(b); Appx1094; Appx1098. Ground 1 of the original petition sought the invalidation of claims 1-3, 8-9, 12, 16 and 19 under §102(b) based on Hideji. Appx0114. Ground 2 sought the invalidation of the same claims under §103 based on Bessler in view of Kocybik. Appx0115.

With its original petition, Broad Ocean filed an English translation of the Japanese language Hideji as Exhibit 1005, but omitted an affidavit attesting to the accuracy of that English translation. Appx0190-0214. In its Preliminary Response to the original petition, Appellant Patent Owner requested that Hideji be stricken from consideration by the Board for failing to comply with 37 C.F.R. §42.63(b), which requires an affidavit attesting to the accuracy of an English translation of a foreign language document, but nevertheless addressed the merits of Ground 1. See Appx1108-1114. Appellant has never disputed the accuracy of the originally filed English translation of Hideji.

After the service of the Patent Owner's Preliminary Response, during a telephonic conference with the Board, Petitioner Broad Ocean explained that Patent Owner's request to strike Hideji was untimely under 37 C.F.R. §42.64(b)(1), but nevertheless sought leave to file an affidavit attesting to the accuracy of the English translation of Hideji as supplemental evidence under 37 C.F.R. §42.64(b)(2). See Appx1140-1141 and Appx1154. The Board authorized Petitioner Broad Ocean to file a motion establishing that the failure to submit an attesting affidavit along with the English translation of Hideji was a clerical mistake under 37 C.F.R. §42.104(c). See Appx1124-1125. Petitioner Broad Ocean filed its motion under §42.104(c) seeking permission to file an

attached affidavit attesting to the accuracy of the originally filed English translation of Hideji. See Appx1127-1135 at Appx1134.

The Board denied Petitioner's motion under §42.104(c) to file the attesting affidavit and, consequently, refused to consider Hideji. See Appx0180-0184. As a result, the Board declined to institute an *inter partes* review of claims 1-3, 8-9, 12, 16 and 19 under §102(b) based on Hideji, but did institute an *inter partes* review of those same claims under §103 based on Bessler and Kocybik. See Appx0184; Appx0188.

Petitioner Broad Ocean then filed a request for rehearing of the Board's decision denying the motion to correct evidentiary Exhibit 1005 by adding the attesting affidavit thereto. See Appx1136-1159. The Board allowed Petitioner Broad Ocean to include a new argument that the attesting affidavit could be filed under 37 C.F.R. §42.5(b) and/or 37 C.F.R. §42.5(c)(3). See Appx1151-1152. Petitioner's request for rehearing was denied because Petitioner's efforts to file an attesting affidavit commenced after the expiration of the one-year statutory bar of 35 U.S.C. §315(b). See Appx1160-1166.

On February 20, 2015, less than one month after the Institution Decision (dated January 21, 2015) instituting the IPR2014-01121 proceeding (see Appx0172), Petitioner Broad Ocean filed its second petition (which was designated IPR2015-00762) challenging claims 1-3, 8-9, 12, 16 and 19 of the

'349 patent based on the same Hideji reference. See Appx0803-0858. The English translation of Hideji filed with the second petition included an attesting affidavit. See Appx1168-1193 at Appx1193. The second petition was accompanied by a motion for joinder with the already instituted IPR2014-01121 under 35 U.S.C. §315(c). See Appx1194-1211.

The second petition included the following explanation of why it was not barred by the one-year statutory time limit of 35 U.S.C. §315(b):

> Although Petitioner was served more than one year ago with a complaint asserting infringement of the '349 patent, the normal statutory one-year bar under 35 U.S.C. §315(c) [sic, §315(b)] does not apply here because (1) less than one month ago, the Board instituted an *inter partes* review trial on the '349 patent on a timely first petition filed by Petitioner (Case No. IPR2014-01121), and (2) Petitioner accompanies this Second Petition with a motion for joinder under 35 U.S.C. §315(c). See 37 C.F.R. §42.122.

Appx0813. More particularly, 37 C.F.R. §42.122(b) states, inter alia, that "[a]ny request for joinder must be filed, as a motion under §42.22, no later than one month after the institution date of any *inter partes* review for which joinder is

requested. The time period set forth in §42.101(b) ***shall not apply*** when the petition is accompanied by a request for joinder." In turn, §42.101(b) implements the one-year statutory bar of 35 U.S.C. §315(b).

In IPR2015-00762, the three-judge panel "reviewed Petitioners' analysis of claims 1-3, 8, 9, 12, 16 and 19, and conclude[d] that Petitioners have demonstrated a reasonable likelihood of prevailing on their contention that each of those claims is anticipated by Hideji." Appx0866 & Appx0876. Nevertheless, a two-judge majority denied the joinder motion, holding that under 35 U.S.C. §315(c), "[a] person cannot be joined *as a party* to a proceeding in which it is already a party." See Appx0870-0871. Consequently, the second petition was denied. See Appx0873. Judge Tartal dissented from the panel majority's interpretation of 35 U.S.C. §315(c) under which the joinder motion was denied. See Appx0874 ("For the reasons explained by several majority opinions in prior decisions of the Board, I am of the opinion that 35 U.S.C. §315(c) permits the joinder of any person who properly files a petition under §311, including a petitioner who is already a party to the earlier instituted *inter partes* review.").

In response, Petitioner requested rehearing of the Decision denying the joinder motion and the resulting denial of the second petition. See Appx0879-0894. Petitioner also requested that an expanded panel of the Board

consider its request for rehearing pursuant to PTAB Standard Operating Procedure 1 §III(A)(2). See Appx0892-0894.

A three-judge majority of an expanded five-judge panel granted Petitioner's request for rehearing, "conclud[ing] that §315(c) permits the joinder of any person who properly files a petition under §311, including a petitioner who is already a party to the earlier instituted *inter partes* review." See Appx0936. The three-judge majority then granted Petitioner's joinder motion, instituted IPR2015-00762 with respect to Hideji, and then joined the IPR2015-00762 proceeding with the previously instituted IPR2014-01121 proceeding. See Appx0937-0941.

In its Final Written Decision, the ***unanimous five-judge panel*** concluded that claims 1-3, 8, 9, 16 and 19 are unpatentable under §103 based on Bessler and Kocybik [see Appx0027-0035] and that the same claims are also unpatentable under §102(b) based on Hideji [see Appx0035-0039].

SUMMARY OF ARGUMENT

The Board did not err in its claim construction rulings. Moreover, Appellant's claim construction arguments are inconsequential because the challenged claims would still be unpatentable under Appellant's urged constructions.

The challenged claims are anticipated because Hideji discloses an HVAC motor that performs sinewave commutation "using independent values of Q and d axis currents," as recited in the challenged claims. Appellant's attempt to distinguish between independent ***demand*** values of Q and d axis currents and independent ***actual*** values of Q and d axis currents is inconsequential because Hideji discloses both sets of independent values.

The challenged claims would have been obvious over Bessler and Kocybik. Appellant does not dispute that all of the limitations of the challenged claims are disclosed by Bessler and Kocybik. Appellant does not dispute that there is substantial evidence supporting the Board's finding of a motivation to combine Bessler and Kocybik. Rather, Appellant merely repeats a teaching-away argument that the Board rejected below. See Appx0030. Appellant's efforts are unavailing here because it has failed to show how the Board's finding of no teaching-away is not supported by substantial evidence.

ARGUMENT

I. STANDARD OF REVIEW

The determination by the Board whether to institute an *inter partes* review is non-appealable. See 35 U.S.C. §314(d). Institution-related issues decided by the Board under 35 U.S.C. §315(c) are non-appealable under §314(d). See *Husky Injection Molding Sys. Ltd. v. Athena Auto, Ltd.*, 838 F.3d 1236, 1246 (Fed. Cir. 2016).

The Board's factual findings underlying its obviousness determinations (including findings on what a reference teaches) are reviewed for substantial evidence. *Merck & Cie v. Gnosis S.p.A.*, 808 F.3d 829, 833-34 (Fed. Cir. 2015). Whether a reference teaches away from a claimed invention is a question of fact reviewed by this Court under the substantial evidence standard. *In re Harris*, 409 F.3d 1339, 1341 (Fed. Cir. 2005).

Anticipation is a question of fact that this Court reviews for substantial evidence in the record to support the Board's findings. *In re Hyatt*, 211 F.3d 1367, 1371-72 (Fed. Cir. 2000).

II. THE BOARD CORRECTLY CONSTRUED THE CHALLENGED CLAIMS OF THE '349 PATENT

In IPR proceedings, unexpired patent claims, such as the challenged '349 patent claims, are given their "broadest reasonable construction." 37 C.F.R. §42.100(b); see *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016).

"While the Board must give terms their broadest reasonable construction, the construction cannot be divorced from the specification and the record evidence." *In re NTP*, 654 F.3d 1279, 1288 (Fed. Cir. 2011).

A. This Court Need Not Construe The Preamble Of The Challenged Claims

Only those terms which are in controversy need to be construed, and only to the extent necessary to resolve the conflict. See *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). In its Initial Decision, the Board found there was no need to construe the preamble of the challenged '349 patent claims.

> For purposes of this Decision, we need not decide whether recitation of an HVAC system in the preambles of the claims is limiting because Petitioners rely on Bessler for such a teaching, not on Kocybik, and there is no requirement that all references applied in an obviousness challenge be drawn precisely from the same art.

Appx0185-0186.

In its Final Written Decision, the Board found "no compelling reason to afford weight to the 'HVAC system' language in the preambles." Appx0021-0022. More importantly, the Board further found that even if the preambles were found

to be limiting, the challenged claims would still be invalid under §103 based on Bessler and Kocybik.

> Our conclusion would be unaffected by a determination that the preambles of the claims reciting an HVAC system are limiting. Although Kocybik is not directed explicitly to HVAC systems, Petitioner relies on Bessler for such a teaching. We are persuaded that a person of ordinary skill in the art would have combined the teachings of the references in the manner articulated by Petitioner, particularly given Petitioner's identification of the disclosure of an ECM by Kocybik and Bessler's discussion of ECMs.

Appx0034 at n. 10 (citations omitted). Likewise, a construction of the preamble is not necessary to resolve the §102 ground based on Hideji because Hideji discloses an HVAC system motor using sinewave commutation. See Appx1404 at ln. 11-15.

Because a construction of the preamble is unnecessary to resolve any invalidity issue, this Court need not address this claim construction matter.

B. The Board Did Not Make A Reversible Error In Construing The "Using Independent Values of Q and d Axis Currents" Claim Term

In its Final Written Decision, the Board clarified its earlier construction of the "using independent values of Q and d axis currents" claim term to now require "the use of ***actual*** Q and d axis current values that are developed independently of each other, without relying on one to derive the other." Appx0022-0023 (emphasis added). The Board's clarification was limited to just the addition of the word "actual" to its earlier construction. Appellant Patent Owner's expert, Dr. Blank, testified that the two components of the IQdr *actual* signal depicted in Figure 8 of the '349 patent -- IQr *actual* which is a Q-axis current and Idr *actual* which is a d-axis -- could be independent of each other. See Appx1303, ln. 24 - Appx1304, ln. 9. Appellant has not argued that the Board's clarified claim construction lacks support in the '349 patent specification.

As discussed below, the Board's perceived need to clarify its earlier claim construction was instigated by Patent Owner's attempts to distinguish the challenged claims over Hideji. See Appx0022. Appellant does not seek to have this Court reinstate the Board's initial construction that Appellant had originally proposed, but rather to substitute the word "demand" for "actual" in the Board's clarified construction. See Appellant's Br. 61. Appellant has not shown that the Board erred by going with *actual* Q and d axis current values rather than the

demand values thereof. Nevertheless, any error made by the Board in construing this claim term would not be reversible because Hideji is still anticipatory under any of the proffered constructions of this term.

In the IPR2014-01121 Institution Decision, the Board, in adopting Patent Owner's proposed construction, "construe[d] 'using independent values of Q and d axis currents' as requiring the use of Q and d axis current values that are developed independently of each other, without relying on one to derive the other." See Appx0178-0179; Appx0022. Dr. Blank explained, in the parlance of the '349 patent, that either the IQdr ***actual*** signal or the IQdr ***demand*** signal could satisfy this claim term as originally construed. See Appx1305 at ln. 3-19.

In the IPR2015-00762 Institution Decision, the Board found that Hideji's *actual* Iq and *actual* Id signals satisfy this limitation. See Appx0864-0865 & Appx0867-0869; Appx0937. In its Response Regarding Hideji, Patent Owner argued that this claim term should apply only to the ***demand*** Q and d axis current values, and not to the ***actual*** Q and d axis current values. See Appx1542-1544; Appx0022 (citing Paper 72, 6, 8). In its Reply, Petitioner disagreed with Patent Owner's proposed narrower construction for this claim term. See Appx1559-1567. During the Oral Hearing, the Board questioned both parties on Patent Owner's proposed narrower construction for this term. See Appx1385, ln. 10 - Appx1387, ln. 20; Appx1406 at ln. 4-25. Thus, the claim construction issue presented here

does not involve a *sua sponte* narrowing by the Board of a previously agreed-upon construction, without prior notice to the parties. Cf. *SAS Inst., Inc. v. ComplementSoft, LLC*, 825 F.3d 1341, 1350-52 (Fed. Cir. 2016).

In its Response Regarding Hideji (Appx1542-1544), as the *sole* support for its newly proposed narrower construction, Appellant Patent Owner relied upon paragraph 12 of the declaration of its expert, Dr. Blank, which in pertinent part states:

> Given the Board's construction, and read in context of the entire limitation, ***in response to signals received from the system controller the motor controller must develop quadrature and direct axis currents, Q and d***, without relying on one to derive the other, and use those independently derived currents to create the signals that will drive the motor using sine wave commutation. The motor controller is tasked to drive the motor in response to system demands using vector control to develop sine wave commutated currents that drive the motor. Thus, taken in context, ***the independent Q and d axis currents must necessarily be the Q and d axis currents the motor controller calculates are required by the system***

> ***controller demands*** and that are used to set or produce the continuous phase sine wave commutated currents for the motor.

Appx0753-0754 at ¶12 (emphasis added). However, Dr. Blank's opinion is devoid of citations to any supporting intrinsic evidence. See *id*. Such "conclusory, unsupported assertions by experts as to the definition of a claim term are not useful to" the Board or this Court. See *Phillips v. AWH Corp.*, 415 F.3d 1303, 1318 (Fed. Cir. 2005) (*en banc*).

Nevertheless, Appellant continues to rely on paragraph 12 of Dr. Blank's declaration here. See Appellant's Br. 60-61. The linchpin of Dr. Blank's opinion excluding IQdr *actual* from the scope of this claim term is an erroneous and baseless presumption that the motor controller must develop the independent values of Q and d axis currents "*in response to signals received from the system controller*". See Appx0753-0754 at ¶12. By way of background, referring to Figure 8 of the '349 patent, the IQdr *actual* signal is developed within the motor controller by the "Frame of Reference Transform, abc to Qdr" box based on the inputted estimate electrical angle signal and the measured current and applied voltage signals. The IQdr *demand* signal is also developed within the motor controller, but by the "Torque to IQdr Map" box based on the inputted Idr demand signal and the "Demanded torque" signal which is shown in Figure 8 as being a

signal received from the speed loop controller that Dr. Blank testified was part of the motor controller (see Appx1348 at ln. 4-12), not from a separate system controller. Dr. Blank has failed to identify any language in the challenged claims that require the independent values of Q and d axis currents be developed by the motor controller in response to signals received from the system controller. Cf. *DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245, 1252 (Fed. Cir. 2014) ("Anticipation challenges under §102 must focus only on the limitations actually recited in the claims.").

Indeed, there is no support in the intrinsic evidence for a further requirement that the independent values of Q and d axis currents be developed by the motor controller in response to signals received from the system controller. The phrase "in response to one or more control signals received from the system controller" recited in the challenged '349 patent claims modifies the phrase "for performing sinewave commutation", not the development of the independent values of Q and d axis currents. As originally filed, claim 1 recited in pertinent part:

> wherein the motor controller is configured for performing sinewave commutation ***in response to one or more control signals received from the system controller*** to produce continuous phase currents in the permanent magnet motor for driving the air-moving component.

Appx1620 (emphasis added). Dr. Blank explained that this clause merely requires the motor controller to use the control signals to perform sinewave commutation. See Appx1283, ln. 16 - Appx1284, ln. 17.

In response to the Examiner's rejection of application claim 1, the patentee amended this clause of claim 1 as follows:

> wherein the motor controller is configured for performing sinewave commutation, using independent values of Q and d axis currents, in response to one or more control signals received from the system controller to produce continuous phase currents in the permanent magnet motore for driving the air-moving component.

Appx1590. There is nothing in the patentee's Amendment suggesting that the newly recited independent values of Q and d axis currents to be ***used*** by the motor controller for performing sinewave commutation, also had to be ***developed*** by the motor controller using one or more control signals received from the system controller. See Appx1588-1598.

Because neither the claim language nor the prosecution history requires the recited independent values of Q and d axis currents must be developed by the motor controller using control signals received from the system controller, there is no intrinsic evidence supporting the argument presented in paragraph 12 of

Dr. Blank's declaration that the recited Q and d axis currents must be the demanded values. Below, Patent Owner made no other argument supporting its newly proposed narrower claim construction limited to ***demand*** Q and d axis currents. See Appx1534-1550 at Appx1542 (citing Ex. 2038, ¶12 [Appx0754, ¶12]).

In its IPR2014-01121 Preliminary Response, Appellant Patent Owner pointed to column 6, lines 1 to 7 of U.S. Patent No. 7,342,379 ("the '379 patent"), which the challenged '349 patent incorporates in its entirety (see Appx0052 at col. 4, ln. 23-29), as the sole intrinsic evidence supporting its initially proposed broader claim construction that the Board adopted in its Institution Decision. See Appx1113. According to Patent Owner, "[t]he '379 patent describes an embodiment in which the IQdr components can be decoupled. That is, the torque contribution from the rotating frame of reference relies on Q axis current that is independent of d axis current. ('379 patent, col. 6:1-7)." See Appx1113. Interestingly, the declaration of Patent Owner's expert, Dr. Blank, fails to discuss the disclosure at column 6, lines 1-7 of the '379 patent. See Appx1316, ln. 6 - Appx1317, ln. 15.

More particularly, the incorporated-by-reference '379 patent, at col. 6, ln. 1-7, states:

> The decoupling of IQdr components in the production of torque can be applied within either a sensorless control system or a sensor-controlled system. If a given motor does not show any discernible hybrid behavior, the control technique can default to that classically used with a PM motor (i.e., Idr torque contribution is assumed to be zero) where the torque contribution comes from IQr.

Appx0801 at col. 6, ln. 1-7. During his deposition, Dr. Blank testified that the second above-quoted sentence merely states that when Idr is equal to zero, IQr will be independent of that Idr value. See Appx1315, ln. 2-24; see also Appx1438, ln. 4-16. A person of ordinary skill would understand these IQdr components to refer to the *actual* I_q and I_d values, not the I_q and I_d *demand* values.

Petitioner's expert, Dr. Ehsani, testified that in such an ideal PM motor, it is the *actual* I_d value that is assumed to be zero and only the *actual* Iq value would serve to produce torque in the motor. See Appx0481-0483 at ¶¶17-19. Patent Owner's expert, Dr. Blank, concurred that the above-quoted paragraph refers to the current that is drawn by the motor, which would be the IQdr *actual* value. See Appx1312, ln. 5 - Appx1314, ln. 10 at Appx1313, ln. 20-21. This testimony, as well as the above-quoted paragraph, constitute the substantial evidence supporting the Board's clarified construction (see Appx0023).

Here, on appeal, for the first time, Appellant Patent Owner now argues that the above-quoted paragraph at column 6, lines 1-7 of the '379 patent must be referring to the demanded currents, not the actual currents, in view of the three preceding paragraphs of the '379 patent specification. See Appellant's Br. 58-59. However, Patent Owner never raised these three preceding paragraphs of the '379 patent specification before the Board. Moreover, Dr. Blank's declaration did not discuss any of these four paragraphs of the '379 patent specification. See Appx0750-0777; Appx1316, ln. 6 - Appx1317, ln. 15. "A party may not introduce new claim construction arguments on appeal…." *Broadcom Corp. v. Qualcomm Inc.*, 543 F.3d 683, 694 (Fed. Cir. 2004). Nevertheless, Dr. Blank testified that he failed to see a connection between the paragraph at column 6, lines 1-7 of the '379 patent and the preceding paragraph at the bottom of column 5 of the '379 patent. See Appx1308, ln. 17 - Appx1309, ln. 17.

In sum, Appellant has not shown that the Board erred in clarifying its claim construction to "the use of ***actual*** Q and d axis current values…." In the event that this Court rules that the Board erred in its clarification by not narrowing its earlier claim construction to the ***demand*** Q and d axis current values, any such error would not be reversible because Hideji would still satisfy that limitation. See *infra* at pp. 73-76. Moreover, Appellant has neither proposed below nor justified a

further requirement that the ***actual*** Q and d axis current values be independent of the ***demand*** Q and d axis current values, or vice versa. See Appx0039.

III. SUBSTANTIAL EVIDENCE SUPPORTS THE BOARD'S FINDINGS UNDERLYING ITS DETERMINATION THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE UNDER §103

The Board concluded that Petitioner demonstrated, by a preponderance of the evidence that the challenged claims are unpatentable under §103 based on Bessler and Kocybik. See Appx0033-0035. The Board "agree[d] with Petitioner's analysis as to how Bessler and Kocybik teach the limitations of claims 1, 16 and 19, which is supported by the testimony of Dr. Ehsani." Appx0029 (citing Appx0491-0493 at ¶¶47-55). The Board also found that "Petitioner has provided adequate reasoning why a person of ordinary skill in the art would have effected the combination proposed (i.e., configuring the system of Bessler to perform sinewave commutation in the manner described in Kocybik), namely that the use of sinewave commutation and independent Q and d axis currents would have provided predictable results to address known problems associated with other types of motors." Appx0029 (citing Appx0147-0148). Namely, using rectangular currents (e.g., 6-step commutation with an ECM) creates unwanted torque, and the use of sinusoidal currents can reduce unwanted torque and create smoother and quieter motor operation. See Appx000271; Appx0492 at ¶52.

A. Bessler Does Not Teach Away From The "System Controller" Recited In The Challenged Claims

Contrary to Appellant's argument, Bessler did not eliminate the "system controller" recited in the challenged claims. Cf. Appellant's Br. 27-29. Patent Owner's argument is fatally flawed because the prior art system controller 104 depicted in Bessler's Figure 1 is not the only structure that can be correlated with the "system controller" recited in the challenged claims as expressly defined by the '349 patent specification. Rather, the conventional thermostat 202 depicted in Bessler's Figures 2 and 3 also correlates with the recited "system controller".

The '349 patent specification states that "the system controller 402 ***may be a thermostat***, an additional control module in communication with a thermostat, ***or*** a standalone controller for the HVAC system 400." Appx0052 at col. 4, ln. 35-38 (emphasis added). This listing of alternative examples of a system controller demonstrates that the breadth of the "system controller" claim term encompasses just a thermostat alone. See *Phillips*, 415 F.3d at 1316; see also *Anchor Wall Sys., Inc. v. Rockwood Retaining Walls, Inc.*, 340 F.3d 1298, 1308 (Fed. Cir. 2003); *Emercon GmbH v. Int'l Trade Com'n*, 151 F.3d 1376, 1385 (Fed. Cir. 1998) (refusing to limit a term used "interchangeably" in the written description to only one of the uses of the term). Thus, the Board correctly found that the challenged claims do not require a separate standalone system controller. See Appx0030.

The only requirement that the challenged claims place on the recited system controller is that it sends at least one control signal to the recited motor controller. See, e.g., Appx0053 at col. 5, ln. 41-43 ("in response to one or more control signals received from the system controller"). The '349 patent specification explains that the control signal(s) sent by the system controller need not be digital, but can be analog. See Appx0052 at col. 3, ln. 59-62. Bessler discloses that the conventional thermostat 202 depicted in Figure 2 sends one or more control signals to the indoor blower drive 222 and the indoor blower driver 230 via bus 204, which is all that is required of the "system controller" recited in the challenged claims:

> Thermostat 202 also includes a device for measuring the temperature of the air surrounding the thermostat and ***generating a temperature signal such as an on/off signal provided via bus 204 to the indoor air moving and the compressor and condenser or evaporator outdoor units (in FIG. 3)***.

Appx000223 at col. 4, ln. 52-57 (emphasis added).

Figure 3 of Bessler is "a block diagram of an ECM drive system 300 that may be used for driving a compressor motor, fan motor, blower motor, or draft

inducer fan motor as employed in the system illustrated in FIG. 2" [Appx000224 at col. 5, ln. 37-40].

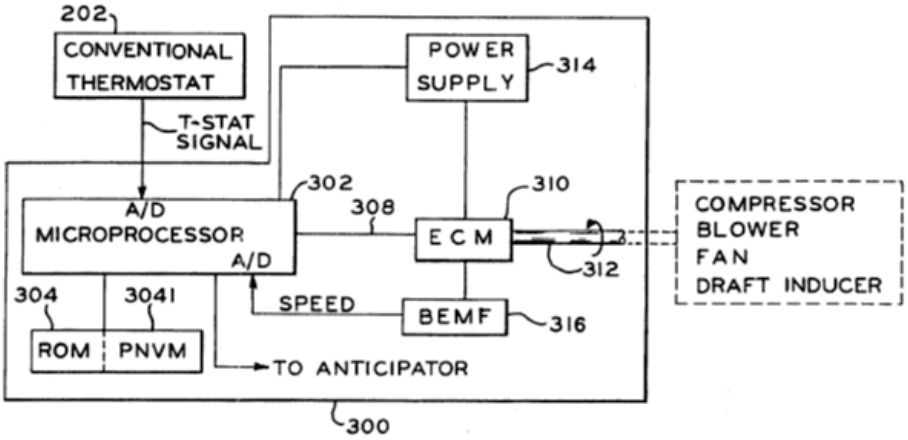


FIG. 3

Appx000219. Bessler's microprocessor 302 controls the speed or torque of the electronically commutated motor 310 in response to one or more control signals received from the thermostat 202.

> Referring to FIG. 3, system 300 includes ***a microprocessor 302 for receiving the on/off temperature signal***. A read only memory (ROM) 304, having software such as illustrated in FIG. 4, may be used to control the operation of the microprocessor 302. ***Microprocessor 302 provides a speed or torque control signal via line 308 to an electronically commutated motor 310 to control the speed or torque of the motor***.

Appx000224 at col. 5, ln. 40-48 (emphasis added).

Below, Patent Owner recognized that Bessler's microprocessor 302 is the motor controller for generating the commutation waves that drive the electronically commutated motor 310, in response to signals received from the thermostat 202. See Appx1515-1516; Appellant's Br. 12. Therefore, Bessler's thermostat 202 corresponds to the "system controller" recited in the challenged claims, as expressly defined by the '349 patent specification (see Appx0052 at col. 4, ln. 35-38).

Lastly, as a predicate for its argument, Appellant seeks to improperly narrow the "one or more control signals" recited in independent claims 1, 16 and 19 to only those control signals that represent "a desired torque or speed of the motor" or "a desired airflow to be produced by the air-moving component". See Appellant's Br. 27-28. However, these more-specific control signals are expressly recited in claims 11 and 12 which depend from claim 1 and in claim 20 which depends from claim 19. See Appx0053. Thus, under the doctrine of claim differentiation, the generic "control signals" limitation recited in the independent claims encompasses other types of control signals than the more-specific control signals recited in dependent claims 11, 12 and 20. See *Bradford Co. v. Conteyor N. Am., Inc.*, 603 F.3d 1262, 1271 (Fed. Cir. 2010).

B. There Is No Teaching Away From Modifying Bessler To Perform Sinewave Commutation

Figure 3 of Bessler is a block diagram of Bessler's electronically commutated motor ("ECM") drive system 300 that may be used for driving a compressor motor, fan motor, blower motor, or draft inducer fan motor [Appx000224 at col. 5, ln. 37-40].

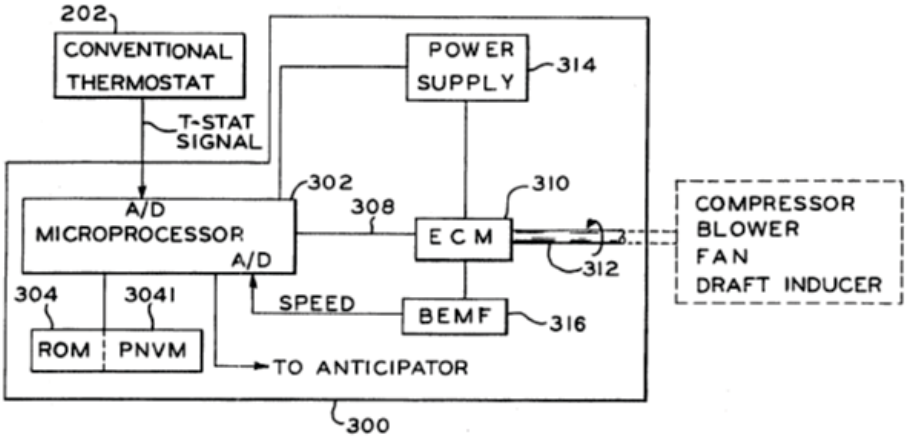
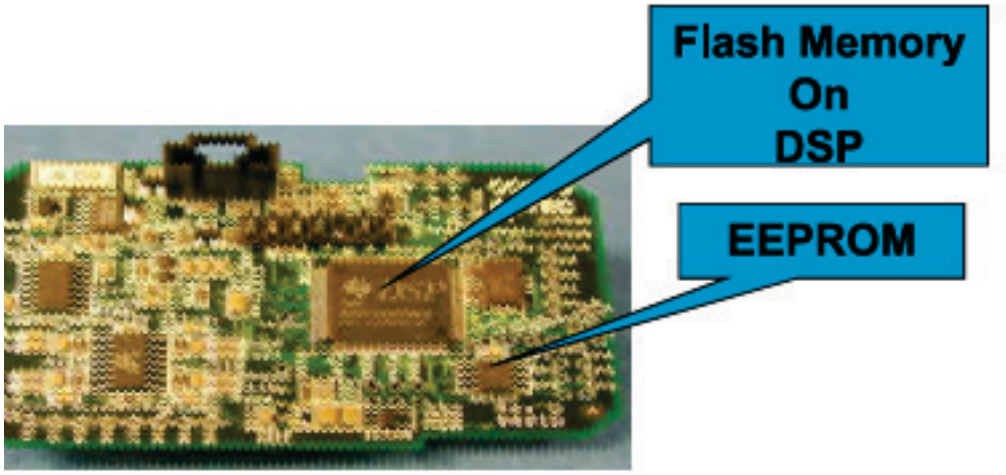


FIG. 3

Appx000219. Bessler's microprocessor 302 controls the speed or torque of the electronically commutated motor 310. Appx000224 at col. 5, ln. 40-48 & col. 6, ln. 7-11. Bessler does not explicitly disclose the shape of the *commutation* wave used by the microprocessor 302 to drive the electronically *commutated* motor 310, whether sinewave, square-wave, or trapezoidal-wave, but the electronically *commutated* motor 310 must be driven by some type of *commutation* wave. See Appx0648, ln. 1 - Appx0649, ln. 10; Appx000257-000258; Appx000262-000263; Appx0051 at col. 1, ln. 30-33 (square-wave); Appx0744 at col. 1, ln. 22-26

(sinewave and trapezoidal wave); Appx1178 at ¶0033 (sinewave). Appellant Patent Owner has not shown any teaching away from either programming the microprocessor 302 to use the sinewave commutation disclosed in Kocybik or replacing microprocessor 302 with a digital signal processor ("DSP") that implements the sinewave commutation disclosed in Kocybik.

By way of background, "[a] digital signal processor (DSP) is a specialized microprocessor (or a SIP block), with its architecture optimized for the operational needs of digital signal processing." See https://en.wikipedia.org/wiki/digital_signal_processor; see also Appx1667 at ¶40. A slide from a PowerPoint presentation (dated March 28, 2005 -- about two years prior to the February 1, 2007 filing of the '349 patent) by a co-inventor of the '349 patent, Mark Carrier, which is reproduced below, shows the DSP chip on a circuit board for the motor controller.



Appx1729-1764 at Appx1745; see also Appx0033 ("DSP chip"). Prior art Kocybik explains that DSPs had been introduced into the marketplace "about 15 years" earlier, and that the "[m]ass production has lead to a decrease in prices; leading to a whole range of reasonably priced and well-tested devices available to implement digital control strategies." Appx000267. Presumably, the '349 patent specification does not actually disclose the "necessity" of using a DSP, as opposed to a basic microprocessor, to perform sinewave commutation (Cf. Appellant's Br. 33) because it was so well known in the art. *Space Sys./Loral, Inc. v. Lockheed Martin Corp.*, 405 F.3d 985, 987 (Fed. Cir. 2005).

While Bessler does not expressly characterize its microprocessor 302 as being a DSP, Bessler does disclose that its microprocessor 302 can process digital signals. Bessler's "[m]icroprocessor 302 may include an analog-to-digital converter for converting the temperature (T-STAT) signal provided by the conventional thermostat 202 and/or the speed signal into a digital signal which is timed to determine the duty cycle of each state." Appx000224 at col. 5, ln. 61-65. Bessler's microprocessor 302 may also include a programmable memory 3041. See Appx000224 at col. 6, ln. 23-32; compare Appx1745 ("flash memory on DSP", "EEPROM").

First, Appellant seemingly attempts to resurrect its argument that economic infeasibility teaches away from the combination of Bessler and Kocybik. Relying

upon U.S. Patent No. 6,498,449, Appellant apparently argues that the DSPs necessary to perform sinewave commutation using vector control cost more than the basic microprocessors used to perform 6-step (i.e., square-wave) commutation. See Appellant's Br. 30 ("the '449 patent notes that d-q transformation calculations require 'a high speed processor such as a [DSP],' but that if such d-q transformation calculations are eliminated, a '***low cost*** microprocessor may be used…instead of the DSPs of the prior art.'").

However, Appellant Patent Owner withdrew just such an economic infeasibility argument during the Oral Hearing below. See Appx0031 at n. 9; Appx1433, ln. 7-23. Nevertheless, the declaration testimony of co-inventor Mark Carrier reveals that the upgrade of the Magellan-model HVAC motor using square-wave commutation to sinewave commutation involved the substitution of a $4.25 DSP for a $1.00 microprocessor, for an increased cost of just $3.25 per motor. See Appx1666-1668 at ¶¶36-43. This purported cost increase of $3.25 per motor to upgrade from square-wave commutation to sinewave commutation is negligible in the context of the total cost for the HVAC system recited in claim 1. See Appx0606, ln. 13 - Appx0610, ln. 2; see also Appx000267.

As a matter of law, the purported cost increase of $3.25 per motor to upgrade from square-wave commutation to sinewave commutation is irrelevant to the combinability of Bessler and Kocybik.

> That a given combination would not be made by businessmen for economic reasons does not mean that persons skilled in the art would not make the combination because of some technological imcompatibility. Only the latter fact would be relevant.

In re Farrenkopf, 713 F.2d 714, 718 (Fed. Cir. 1983); see also *Orthopedic Equip. Co. v. U.S.*, 702 F.2d 1005, 1013 (Fed. Cir. 1983). Appellant did not identify any technological incompatibility that discouraged the upgrade from square-wave commutation to sine-wave commutation. See Appx1666-1668 at ¶¶36-43. More importantly, other than the substitution of a DSP chip for the general-purpose microprocessor chip, Appellant Patent Owner did not identify any other additional hardware necessary to upgrade from square-wave commutation to sinewave commutation. See Appx1666-1668 at ¶¶36-43; see also Appx0606, ln. 13 - Appx0610, ln. 2.

Second, contrary to Appellant's arguments, the elimination of the prior art *system* controller 104 from Bessler's inventive HVAC system depicted in Figures 2 and 3 does not teach away from either programming Bessler's microprocessor 302 in the *motor* controller to use the sinewave commutation disclosed in Kocybik or replacing microprocessor 302 with a DSP that can implement the sinewave commutation disclosed in Kocybik. Cf. Appellant's Br. 30-31. As part of this

argument, Appellant seemingly seeks to conflate the system controller with the motor controller. Cf. Appellant's Br. 31. However, there is no requirement in the challenged claims, or even any mention in the '349 patent specification, that the system controller must include a basic microprocessor, much less a DSP. See Appx0052 at col. 3, ln. 50 - col. 4, ln. 38. Indeed, the '349 patent specification expressly states that the system controller may be just a simple thermostat alone. See Appx0052 at col. 4, ln. 35-38. Moreover, in the '349 patent, sinewave commutation is performed by the motor controller, not the system controller. See Appx0052 at col. 3, ln. 59-63 & col. 4, ln. 3-7. Thus, substantial evidence supports the Board's finding that Appellant's teaching away argument is "not commensurate in scope with the claim language." See Appx0030.

"A reference does not teach away, however, if it merely expresses a general preference for an alternative invention but does not 'criticize, discredit, or otherwise discourage' investigation into the invention claimed." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009) (citing *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)). Here, Bessler's simplification of the *system controller* by using just the conventional thermostat 202 does not criticize, discredit or otherwise discourage investigation into programming Bessler's microprocessor 302 in the *motor controller* to use sinewave commutation or replacing microprocessor 302 with a DSP that can implement sinewave

commutation. See *Fulton*, 391 F.3d at 1201; *Galderma Labs., L.P. v. Tolmar, Inc.*, 737 F.3d 731, 739 (Fed. Cir. 2013). If anything, Bessler expresses an openness to the modification of the microprocessor 302 by noting that the microprocessor "***may***" have an analog-to-digital converter (see Appx000224 at col. 5, ln. 61-65), a programmable, non-volatile memory 3041 (see Appx000224 at col. 6, ln. 23-32), and/or a keypad or dip switches (see Appx000224 at col. 6, ln. 32-35).

Third, Appellant's reliance upon Kocybik for a teaching away is likewise unavailing. Cf. Appellant's Br. 31-32. Kocybik's omission of HVAC systems or motors from its listing of application areas for sinewave commutation (see Appx0265-0266) does not criticize, discredit or otherwise discourage investigation into using sinewave commutation in HVAC motors. See *Fulton*, 391 F.3d at 1201; *Galderma*, 737 F.3d at 739. Furthermore, contrary to Appellant's premise of a "common understanding that sinewave commutation techniques were ill-suited for relatively simple applications such as HVAC systems" [Appellant's Br. 31], Hideji favorably discloses using sinewave commutation in an HVAC system motor. See Appx1173 at ¶0001; Appx1178 at ¶0033. "Where the prior art contains 'apparently conflicting' teachings (i.e., where some references teach the combination and others teach away from it) each reference must be considered 'for its power to suggest solutions to an artisan of ordinary skill…consider[ing] the degree to which one reference might accurately discredit another.'" *Medichem,*

S.A. v. Rolabo, S.L., 437 F.3d 1157, 1165 (Fed. Cir. 2006) (quoting *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991)). Appellee is not now relying upon Hideji as a new secondary reference in addition to Kocybik, but rather as evidence of the true state of the art. See *Genzyme Therapeutic Prods. L.P. v. Biomarin Pharm. Inc.*, 825 F.3d 1360, 1369 (Fed. Cir. 2016); *Ariosa Diagnostics v. Verimata Health, Inc.*, 805 F.3d 1359, 1365 (Fed. Cir. 2015).

C. The Board Did Not Engage In Impermissible Hindsight

In finding no hindsight reconstruction, the Board properly relied upon the substantial evidence of a motivation to combine Bessler and Kocybik. See Appx0031. "[A]s the Supreme Court suggests [in *KSR*], a flexible approach to the TSM test prevents hindsight and focuses on evidence before the time of invention". *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1260 (Fed. Cir. 2007); *McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358, 1364-65 (Fed. Cir. 2008).

In their Petition, Appellees explained the motivation to combine Bessler and Kocybik as follows:

> Furthermore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Bessler and Kocybik because, as disclosed by Kocybik itself and supported by Dr. Ehsani's declaration, the use of sine wave commutation and independent q- and d-axis

> currents would have provided predictable results to known problems associated with other types of motors. See *Id*.; see also *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415-421 (2007). Namely, using rectangular currents (e.g., 6-step commutation with an ECM) creates unwanted torque, and the use of sinusoidal currents can reduce unwanted torque and create smoother and quieter motor operation. See Ex. 1007, 25; Ex. 1009, ¶52.

Appx0147-0148. As evidence supporting this motivation to combine, Appellees cited to Kocybik itself (Appx000271) and to Dr. Ehsani's declaration (Appx0492 at ¶52). This evidence is confirmed by the prior art '449 patent. See Appx0744 at col. 1, ln. 22-26 ("It is known in the art relating to electric motors that polyphase permanent magnet (PM) brushless motors with a sinusoidal field offer the capability of providing low torque ripple, noise, and vibration in comparison with those with a trapezoidal field.").

The Board found that Petitioner provided a rational basis with a reasoned underpinning for the combination of Bessler and Kocybik. See Appx0029-0030; Appx0186. Appellant Patent Owner has not presented any technical expert declaration, or even argument, that contradicts or rebuts paragraph 52 of

Dr. Ehsani's declaration. See Appx0031. Thus, the Board's finding of no hindsight reconstruction (see Appx0031) is supported by substantial evidence.

Furthermore, "[s]econdary considerations 'can be the most probative evidence of non-obviousness in the record, and enables the court to avert the trap of hindsight.'" *Crocs, Inc. v. Int'l Trade Com'n*., 598 F.3d 1294, 1310 (Fed. Cir. 2010) (quoting *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 960 (Fed. Cir. 1986)). Here, the Board fully considered Patent Owner's evidence of secondary considerations and found it unavailing. See Appx0032-0033.

IV. THE BOARD PROPERLY JOINED THE HIDEJI-GROUND, AND SUBSTANTIAL EVIDENCE SUPPORTS THE BOARD'S DETERMINATION THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE UNDER §102

In its Final Written Decision, the Board found that the challenged claims are anticipated by Hideji. See Appx0035-0039. The Board's findings and rulings, to the extent reviewable by this Court, should be affirmed.

A. The Board's Institution-Stage Decision Joining Hideji Is Non-Appealable

Hideji was joined to the already-instituted IPR2014-01121 proceeding as a result of the institution stage decision by an expanded panel that granted Petitioner's joinder motion under 35 U.S.C. §315(c). See Appx0932-0944. This institution stage decision is nonappealable. See §314(d). The Supreme Court has

held that the scope of nonappealability under §314(d) includes "questions that are closely tied to the application and interpretation of statutes related to the Patent Office's decision to initiate inter partes review." *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2141 (2016) (holding Board's institution decision under §312(a)(3) to be nonappealable). In turn, this Court has defined the "closely related" statutes falling within the scope of non-appealability under §314(d) as follows:

> Even though the Supreme Court did not set forth any specific framework for determining if a statute is "closely related," the statutes "closely related" to the decision whether to institute are necessarily, and at least, those that define the metes and bounds of the *inter partes* review process.

Husky, 838 F.3d at 1246. Section 315(c) falls within this scope of non-appealability under §314(d) because the joinder provisions of §315(c) define the metes and bounds of the *inter partes* review process. Furthermore, under the Board's majority view of §315(c), it is undisputable that Appellees' IPR2015-00762 Petition was timely filed. See Appx0933-0934.

Neither Appellant nor Amicus BIO has shown that the Board's institution decision here falls within any of the narrow exceptions to the Supreme Court's

unreviewability holding. See *Cuozzo*, 136 S. Ct. at 2141-42. This Court's pending *en banc* rehearing in *Wi-Fi One, LLC v. Broadcom Corp*. cannot alter the Supreme Court's unreviewability decision in *Cuozzo*.

1. The Board Did Not Act *Ultra Vires*

The Supreme Court noted that it did not "categorically preclude review" of any decision where the Patent Office acted outside of its statutory authority, e.g., "cancelling a patent claim for 'indefiniteness under §112' in inter partes review." *Cuozzo*, 136 S. Ct. at 2141-42. Here, the Board did not act outside its statutory authority.

First, §315(b) states that, in general, an IPR petition must be filed within one year after the service of a patent infringement complaint, but that this one-year bar "shall not apply to a request for joinder under subsection (c)." Subsection (c), in turn, states "[i]f the Director institutes an inter partes review, the Director, in his or her discretion, may join as a party to that inter partes review any person who properly files a petition under section 311 that the Director, after receiving a preliminary response under section 313 or the expiration of the time for filing such a response, determines warrants the institution of an inter partes review under section 314." See 35 U.S.C. §315(c). The Patent Office promulgated a rule limiting the time period during which the one-year bar of §315(b) does not apply in the case of joinder, to just one month after the institution of the first petition. See

37 C.F.R. §42.122(b). This one-month period was the subject of notice-and-comment rulemaking. See 77 Fed. Reg. 48680, 48681, 48690 (Aug. 14, 2012).

Here, there is no dispute that the IPR2015-00762 petition and joinder motion were filed on February 20, 2015, which is less than one month after the institution of IPR2014-01121 on January 21, 2015. See Appx0933-0934. Appellant and Amicus BIO contend that the Board acted *ultra vires* by construing the phrase "join as a party" appearing in §315(c) to allow self-joinder. See Appellant's Br. 38-40, & 45-54; Amicus BIO's Br. 10-13 & 26-28. "However, statutory interpretation disputes fall outside this exception for *ultra vires* agency action…." *Achates Reference Pub., Inc. v. Apple Inc.*, 803 F.3d 652, 658-59 (Fed. Cir. 2015).

Second, the Board's Chief Judge, acting on behalf of the Director, has the authority to designate an expanded panel to hear a request for rehearing in appropriate cases. See 35 U.S.C. §6(c); *In re Alappat*, 33 F.3d 1526, 1530-35 (Fed. Cir. 1994) (*en banc*), *overruled on other grounds by In re Bilski*, 545 F.3d 943 (Fed. Cir. 2008). The circumstances under which a Board panel hearing a request for rehearing may be expanded is governed by the Board's Standard Operating Procedure 1, which was followed here. More specifically, contrary to Amicus BIO's arguments (cf. Amicus Br. 21 & 23-25), the IPR2015-00762 Institution Decision clearly states that, consistent with Standard Operating Procedure 1 §III(B), it was the Acting Chief Judge, not some "unspecified actors

within 'the agency'", that designated the expanded panel here on behalf of the Director. See Appx0933 at fn. 1.

2. Appellant Cannot Show That It Was Deprived Of Due Process

Not only is there no evidence that Appellant was deprived of due process, Appellant has waived any due process argument.

First, the Acting Chief Judge did not *sua sponte* expand the panel hearing Petitioner's request for rehearing. Rather, Petitioner moved for an expanded panel pursuant to the Board's Standard Operating Procedure 1 §III(A)(2) (Rev. 14, May 8, 2015), which explains that a panel may be expanded when "necessary to secure and maintain uniformity of the Board's decisions, such as where different panels of the Board render conflicting decisions on issues of statutory interpretation or rule interpretation, of a substantial difference of opinion among judges exists on issues of statutory interpretation or rule interpretation." See Appx0892-0894. In support of its motion for an expanded panel, Petitioner pointed to, *inter alia*, the conflicting interpretations of §315(c) between the three-judge panel below (see Appx0859-0877) and the expanded 7-judge panel in *Target Corp. v. Destination Maternity Corp.*, IPR2014-00508 (PTAB Feb. 12, 2015) (Paper 28). See Appx0892-0894. Appellant Patent Owner opposed the request for an expanded panel. See Appx1711-1728 at Appx1724-1727.

Therefore, Appellant was not deprived of procedural due process with respect to the request for expanded panel.

Appellant and Amicus BIO acknowledge the existence of the predicate for an expanded panel stated in Standard Operating Procedure 1 §III(A)(2) -- conflicting panel decisions on the statutory interpretation of §315(c). See Amicus Br. 7; Appellant's Br. 48. In the *Target* decision cited by Petitioner as a conflicting decision, an expanded 7-judge panel reversed the 5-judge panel's statutory interpretation of §315(c) pursuant to a request for rehearing. See *Target*, IPR2014-00508, Decision (Paper 28). Thus, Appellant Patent Owner knew exactly what Petitioner was requesting the Acting Chief Judge to do here, and that the Board had previously done so in *Target*. Nevertheless, Appellant Patent Owner never argued below that its due process rights would be deprived by the Acting Chief Judge expanding the panel here. Cf. Appx1724-1727. Consequently, Appellant has waived this due process argument. See *Alappat*, 33 F.3d at 1536 ("Alappat has waived any due process argument by acquiescing to the Commissioner's actions in this case."); see also *In re DBC*, 545 F.3d 1373, 1378 (Fed. Cir. 2008) ("It is well-established that a party generally may not challenge an agency decision on a basis that was not presented to the agency."). Amicus BIO cannot make a due process argument that Appellant waived. See *Alappat*, 33 F.3d at 1536.

Second, there is no evidence that the Acting Chief Judge instructed the two additional judges (Judges Medley and Arbes) how to vote on Petitioner's request for rehearing. In accordance with this Court's *en banc Alappat* decision, the Director or Chief Judge may include as new members for an expanded panel, even those judges that she/he suspects will vote in a desired way:

> However, the present statutory scheme does allow the Commissioner to determine the composition of Board panels, and thus he may convene a Board panel which he knows or hopes will render the decision he desires, even upon rehearing, as he appears to have done in this case.
>
> Such a result does not reduce the Board to an alter ego or agent of the Commissioner.

Alappat, 33 F.3d at 1535. As of the October 5, 2015 Decision granting the request for rehearing (see Appx0932), the view that §315(c) allowed for joinder by the same party was (and still remains) the majority view and was widely held among Board judges who might have been added to expand the panel. See *Target*, IPR2014-00508, Decision (Paper 28) at pp. 6-17; *Ariosa Diagnostics v. Ises Innovation Ltd.*, IPR2012-00022, Final Written Decision (Paper 166) at pp. 18-22 (PTAB Sept. 2, 2014); *Samsung Elecs. Co. v. Virginia Innov. Sci., Inc.*, IPR2014-00557, Decision (Paper 10) at pp. 14-17 (PTAB June 13, 2014); *Sony*

Corp. v. Yissum Research Dev. Co., IPR2013-00327, Decision (Paper 15) at pp. 3-5 (PTAB Sept. 24, 2013), *aff'd*, 626 Fed. App'x 1006 (Fed. Cir. 2015); *Microsoft Corp. v. Proxyconn, Inc.*, IPR2013-00109, Decision (Paper 15) at pp. 4-5 (PTAB Feb. 25, 2013); *ABB Inc. v. Roy-G-Bev Corp.*, IPR2013-00282, Decision (Paper 15) at pp. 3-4 (PTAB Aug. 9, 2013).

Thus, in order to prevail on its due process argument, Appellant would have had to have shown that the Acting Chief Judge instructed Judges Medley and Arbes how to vote. See *Alappat*, 33 F.3d at 1535 ("the fact remains that the Commissioner may not unilaterally overturn a decision of a Board or instruct other Board members how to vote."). Here, Appellant Nidec has expressly disclaimed any such argument.

> To be clear, Nidec is not alleging that the agency is directing individual judges to decide cases in a certain way, nor that the decisions of individual judges are not the product of their own independent analysis and judgment, as evidenced by the spirited dissent in the expanded panel decision below.

Appellant's Br. 43. Because Appellant is not making this specific due process argument, Amicus BIO cannot make it (cf. Amicus Br. 19-21 & 23). See *Alappat*, 33 F.3d at 1535. Moreover, Judges Medley and Arbes are to be afforded a

presumption of honesty and integrity. See *Ethicon Endo-Surgery, Inc. v. Covidien LP*, 812 F.3d 1023, 1030 (Fed. Cir. 2016).

In sum, Appellant cannot show that the Board's general practice for expanding a Board panel as set forth in the Board's Standard Operating Procedure 1 deprived Appellant of due process, or that the addition of the particular two new judges to the 3-judge panel here, Judges Medley and Arbes, deprived Appellant of due process.

B. Joinder Of The "Same" Party Is Allowed Under 35 U.S.C. §315(c)

If this Court decides to substantively review the Board's statutory construction of §315(c) in the IPR2015-00762 Institution Decision, the Board's interpretation of §315(c) to allow the joinder of a second petition by the same petitioner was not only reasonable under *Chevron,* but correct. The overwhelming majority view of the Board, as explained in *Target*, IPR2014-00508, Decision (Paper 28), is that §315(c) permits the joinder of any person who properly files a petition under §311, including a petitioner who is already a party to the earlier instituted IPR. See *supra* at pp. 62-63. The *only* Board decision that has adopted the minority view espoused by Appellant is *Skyhawke Techs. v. L&H Concepts, LLC*, IPR2014-01485, Decision (Paper 13) (PTAB Mar. 20, 2015). See Amicus Br. 7. The majority of the 5-judge expanded panel in the IPR2015-00762

Institution Decision adopted the broad construction of §315(c) set forth in *Target*. See Appx0936.

Turning to the express wording of the statute, §315(c) provides that:

> If the Director institutes an inter partes review, the Director, in his or her discretion, may join as a party to that inter partes review *any person who properly files a petition under section 311* that the Director…determines warrants the institution of an inter partes review under section 314.

35 U.S.C. §315(c) (emphasis added). Thus, the Director has the discretion to join "any person who properly files a petition under section 311" that meets the standard for institution in §314. Filing a petition under §311, therefore, is the predicate for joinder.

In *Target*, a majority of the 7-judge panel of the Board correctly concluded that the phrase "any person who properly files a petition under section 311" appearing in §315(c) includes anyone other than the patent owner. *Target,* IPR2014-00508, Decision (Paper 28) at pp. 7-8. As the Board explained, §311(a) specifies that anyone "who is not the owner of a patent" may file a petition for *inter partes* review of the patent. Thus, the only "person" excluded from joinder in

§315(c) is the patent owner. *Target,* at p. 7. The Board concluded that to exclude an existing party would ignore the statutory language:

> If the legislature meant to exclude joining the same petitioner to an instituted *inter partes* review, it is unclear why it used the word "*any*" in the statute, such that "*any* person" who properly files a petition may be joined. Congress could have specified "any non-party" instead of "any person". An interpretation that requires us to read "any party" as excluding a same petitioner, in essence, reads the word "any" out of the statute and ignores the statutory language of §311(a).

Target at p. 8 (emphasis in original; footnote omitted).

The Board also explained that because §315(c) requires the person seeking joinder to "properly file[ ] a petition" that meets the standard for institution in section 314, it "clearly contemplates that the merits of the petition be considered in determining whether joinder is granted, and thus, as a consequence, necessarily contemplates joinder of issues as well as joinder of parties." *Target* at pp. 9-10.

The Board also addressed the legislative history cited by Appellant and Amicus BIO. See Appellant's Br. 52; Amicus Br. 13. The Board acknowledged that the Final Committee Report stated that "[t]he Director may allow other

petitioners to join an inter partes or post-grant review" but the Board explained that this statement "does not preclude joinder of the same petitioner." *Target* at p. 10 (citing H.R. Rep. No. 112-98, pt. 1, at 76 (2011)).

In sum, the Board's interpretation of §315(c) in *Target* was correct, and, at a minimum, reasonable under *Chevron*. In *Chevron*, the Supreme Court held that where Congress has delegated interpretive authority to an agency, and a provision in a statute that the agency administers is silent or ambiguous (such that Congress did not "directly address[ ] the precise question at issue"), a court must defer to the agency's interpretation of the statute if it is a "permissible" or "reasonable" interpretation. *Chevron U.S.A. Inc. v. Nat. Res. Def. Council, Inc.*, 467 U.S. 837, 840, 842-44 (1984). Thus, this Court should defer to the Board's reasonable interpretation of §315(c) because §315(c), according to the Board, is ambiguous. See *Target*, at p. 8.

C. The Board's Findings That Hideji Discloses All Of The Limitations Of The Challenged Claims Are Supported By Substantial Evidence

While not disputing that Hideji's motor controller performs sinewave commutation, Appellant seemingly argues that Hideji does not do so in response to a control signal. Cf. Appellant's Br. 63. Such an argument is unfounded.

Challenged claim 1 recites "wherein the motor controller is configured for performing sinewave commutation, using independent values of Q and d axis

currents, ***in response to one or more control signals received from the system controller*** ...." (emphasis added). A similarly phrased limitation is recited in independent claims 16 and 19. According to Patent Owner's expert, Dr. Blank, it is the overall function of sinewave commutation that is performed in response to the control signal from the system controller, not the development of independent values of Q and d axis currents. See Appx1282, ln. 17 - Appx1286, ln. 2.

The '349 patent specification explains that "the system controller 402 may be a thermostat". Appx0052 at col. 4, ln. 35-38. Claim 12, which ultimately depends from claim 1, and claim 20, which depends from claim 19, both recite that the control signal from the system controller represents a desired speed of the permanent magnet motor. See Appx0053. Thus, under the doctrine of claim differentiation, the control signal recited in claims 1 and 19 can represent the desired speed of the motor. See *Phillips*, 415 F.3d at 1314-15; *Bradford*, 603 F.3d at 1271. Further, the control signal recited in independent claim 16 should also encompass a control signal representing the desired speed of the motor. See *Phillips*, 415 F.3d at 1314 ("claim terms are normally used consistently throughout the patent"). Indeed, Figure 8 of the '349 patent depicts the receipt of a speed demand signal from a system controller. See Appx1289, ln. 23 - Appx1290, ln. 25.

"One of ordinary skill in the art would know that the motor controller of Hideji would use sine wave commutation in response to a control signal from the

system controller. For example, when the thermostat sends the signal for the air conditioning system to begin cooling, the motor controller would, in turn, use sine wave commutation to cause the motor to turn the fan and move air through the system." Appx0489-0490 at ¶39. As depicted in Figure 2 of Hideji, the motor controller receives a "target speed" signal from a system controller, such as a thermostat. See Appx1179 at ¶0037; Appx0488 at ¶34 ("Fig. 2 in Hideji shows an input of a target speed, which originates in a system controller that commands the speed at which the motor is to turn."); Appx1690, ln. 19 - Appx1691, ln. 6. "That target speed represents a desired speed of the permanent magnet motors." Appx0491 at ¶44.

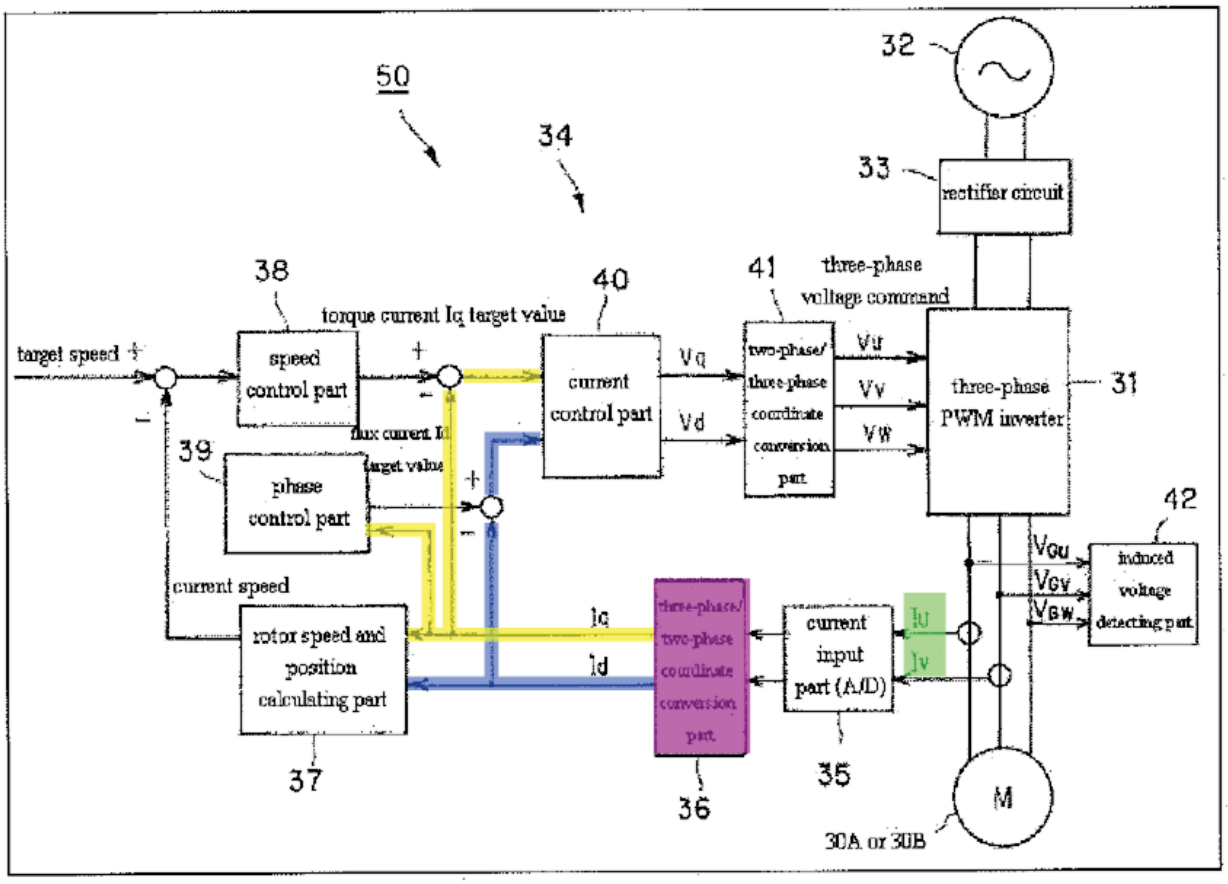
1. Hideji's Motor Controller Performs Sinewave Commutation Using Independent *Actual* Values Of Q And d Axis Currents

There is substantial evidence supporting the Board's finding that Hideji's motor controller performs sinewave commutation using independent *actual* values of Q and d axis currents.

Figure 2 of Hideji, which is reproduced below with highlighting by Appellees, illustrates that the three-phase/two-phase coordinate conversion part 36 (highlighted in purple) outputs separate values for I_q (highlighted in yellow) and I_d (highlighted in blue), which are the rotating Q and d axis currents, respectively,

based on actual current measurements (highlighted in green) taken in the stationary frame of reference.

【Fig. 2】



Hideji expressly discloses the generation of the *actual* values of I_q and I_d which correlate with the components of the '349 patent's IQdr *actual* signal, as follows:

> The three-phase/two-phase coordinate conversion part 36 converts the coordinates of the alternating current I_u and I_v introduced by the current input part 35 to a ***revolving coordination system (d-q coordination system)*** on the rotor of the brushless DC motor 30A, and ***calculates flux***

> ***current I_d (d-axis current) and torque current I_q (q-axis current)***.

Appx1179, ¶0035 (emphasis added).

The Board held that the flux current I_d (d-axis current) and the torque current I_q (Q-axis current) calculated and separately outputted on different lines by the three-phase/two-phase coordinate conversion part 36 are independent of each other. See Appx0037-0039. There is substantial evidence that a person of ordinary skill would understand that the *actual* I_q and I_d values output by the three-phase/two-phase conversion part 36 are independent. See Appx0489 at ¶38; Appx1321, ln. 16 - Appx1324, ln. 1 (Dr. Blank testifying that motor controllers use the equations for calculating I_q and I_d presented in paragraph 26 of his IPR2014-01122 declaration, which would necessarily result in independent values of Q and d axis currents); Appx1254-1255 at ¶26; Appx1698 at ln. 1-8.

Indeed, Appellant does not dispute that the *actual* I_q value and the *actual* I_d value, when output by Hideji's three-phase/two-phase coordinate conversion part 36, are independent of each other. Cf. Appellant's Br. 63-64. Instead, Appellant argues that the independence of the actual I_q value from the actual I_d value is subsequently negated by the use of the *actual* I_q value by phase control part 39 to calculate the I_d *target* value (see Appellant's Br. 63-64). The Board twice rejected the very same argument because even if the I_d ***target*** value is dependent upon the

actual I_q value, the ***actual*** I_q value is still independent of the ***actual*** I_d value which is all the challenged claims require in terms of independence. See Appx0038-0039; Appx0868-0869. That is, the challenged claims do not require the actual values of Q and d axis currents be independent of the demand values of Q and d axis currents. According to Patent Owner's expert, Dr. Blank, the fact that the I_d ***target*** value is equal to K x ***actual*** I_q^2 [see Appx1179-1180 at ¶¶0038-0039; Appx0039] does not detract from the independence of the ***actual*** I_q and ***actual*** I_d values. See Appx1337, ln. 21 - Appx1339, ln. 3.

Hideji's current control part 40, which is part of the motor controller, uses the independent *actual* I_q and I_d values for performing sinewave commutation, by using those values to calculate the V_q and V_d signals.

> The current control part 40 executes PI control based on the deviation between the torque current I_q target value generated by the speed control part 38 and the ***actual*** torque current I_q to calculate a torque voltage V_q (V_q-axis voltage), and executes PI control based on the deviation between the flux current I_d target value generated by the phase control part 39 and the ***actual*** flux current I_d target (sic) value to calculate a flux voltage V_d (V_d-axis voltage).

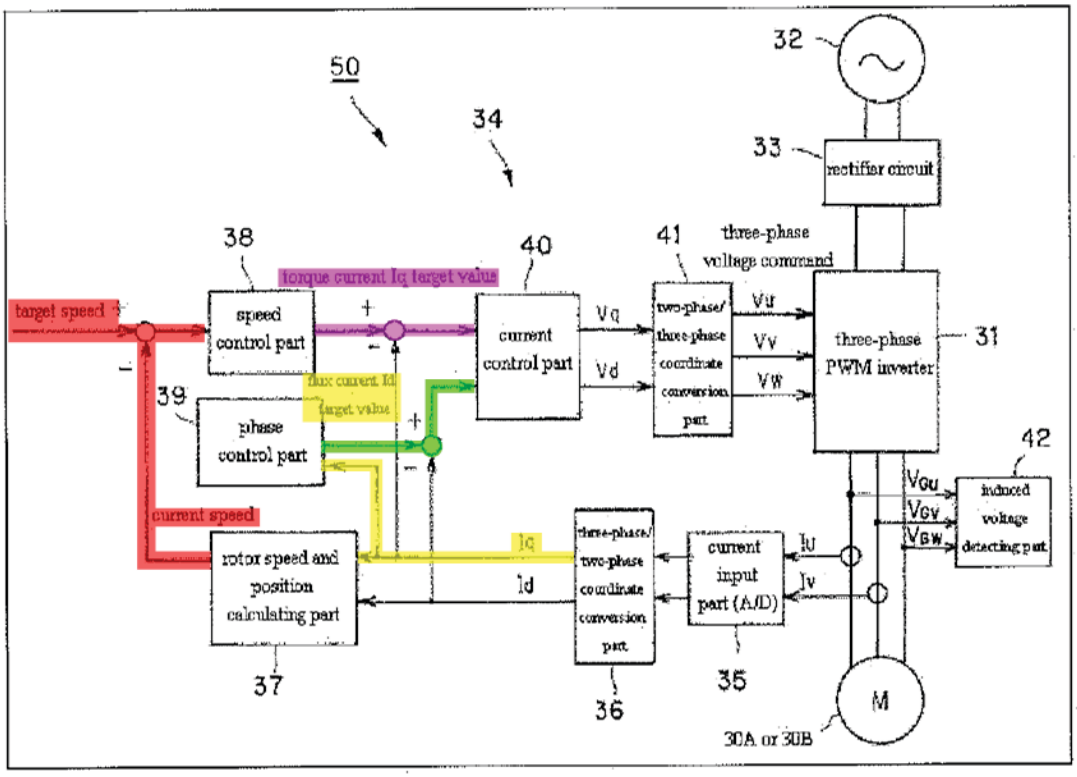
Appx1180 (emphasis added) at ¶0040; see also Appx1697 at ln. 2-19. The V_q and V_d signals, in turn, control the sinewave commutation. See Appx1180 at ¶0041.

2. Hideji's Motor Controller Performs Sinewave Commutation Using Independent *Demand* Values of Q And d Axis Current

Assuming *arguendo* that the "independent values of Q and d axis current" recited in the challenged claims refer to the *demand* Q and d axis current values as urged by Appellant (see Appellant's Br. 56-61), Hideji would still satisfy this limitation. See Appx1386, ln. 18 - Appx1387, ln. 7.

Figure 2 of Hideji is reproduced with highlighting to illustrate the development of the Iq *target* signal and the Id *target* signal, which correlate with the components of the '349 patent's IQdr *demand* signal.

【Fig. 2】



Hideji discloses that every 1 ms, the speed control part 38 generates an I_q *target* value (highlighted in purple) based on speed signals (highlighted in red) including the "target speed" control signal.

> The speed control part 38 performs proportional integral control (PI control) based on the deviation between the speed of the rotor calculated by the rotor speed and position calculating part 37 and the target speed of the rotor every 1 ms, for example, ***to generate a torque current I_q target value***.

Appx1179 at ¶0037 (emphasis added). The speed control part 38 and the rotor speed and position calculating part 37 are part of Hideji's motor controller (i.e., the control device 34). See Appx1178 at ¶0032.

Hideji further discloses that the phase control part 39 generates an I_d *target* signal (highlighted in green) that is a function of the *actual* I_q signal (highlighted in yellow).

> The phase control part 39 identifies the state of a load by introducing the torque current I_q in direct proportion to the change of the load acting on the brushless DC motor 30A, ***to generate a flux current I_d target value*** corresponding to the state of the load. Specifically, by introducing the torque current I_q in direct proportion to the increase of the load acting on the brushless DC motor 30A, the flux current I_d target value is reduced on the

> basis of the following formula. In addition, in the following formula, k is a positive constant.
>
> The flux current I_d target value is equal to k x I_q^2....

Appx1179 at ¶¶0038-39 (emphasis added). The phase control part 39 is part of Hideji's motor controller (i.e., control device 34). See Appx1178 at ¶0032.

Whether the recited Q and d axis current values are actual current values, in which case Hideji discloses independent *actual* I_q and I_d current values, or whether they are demand current values, in which case Hideji discloses independent *target* I_q and I_d current values, a skilled person would understand that the independence is not intermingled. That is, there is nothing in the claim language that would require the flux current I_d ***target*** value to be independent of the ***actual*** torque current I_q. See Appx0039.

Patent Owner's expert, Dr. Blank, admitted that because the I_q *target* value is solely a function of rotor speed and the I_d *target* value is solely a function of the *actual* I_q value, the I_q *target* value and the I_d *target* value are developed independently of each other (i.e., by different parts: the speed control part 38 and the phase control part 39), without relying on one to derive the other. See Appx1339, ln. 4 - Appx1340, ln. 18. Reflecting this independence, Figure 2 of Hideji illustrates the I_q *target* and I_d *target* values as being on two separate lines.

The independent *actual* I_q and *actual* I_d values and the independent I_q *target* and I_d *target* values are used by Hideji's current control part 40 to calculate the V_q and V_d signals which control the sinewave commutation. See Appx1180 at ¶¶0040-0041. This current control part 40 is part of Hideji's motor controller (i.e., control device 34). See Appx1178 at ¶0032.

CONCLUSION

For all of the foregoing reasons, the final judgment of the Board that claims 1-3, 8, 9, 12, 16 and 19 of the '349 patent are unpatentable should be affirmed.

Respectfully submitted,

Dated: January 10, 2017

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CERTIFICATE OF SERVICE

I, the undersigned, being duly sworn according to law and being over the age of 18, upon my oath depose and say that on January 10, 2017, I hereby certify that a true and correct copy of the foregoing **BRIEF FOR APPELLEES** was served upon the following counsel of record on January 10, 2017, via electronic CM/ECF filing and e-mail, as follows.

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CERTIFICATE OF COMPLIANCE

This brief complies with the type-volume limitation of Fed. R. App. P. 32(a)(7)(B). I certify that according to the word-processing system used in preparing it, the foregoing **BRIEF FOR APPELLEES** contains 13,920 words, excluding those portions of the brief exempted by Fed.R.App.P. 32(a)(7)(B)(iii), and therefore complies with the type-volume limitation set forth in Fed.R.App.P 28.1(e)(2)(B)(i).

This brief complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type style requirements of Fed. R. App. P. 32(a)(6). The brief has been prepared in a proportionally spaced typeface using Microsoft Word 2010 in 14-point Times New Roman font.

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