

**United States Court of Appeals  
for the Federal Circuit**

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**NIDEC MOTOR CORPORATION,**  
*Appellant*

v.

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

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2016-1900

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Appeal from the United States Patent and Trademark  
Office, Patent Trial and Appeal Board in No. IPR2014-  
01122.

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Decided: March 14, 2017

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SCOTT R. BROWN, Hovey Williams LLP, Overland  
Park, KS, argued for appellant. Also represented by  
MATTHEW B. WALTERS.

STEVEN F. MEYER, Locke Lord LLP, New York, NY,  
argued for appellees. Also represented by JOSEPH  
ANTHONY FARCO; CHARLES BAKER, Houston, TX.

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Before LOURIE, MOORE, and TARANTO, *Circuit Judges*.

MOORE, *Circuit Judge*.

The present appeal arises from an inter partes review (“IPR”) involving Zhongshan Broad Ocean Motor Co. Ltd., Broad Ocean Motor LLC, and Broad Ocean Technologies, LLC (collectively “Broad Ocean”) and Nidec Motor Corp. (“Nidec”). Broad Ocean petitioned for IPR of claim 21 of Nidec’s U.S. Patent No. 7,208,895 (the “895 patent”). The Patent Trial and Appeal Board (the “Board”) instituted the IPR and found that claim 21 was anticipated by U.S. Patent No. 5,569,995 (“Kusaka”). Nidec appeals that decision to our court. Because the Board’s decision is not supported by substantial evidence, we reverse.

#### BACKGROUND

The ’895 patent discloses a system for controlling the torque of an electromagnetic motor. Figure 1 illustrates its basic operation. Controller 110 receives various inputs, including torque demand and rotor position/speed. ’895 patent at 2:24–30. The output of the controller is input into drive 108, which outputs three energizable phase windings 106A, 106B, and 106C to the motor. *Id.* at 2:16–22. Each winding wraps around the motor 101, which comprises stator 102 and rotor 104. *Id.* at 2:14–16.

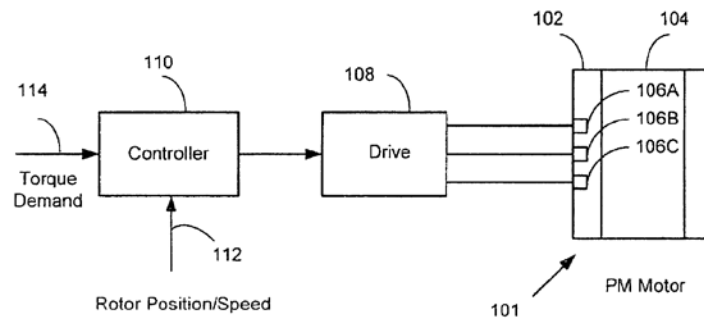


FIG. 1

*Id.* at Fig. 1.

Motor control values can be expressed relative to two different frames of reference: the stationary frame of reference and the rotating frame of reference. The stationary frame of reference calculates values relative to the position of the stator. For example, voltages 106A–C in Figure 1 are expressed in the stationary reference frame. *Id.* at 3:21–25. The rotating frame of reference calculates values relative to the position of the rotor. In the rotating frame of reference, the d-axis is aligned with the rotor, and the q-axis is offset by 90 degrees. A signal in the rotating frame of reference contains both q-axis and d-axis components.

Figure 2 provides a more detailed description of the operation of the controller. The dispute in this case centers on the vectorize block 212. The inputs to the vectorize block are reference currents  $I_{qr}$  demand 208 and  $I_{dr}$  demand 209. The  $I_{qr}$  and  $I_{dr}$  demand signals are “concatenated” in vectorize block 212 to produce  $I_{Qdr}$  demand signal 214. *Id.* at 3:3–13.

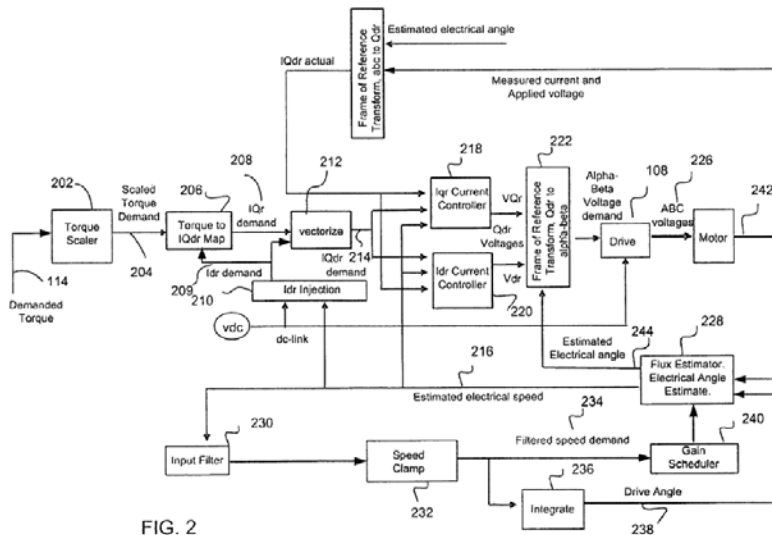


FIG. 2

*Id.* at Fig. 2. Claim 12, from which challenged claim 21 depends, requires “combining the  $I_{qr}$  demand and the dr-

axis injection current [I<sub>dr</sub>] demand to produce an IQ<sub>dr</sub> demand.” *Id.* at 10:1–16. The Board construed (1) “IQ<sub>r</sub> demand” as “Q-axis demand current;” (2) “dr-axis injection current demand” as “d-axis injection current;” and (3) “IQ<sub>dr</sub> demand” as “a current demand that includes Q- and d-axis current demands.” J.A. 14. Neither party challenges these constructions on appeal.

The Board found Kusaka anticipates claim 21 of the ’895 patent. Kusaka is a patent assigned to Toyota that discloses the motor control system shown in Figure 1:

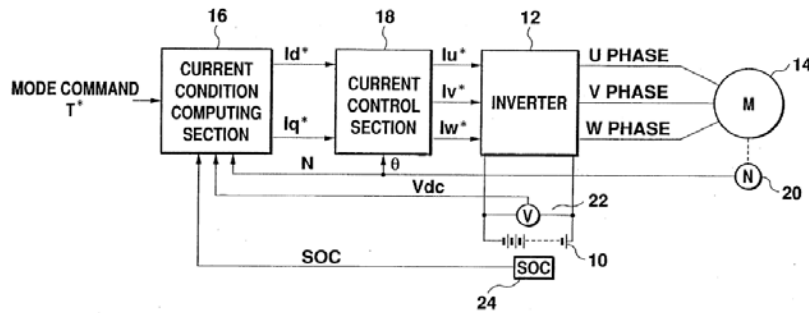


Fig. 1

Current Control Section block 18 has three inputs: I<sub>d</sub>, I<sub>q</sub>, and  $\theta$ . I<sub>d</sub> and I<sub>q</sub> are reference currents in the rotating frame of reference, and  $\theta$  is the angular position of the rotor. The Control block has three outputs: phase reference currents I<sub>u</sub>, I<sub>v</sub>, and I<sub>w</sub>. Broad Ocean concedes that I<sub>u</sub>, I<sub>v</sub>, and I<sub>w</sub> are in the stationary frame of reference. Appellees’ Br. 50–51.

The Board found that Kusaka’s reference currents I<sub>q</sub> and I<sub>d</sub> disclosed the “IQ<sub>r</sub> demand” and “dr-axis injection current demand” limitations, respectively, and that “the set of I<sub>u</sub>\*, I<sub>v</sub>\*, and I<sub>w</sub>\* is an IQ<sub>dr</sub> demand as we have construed the term.” J.A. 19. Based on these disclosures, it found that Kusaka anticipated claim 21 of the ’895 patent. Nidec appeals. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4)(A).

## ANALYSIS

Anticipation is a question of fact we review for substantial evidence. *REG Synthetic Fuels, LLC v. Neste Oil Oyj*, 841 F.3d 954, 958 (Fed. Cir. 2016). “[A] claim is anticipated if each and every limitation is found either expressly or inherently in a single prior art reference.” *King Pharm., Inc. v. Eon Labs, Inc.*, 616 F.3d 1267, 1274 (Fed. Cir. 2010) (quotations omitted).

Nidec argues Kusaka does not anticipate because it does not disclose “produc[ing] an IQdr demand.” It argues Kusaka discloses three separate phase currents in the stationary frame of reference, rather than an IQdr demand, which must be in the rotating frame of reference. Appellants’ Br. 28–32.

Throughout the IPR proceedings, both Nidec and Broad Ocean took the position that the IQdr demand must be a signal in the rotating frame of reference. In its petition for IPR, Broad Ocean’s expert testified that the letter “r” in “IQr” and “Idr” “further enforces the determination that the value is one in the rotating frame of reference.” J.A. 118–19. In its Patent Owner’s Response, Nidec argued on multiple occasions that the IQdr demand signal is in the rotating frame of reference. *See* J.A. 319, 321–22. And in its Petitioner’s Reply, Broad Ocean noted that “‘IQdr’ is a common term used in the art as a general reference for the quadrature current IQ and the direct current Id in the rotating frame of reference.” J.A. 355.

The parties’ understanding that an IQdr demand signal must be in the rotating frame of reference is consistent with the ’895 patent’s specification. After leaving the vectorize block, the IQdr demand signal is converted to a vector of motor voltages in the rotating frame of reference. This vector is then converted into three reference voltages in the stationary frame of reference, which are applied to the motor. ’895 patent at 3:14–25. Given that the information in the IQdr demand signal is ulti-

mately converted from the rotating frame of reference to the stationary frame of reference, the IQdr demand signal itself must be in the rotating frame of reference.

The Board's finding that Kusaka anticipates claim 21 is not supported by substantial evidence because Kusaka fails to disclose an IQdr demand. The Board identified Kusaka's set of reference currents  $I_u$ ,  $I_v$ , and  $I_w$  as disclosing an IQdr demand, but those signals are not in the rotating frame of reference. As Broad Ocean concedes,  $I_u$ ,  $I_v$ , and  $I_w$  are expressed in the stationary frame of reference. Appellees' Br. 50–51. Because Kusaka does not disclose a signal in the rotating frame of reference, it does not disclose an IQdr demand. The Board's contrary finding is unsupported.<sup>1</sup>

The Board held that anticipation can be found even when a prior art reference fails to disclose a claim element so long as a skilled artisan reading the reference would “at once envisage” the claimed arrangement. J.A. 21 (citing *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015)). The Board's misapplication of *Kennametal* improperly assumed disclosure of a claim element.

In *Kennametal*, the challenged claim required a ruthenium binding agent and a PVD coating to be used together. The prior art reference disclosed five binding agents (one of which was ruthenium) and three coating techniques (one of which was PVD). The reference never disclosed the specific combination of ruthenium and PVD,

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<sup>1</sup> Broad Ocean argues Nidec waived the argument that Kusaka does not disclose an IQdr demand. See Appellees' Br. 2, 54. We disagree. Nidec argued both to the Board (J.A. 319, 321–22) and to our court (Appellants' Br. 29, 30) that Kusaka does not disclose an IQdr demand signal in the rotating frame of reference.

but it taught that any of the five binding agents could be used with any of the three coating techniques. We held that substantial evidence supported the Board’s finding that the reference effectively taught fifteen combinations, one of which anticipated the challenged claim. *Kennametal*, 780 F.3d at 1382–83.

*Kennametal* does not stand for the proposition that a reference missing a limitation can anticipate a claim if a skilled artisan viewing the reference would “at once envisage” the missing limitation. Rather, *Kennametal* addresses whether the disclosure of a limited number of combination possibilities discloses one of the possible combinations. As we explained, the relevant question was “whether the number of categories and components disclosed in [the prior art reference] is so large that the combination of ruthenium and PVD coatings would not be immediately apparent to one of ordinary skill in the art.” *Id.* at 1382 (quoting *Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC*, 683 F.3d 1356, 1361 (Fed. Cir. 2012)) (quotations omitted). *Kennametal* does not permit the Board to fill in missing limitations simply because a skilled artisan would immediately envision them.

#### CONCLUSION

We hold that the Board’s finding that Kusaka anticipates claim 21 of the ’895 patent is not supported by substantial evidence. The Board’s opinion is therefore reversed. Because we reverse on the IQdr demand issue, we need not address Nidec’s other arguments.

#### REVERSED

#### COSTS

Costs to Nidec.