

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

NIDEC MOTOR CORPORATION,  
Patent Owner.

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Case IPR2015-00762  
Patent 7,626,349 B2

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Before BENJAMIN D. M. WOOD, JAMES A. TARTAL, and  
PATRICK M. BOUCHER, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* PATRICK M.  
BOUCHER, in which *Administrative Patent Judge* BENJAMIN D. M.  
WOOD joins.

Opinion Dissenting filed by *Administrative Patent Judge* TARTAL.

IPR2015-00762  
Patent 7,626,349 B2

BOUCHER, *Administrative Patent Judge*.

DECISION  
Denying Institution of *Inter Partes* Review  
37 C.F.R. § 42.108

On February 20, 2015, Zhongshan Broad Ocean Motor Co., Ltd., Broad Ocean Motor LLC, and Broad Ocean Technologies, LLC (“Petitioners”) filed a Petition (Paper 3, “Pet.”) pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–3, 8, 9, 12, 16, and 19 (“the challenged claims”) of U.S. Patent No. 7,626,349 B2 (“the ’349 patent”). Concurrent with their Petition, Petitioners filed a Motion for Joinder (Paper 4, “Mot.”) to join this proceeding with IPR2014-01121 (“the related proceeding”), which was instituted on January 21, 2015. Nidec Motor Corporation (“Patent Owner”) filed a Preliminary Response (Paper 10, “Prelim. Resp.”) to the Petition on April 21, 2015. Pursuant to our authorization, Petitioners filed a Reply (Paper 11) on April 28, 2015, limited to addressing the joinder issues.

For the reasons provided below, we deny Petitioner’s Motion for Joinder. We also deny the Petition and do not institute an *inter partes* review.

## I. BACKGROUND

### A. The '349 patent (Ex. 1001)

The '349 patent relates to heating, ventilating and/or air conditioning (“HVAC”) systems that use air-moving components, such as a blower. Ex. 1001, col. 1, ll. 8–11. Figure 4 of the '349 patent is reproduced below.

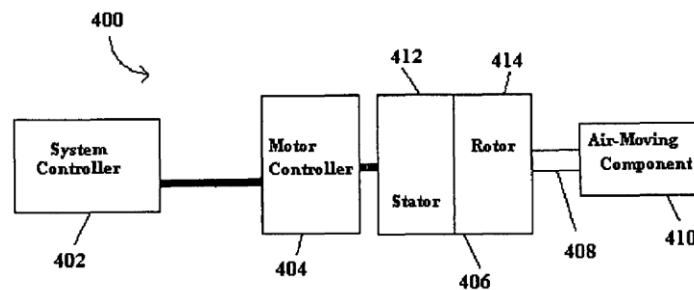
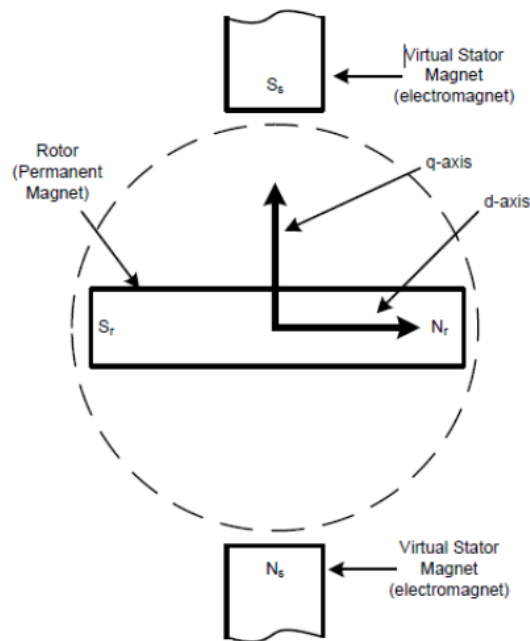


Figure 4

Figure 4 is a block diagram of HVAC system 400, which includes system controller 402, motor controller 404, permanent magnet motor 406, and air-moving component 410. *Id.* at col. 3, ll. 50–52. Permanent magnet motor 406 includes shaft 408, stationary assembly 412, and rotatable assembly 414. *Id.* at col. 3, ll. 52–54. The rotatable and stationary assemblies are coupled magnetically, and the rotatable assembly is coupled to the air-moving component via the shaft to drive rotation of the air-moving component. *Id.* at col. 3, ll. 54–58. The motor controller is configured to perform 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. *Id.* at col. 3, ll. 59–63.

Although the claims at issue are drawn to performing sine wave commutation using independent “values of Q and d axis currents,” the specification of the ’349 patent does not mention “values of Q and d axis currents” outside of its claims. Petitioners’ witness, Dr. Mark Ehsani, explains that “vector control” provides one method of controlling permanent-magnet synchronous motors, and that “[t]he 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.” Ex. 1009 ¶ 13. The drawing from page 6 of Dr. Ehsani’s Declaration is reproduced below.



The drawing from Dr. Ehsani’s Declaration illustrates a rotor, which has a permanent magnet having north and south poles  $N_r$  and  $S_r$ , respectively, and

illustrates a stator, which includes electromagnets that result in a virtual stator magnet having north and south poles  $N_s$  and  $S_s$ , respectively. *Id.* at ¶ 15. The d axis is aligned with the rotor and the Q axis<sup>1</sup> is offset 90° from the d axis. The motor commutates the winding currents to maintain orthogonality of the d and Q axes as the rotor turns. *Id.* at ¶ 16.

The '349 patent incorporates by reference the disclosure of U.S. Patent No. 7,342,379 B2 (Ex. 3001, “the '379 patent”). Ex. 1001, col. 4, ll. 23–29. The '379 patent describes embodiments in which a Q-axis current is calculated “based on a given [d-axis] current injection to produce a desired rotor torque.” Ex. 3001, col. 5, ll. 27–30. The '379 patent also describes embodiments in which the Q-axis current and the d-axis injection current “are multiplexed.” *Id.* at col. 5, ll. 51–57.

### *B. Illustrative Claim*

Claim 1 of the '349 patent is illustrative of the claims at issue:

1. A heating, venting and/or air conditioning (HVAC) system comprising a system controller, a motor controller, an air-moving component, and a permanent magnet motor having a stationary assembly, a rotatable assembly in magnetic coupling relation to the stationary assembly, and a shaft coupled to the air-moving component, 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 signals received from the system controller to produce

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<sup>1</sup> Dr. Ehsani uses a lower-case letter q in referring to this axis. We use an upper-case letter Q for consistency with the claims that are before us.

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