

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

v.

NIDEC MOTOR CORPORATION,
Patent Owner.

Case IPR2014-01121
Patent 7,626,349 B2

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

BOUCHER, *Administrative Patent Judge*.

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

On July 3, 2014, Zhongshan Broad Ocean Motor Co., Ltd., Broad Ocean Motor LLC, and Broad Ocean Technologies, LLC (“Petitioners”) filed a Petition (Paper 1) pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–3, 8, 9, 12, 16, and 19 of U.S. Patent No. 7,626,249 B2 (“the ’349 patent”). A corrected Petition (Paper 7, “Pet.”) was filed on July 28, 2014. Nidec Motor Corporation (“Patent Owner”) filed a Preliminary Response (Paper 14, “Prelim. Resp.”) to the corrected Petition on October 24, 2014. On November 10, 2014, Petitioners filed a Motion to Submit Corrected Exhibits and Maintain Filing Date (Paper 17, “Mot.”). On November 17, 2014, Patent Owner filed an Opposition to the Motion (Paper 19, “Opp.”).

For the reasons set forth below, we deny Petitioners’ Motion. Applying the standard set forth in 35 U.S.C. § 314(a), which requires demonstration of a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim, we institute an *inter partes* review of claims 1–3, 8, 9, 12, 16, and 19. The Board has not made a final determination of the patentability of any claim.

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.

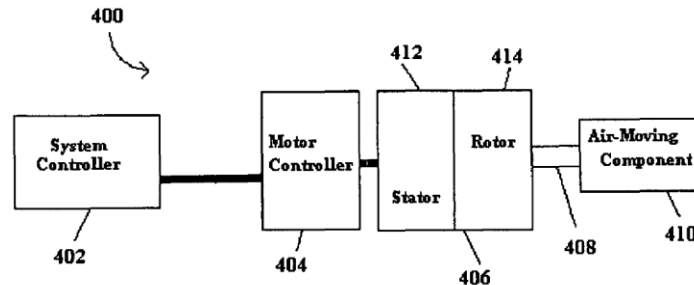
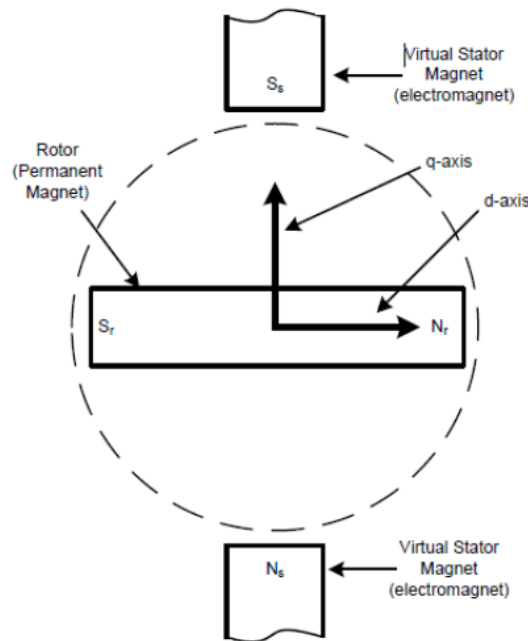


Figure 4

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 magnetically coupled, 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 sine wave 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.

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 axis¹ 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.

¹ 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.

The '349 patent incorporates the disclosure of U.S. Pat. No. 7,342,379 (Ex. 3001, “the '379 patent”) by reference. 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, ventilating 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 sine wave commutation, using independent values of Q and d axis currents, in response to one or more signals received from the system controller to produce continuous phase currents in the permanent magnet motor for driving the air-moving component.

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