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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/933,333	11/05/2015	Brian Jay Tillotson	15-0892-US-NP	5201

63759 7590 11/04/2019

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ART UNIT	PAPER NUMBER
2837	

NOTIFICATION DATE	DELIVERY MODE
11/04/2019	ELECTRONIC

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRIAN JAY TILLOTSON and PENG ZENG
(Applicant: THE BOEING COMPANY)

Appeal 2019-000743
Application 14/933,333
Technology Center 2800

Before BEVERLY A. FRANKLIN, MICHAEL P. COLAIANNI, and BRIAN D. RANGE, *Administrative Patent Judges*.

FRANKLIN, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant[1] requests our review under 35 U.S.C. § 134(a) of the Examiner's decision rejecting claims 1–28. We have jurisdiction over the appeal under 35 U.S.C. § 6(b).

STATEMENT OF THE CASE

[1] Appellant identifies the real party in interest as The Boeing Company. App. Br. 2.

Claim 1 is illustrative of Appellant's subject matter on appeal and is set forth below:

> 1. An apparatus comprising:
> a rotor (116) comprising an electrically conductive material (120), wherein the rotor (116) is rotatable about an axis (122);
> stator coils (118) positioned adjacent to the rotor (116) such that an eddy current (128) is generated in the rotor (116) when an alternating current (130) flows through the stator coils (118); and
> a current control system (112) that controls a flow of the alternating current (130) through the stator coils (118) based on a position (134) of the rotor (116), wherein a stator coil (136) in the stator coils (118) generates an alternating magnetic field (144) when the alternating current (130) flows through the stator coil (136) causing the eddy current (128) in the rotor (116) such that a repulsive force (140) between the stator coil (136) and the rotor (116) rotates the rotor (116) about the axis (122).

The Examiner relies on the following prior art references as evidence of unpatentability:

Griepentrog	US 2005/0225188 A1	Oct. 13, 2005
Jansen	US 2007/0001533 A1	Jan. 4, 2007
Spooner	US 2008/0124233 A1	May 29, 2008
Stiesdal	US 2010/0072854 A1	Mar. 25, 2010
Frölich	US 2016/0141923 A1	May 19, 2016

THE REJECTIONS

1. Claims 1–4, 7–11, 21, 23, and 24 are rejected under 35 U.S.C. § 103 as being unpatentable over Spooner in view of Frölich.

2. Claims 5, 19, 22, and 26 are rejected under 35 U.S.C. § 103 as being unpatentable over Spooner in view of Frölich, and further in view of Jansen.
3. Claims 6, 12–18, and 20 are rejected under 35 U.S.C. § 103 as being unpatentable over Spooner in view of Frölich and Jansen, and further in view of Griepentrog.
4. Claims 27 and 28 are rejected under 35 U.S.C. § 103 as being unpatentable over Spooner in view Stiesdal.

ANALYSIS

Upon consideration of the evidence and each of the respective positions set forth in the record, we find that the preponderance of evidence supports Appellant's position in the record. We thus reverse the Examiner's decision for the reasons provided by Appellant in the record, and add the following for emphasis.

Rejections 1–3

Spooner describes an electric motor comprising a rotor 22 surrounded by a fixed stator 23. The rotor 22a may be generally cylindrical (Spooner, Fig. 2a) or the rotor 22b may be generally disk like (Spooner, Fig. 2b). The stator comprises an array of field coils wound around respective pole pieces which when appropriately energized with an AC supply will generate a rotating magnetic field in a conventional way. The magnetic flux produced by the stator coils induces eddy currents in the rotor which in turn generate a magnetic field which interacts with the stator field. As the stator magnetic field rotates, the interaction of the magnetic fields generated by the stator

and the rotor causes the rotor to rotate. Spooner, paras. [0022]–[0024], Figs. 2a and 2b.

The Examiner admits that Spooner does not teach that the flow of alternating current through the stator coils is controlled based on a position of the rotor, as recited in Appellant's claim 1. Final Act. 5. However, the Examiner asserts that current control in accordance with a position of the rotor is conventional and commonly known for motor control systems, as taught, for example, by Frölich. *Id.*

Frölich teaches a rotor comprising a main body 6 which consists of a material with a low magnetic conductivity. Rotor segments 13 are situated in depressions 9 in the main body 6, which rotor segments consist of material having good magnetic conductivity. Frölich, paras. [0059]–[0061], Figs. 1-3. The teeth 24 of a stator 23 are provided in a known manner with windings. On supplying with a rotary current, they generate a rotary field circulating in the air gap between the stator 23 and the rotor. The stator teeth 24 with the energized windings respectively attract the nearest rotor segments 13 of the rotor and are less energized sinusoidally in a known manner when the rotor segments 13 of the rotor come nearer to the stator teeth 24 which are attracting them. At the same time, the next phase to the other stator teeth 24 is energized increasingly more intensively, which in turn attract other rotor segments 13. With rotor position detection, it is ensured that the optimum phase position of the stator currents is controlled. Frölich, para. [0073], Fig. 4.

Appellant argues that the teachings of Frölich with respect to controlling the current in a stator in accordance with the position of a rotor are not relevant to the electric motor described in Spooner. Appeal Br. 9.

Appellant argues that Frölich teaches using rotor position detection to determine the position of magnetically conductive segments of the rotor relative to teeth of the stator. Appeal Br. 9–10. Appellant argues that, however, in Spooner the rotor is a unitary solid cylinder or disk of ferromagnetic material, and thus, the rotor in the motor described in Spooner does not have any segments whose position may be determined. Appeal Br. 10. Appellant submits that therefore the teaching of Frölich to determine the positions of magnetically conductive segments of the rotor for controlling the current in a stator is not relevant to the motor described in Spooner and, thus, there is no reason for combining this teaching of Frölich with the teachings of Spooner. *Id.* We are persuaded by such argument. Notably, the Examiner does not resolve this valid point raised by Appellant that in Spooner, the rotor is a unitary solid cylinder or disk of ferromagnetic material, and thus, the rotor in the motor described in Spooner does not have any segments whose position may be determined, which is completely different from the configuration and mechanism according to Frölich. Ans. 2–4. We thus affirm Rejections 1–3 (the Examiner does not use the additional references applied in Rejection 2 and 3 to cure the deficiency in the combination of Spooner in view of Frölich).

Rejection 4

Rejection 4 involves the rejection of independent claim 27 (and dependent claim 28). Claim 27 is drawn to a method for controlling an electric motor. Claim 27 features sending a direct current through a stator coil to create an attractive force between the stator coil and the rotor when the rotor is in a first position and sending an alternating current through the

stator coil to create a repulsive force between the stator coil and the rotor when the rotor is in a second position. Thus, claim 27 features using both attractive and repulsive forces to rotate the rotor of a motor.

Appellant argues that neither Spooner, nor Stiesdal, nor the combination thereof, teach controlling the current in the stator such that attractive force is used when the rotor is in one position and a repulsive force is used when the rotor is in a second position, as recited claim 27. Appeal Br. 12.

The Examiner asserts that it would have been obvious "to modify the invention of Spooner with the teaching of Stiesdal to use DC current to energize stator coils in order to create an attractive magnetic force as complementary to the repulsive force in order to generate rotating torque." Ans. 5. However, we agree with Appellant that the Examiner has not adequately explained how either reference describes or suggests creating an attractive force as complementary to a repulsive force. Appeal Br. 12. Reply Br. 5.

Furthermore, as pointed out by Appellant on page 5 of the Reply Brief, claim 27 is not even drawn to an attractive force that is "complementary" to a repulsive force, but specifies sending a direct current through a stator coil to create an attractive force between the stator coil and the rotor when the rotor is in a first position, and sending an alternating current through the stator coil to create a repulsive force between the stator coil and the rotor when the rotor is in a second position. We agree with Appellant that the Examiner does not adequately explain how these additional features of claim 27 are described or suggested in the cited references. Appeal Br. 12. Reply Br. 5.

In view of the above, we reverse Rejection 4.

DECISION

Each rejection is reversed.

ORDER

REVERSED