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Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
Row 1: 12/077,814, 03/20/2008, Sooyoul Hong, STC.085.A1, 7421
Row 2: 98068, 7590, 11/15/2016, Hollingsworth Davis, 8000 West 78th Street, Suite 450, Minneapolis, MN 55439, EXAMINER CHAU, LINDA N
Row 3: ART UNIT 1785, PAPER NUMBER
Row 4: NOTIFICATION DATE 11/15/2016, DELIVERY MODE ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte SOOYOUL HONG, KISEOK MOON, and CARL (XIAO) CHE

Appeal 2015-007012
Application 12/077,814
Technology Center 1700

Before PETER F. KRAZ, JEFFREY T. SMITH, and
N. WHITNEY WILSON, *Administrative Patent Judges*.

KRATZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 11–15, 17, 18, 20–27, and 29–38. We have jurisdiction pursuant to 35 U.S.C. § 6.

Appellants' claimed invention is directed to apparatus comprising a substrate, an anti-ferromagnetic layer comprising $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ over the substrate, and a patterned perpendicular magnetic layer over the anti-ferromagnetic layer and an exchange-spring formed by the latter two layers. A method for forming the device/apparatus is also claimed. The

Specification provides that “[t]he $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ material has a Neel temperature¹ between 200° to 520° K” (Spec. 8).

Claim 11 is illustrative and reproduced below:

11. An apparatus, comprising:
a substrate;
an anti-ferromagnetic layer over the substrate comprising $\text{Fe}_x\text{Ni}_{1-x}\text{O}$;
a patterned perpendicular magnetic layer over the anti-ferromagnetic layer; and
an exchange-spring formed by the anti-ferromagnetic layer and the magnetic layer.

The Examiner relies on the following prior art references as evidence in rejecting the appealed claims:

De Haas	US 2004/0086750 A1	May 6, 2004
Suess	US 2007/0292720 A1	Dec. 20, 2007
Berger	US 2008/0292907 A1	Nov. 27, 2008

Nogues, *Exchange bias*, Journal of Magnetism and Magnetic Materials 192, 203-232 (1999).

The Examiner maintains the following grounds of rejection:

1. Claims 11–15, 17, 18, 21–27, and 29–36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Suess in view of De Hass.
2. Claims 20, 37, and 38 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Suess in view of De Hass and Berger.

¹ According to the Oxford English Dictionary (oed.com), an antiferromagnetic material’s Néel temperature (T_N) is a transition temperature (point), above which temperature the material is paramagnetic. According to Nogués (J. Nogués, Ivan Schuller, Exchange Bias, Journal of Magnetism and Magnetic Materials, 192 (1993) 203-232) submitted by Appellants and of record, the T_N for NiO is 520 °K and the T_N range for $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ is 200-520 °K (Table 2, p. 212).

Appellants' argument and Declaration evidence expose no reversible error in the Examiner's obviousness rejections. Accordingly, we affirm both of the stated rejections.

Appellants argue the rejected claims together as a group with respect to the first stated rejection with the exception of dependent claim 17. Accordingly, we select claim 11 as the representative claim for the claims subject to the first stated rejection with the exception of separately argued claim 17, which we consider separately. Appellants rely on the arguments as made with respect to the first stated rejection in traversing the Examiner's second stated rejection.

Rejection 1

The Examiner has determined, *inter alia*, that it would have been obvious to one of ordinary skill in the art to employ an anti-ferromagnetic layer comprising NiO in the device of Sues based on DeHaas's teaching of a ferromagnetic layer that may comprise NiO (Final Act. 2–4). In this regard, the Examiner takes the position that representative claim 11 embraces a ferromagnetic layer that comprises NiO based on the Examiner's interpretation of the claim term $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ as embracing NiO (x is not specified and may be equal to zero) (Final Act. 7–8; Ans. 3).

Appellants limit their argument to the $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ material requirement of the antiferromagnetic layer and argue that the Examiner's claim interpretation is unreasonably broad and the rejection is thereby in error because one of ordinary skill in the art would not interpret x to be zero given that the compound formula includes iron (Fe) as evinced by a Declaration of

Dr. Thomas P. Nolan when interpreted in light of the subject Specification (App. Br. 5–6; Reply Br. 5–6).

Dr. Nolan states that “[s]ince the compound specifies iron, one would not normally expect “x” to be equal to zero” (Decl. ¶ 6).

Moreover, Dr. Nolan points to the subject Specification statement concerning the Neel temperature range of 200 – 520 °K for $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ material as supporting an interpretation of x not being equal to zero for the claimed $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ of the anti-magnetic layer (Decl. ¶ 7; Spec. p. 8, ll. 6–9). In particular, Dr. Nolan declares that according to Wikipedia, the FeO Neel temperature is 198 °K and the Neel temperature for NiO is 525 °K, which indicates that the Specification Neel temperature range supports an interpretation of the compound formula $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ as not including zero or one as a value for x (Declaration ¶ 7).

In light of the above, Appellants argue that the Examiner’s interpretation of the claimed formula $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ so as to read on NiO is unreasonable and contend that the rejection should be reversed because it is premised on a faulty claim interpretation (App. Br. 5–6). In addition, and as for separately argued dependent claim 17, Appellants contend that the Neel temperature limitation set forth in dependent claim 17 “between about 200° and 520° K” does not include 525 °K, which is the Neel temperature for NiO according to the Declaration of Dr. Nolan.

We reject Appellants proposed claim construction and concur with the Examiner that the contested claim term x as employed in representative claim 11 is open to a value of zero. Hence, we are not persuaded of reversible error in the Examiner’s first stated obviousness rejection.

As observed by the Examiner, the subject Specification place no numerical limits on the value of x in the formula $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ leaving the x term open to having a value of zero and the Declaration of Dr. Nolan is not persuasive of error in such a broadest reasonable construction of the claim when the claim including this contested claim term is read in light of the subject Specification by one of ordinary skill in the art. In this regard, Dr. Nolan statement that “one would not normally expect “ x ” to be equal to zero” does not serve to articulate why one of ordinary skill in the art would not read x as being open to a zero value when read in light of the subject Specification (Ans. 3; Decl. ¶ 6).

Moreover, dependent claim 17 employs the term “about” in providing the Specification Neel temperature range that was set forth without an “about” qualifier in the detailed description section at page 8 of the Specification. Thus, the inclusion of dependent claim 17 indicates that representative independent claim 11, from which claim 17 depends, is not limited by the Neel temperature range set forth in the detailed description of the Specification. In this regard, such a broadest reasonable construction of the contested claim term in representative claim 11 is consistent with the Specification statement indicating that the invention is not limited by the specific constructions described in the Specification (Spec. 8, ll. 15–22). Significantly, the Examiner’s claim construction, with which we agree, is bolstered by Nogués, as submitted by Appellants, wherein NiO is reported as having a $T_N = 520$ °K. We credit the latter submission over the Wikipedia derived $T_N = 525$ °K for NiO as reported in the Declaration of Dr. Nolan. Hence, even if we considered the $\text{Fe}_x\text{Ni}_{1-x}\text{O}$ material of claim 11 to be limited to the Neel temperature range of 200-520 °K reported in the detailed

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description of the subject Specification (which also applies to separately argued claim 17), NiO ($T_N = 520 \text{ }^\circ\text{K}$) would not be excluded by the claim term $\text{Fe}_x\text{Ni}_{1-x}\text{O}$. Therefore, we sustain the Examiner's first stated rejection.

Rejection 2

Concerning the separate obviousness rejection of certain dependent claims over Sues in view of De Hass and Berger, Appellants limit their argument to substantially the same the argument presented against Rejection 1 in relying on the Neel temperature range as a patentable distinction for the claimed material (App. Br. 6).

It follows that we shall affirm the latter rejection (Rejection 2).

CONCLUSION

The Examiner's decision to reject the appealed claims is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED