THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 22

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte WILLIAM C. CAIN

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Appeal No. 95-5142
Application 08/078,917[1]

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ON BRIEF

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Before HAIRSTON, KRASS, and MARTIN, Administrative Patent Judges.

MARTIN, Administrative Patent Judge.

**DECISION ON APPEAL**

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[1] Application for patent filed June 21, 1993.

This is an appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-7, all of Appellant's pending claims, under § 103. We reverse.

The invention is described in Appellant's specification as an improvement on the prior art transducer shown in Appellant's Figure 1, which shows an MR (magnetoresistive) read transducer 20 as disclosed in Krounbi et al. U.S. Patent 5,018,037 (Krounbi). The prior art structure is described in Appellant's specification as follows (at 3, lines 10-23):

> A central active layer area region 16 is composed of a soft adjacent layer 2 separated from an MR layer 6 by a nonmagnetic spacer layer 4. Passive end regions 18 each include a hard magnetic biasing layer 10 and a conductive layer 8. The central active region is defined by the space between the passive end regions 18.
>
> End regions 18 produce a longitudinal bias field, while a transverse bias field is produced in at least part of the central active region 16. Transverse biasing occurs when a sense current passes through soft adjacent layer 2. The biasing at least partially compensates for hysteresis effects, thereby improving linearity and sensitivity of the signal generated in the transducer.

Krounbi explains that it is necessary to provide both longitudinal and transverse biasing of the MR layer in order

to eliminate Barkhausen noise and to maintain the sensor in its most linear operating range (col. 1, lines 11-14).

Layers 2, 4, and 6 of the prior art device shown in Appellant's Figure 1 appear as layers 34, 36, and 38, respectively, in Appellant's Figure 2, which shows his invention as additionally including an exchange layer 32 adjacent to the biasing layer, i.e, soft adjacent layer 34, and on the opposite side of the soft adjacent layer from the spacer layer 36. This exchange layer, which is in electrical and magnetic continuity with soft active layer, produces a field transverse to MR layer 38 that enables saturation of the soft active layer 34 either without a sense current or a relatively low sense current (Spec. at 3, lines 31-35), thereby reducing the size of the sense current and thus the power supply (Spec. at 2, lines 5-11).

As in the prior art device shown in Appellant's Figure 1, Appellant's transducer includes a hard magnetic bias layer 44 and a conductive layer 42 for generating longitudinal biasing of the MR layer (Spec. at 4, lines 3-16).

Claim 1, the sole independent claim, uses the term "soft active layer" in place of "soft secondary layer":[2]

> 1. A magnetoresistive read transducer for sensing magnetic signals and converting said signals to electrical signals, comprising:
> a unitary magnetoresistive layer;
> a soft active layer for providing a longitudinal bias to said transducer;[3]
> a spacer layer, interposed between said unitary magnetoresistive layer and said soft active layer; and
> an exchange layer, in contact with said soft active layer and on the opposite side of said soft active layer from said spacer layer for generating an exchange field along a direction transverse to said soft active layer, thereby reducing the sense current required to saturate said soft active layer;
> so that a sense current is generated in said transducer when said transducer is passed over magnetic storage media.

We note that the claim does not preclude the MR layer from being formed of a "soft" magnetic material.

The sole reference relied on by the examiner is:

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[2] Incorrect copies of claim 1 were submitted with Appellant's substitute brief filed April 10, 1995 (hereinafter, Brief), with the letter received (by mail) on July 22, 1996, and with the letter received (by fax) on December 11, 1997.

[3] This limitation appears to be inconsistent with Appellant's specification, which, as noted earlier, states that longitudinal biasing is provided by end regions 48 and that the function of the soft secondary layer and the exchange layer is to provide transverse biasing.

Hempstead et al. (Hempstead) 4,103,315 July 25, 1978

Claims 1-7 stand rejected under 35 U.S.C. § 103 as obvious over the admitted prior art shown in Appellant's Figure 1 and described at pages 1-2 of the specification in view of Hempstead.

Inasmuch as Appellant treats all of the appealed claims as standing or falling together (Brief at 3), we will specifically discuss only claim 1.

As evidence of the obviousness of adding an exchange layer to the prior art device show in Appellant's Figure 1, the examiner cites Hempstead, which discloses magnetic read/write heads in which the magnetoresistive film is formed as a single domain by using exchange anisotropy to bias magnetic films in a unique direction which is defined during device fabrication (col. 3, lines 41-47). This is accomplished either by depositing an antiferromagnetic film onto a ferromagnetic film in the presence of a magnetic field, or by depositing a ferromagnetic film onto an antiferromagnetic film followed by heating and cooling the films in a magnetic field in order to obtain the required

magnetic spin alignment in the antiferromagnetic film (col. 5, lines 46-54). Figure 2 shows an embodiment of such a structure which includes a plurality of ferromagnetic/ antiferromagnetic layer pairs (10,11), (13, 22), (24, 25), and 27, 28) separated by nonmagnetic layers 9, 12, 23, and 26 (col. 10, lines 11-54).

In the final Office action (at 3), the examiner relies on Figure 2 of Hempstead as follows with respect to claim 1:"Hempstead et al[.] (US 4,103,315) disclose an exchange layer 28 which contacts a soft adjacent layer 27 and is on the opposite side of the soft layer from the spacer layer 26." With respect to the particular material and thickness limitations appearing in the dependent claims, the examiner notes (at 3) that in Hempstead "[t]he exchange layer is iron manganese and has a thickness of about 150-350 Angstroms; see Figure 5 and column 5, lines 48-57. Hempstead et al[.] teach an exchange layer which comprises nickel oxide and an exchange layer comprising cobalt oxide; see column 4, lines 20-28." As motivation for modifying the prior art device in view of Hempstead in a way that satisfies claim 1, the examiner argued that

> one of ordinary skill in the art would have been motivated to provide the magnetoresistive read transducer of the Applicant's Prior Art with an exchange layer which contacts a soft adjacent layer and is on the opposite side of the soft layer from the spacer layer as shown in Hempstead et al[.] in order to have fixed the magnetization of the adjacent layer. [Final Office action at 3-4.]

Appellant responded with several arguments, one of which is that Hempstead fails to address the power consumption problem solved by Appellant's invention (Brief at 5). This argument is unconvincing because the teachings of the prior art need not be combined to solve the same problem that is solved by the claimed invention. In re Beattie, 974 F.2d 1309, 1312, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992).

Appellant also argued (Brief at 6) that the motivation alleged by the examiner (i.e., fixing the magnetization of the soft adjacent layer) lacks support and that "the use of unsupported statements by the Examiner as to the motivation of one or ordinary skill in the art is improper and should not be the basis for determining obviousness," citing In re Fritch, 972 F.2d 1260, 1265, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992) (the examiner can satisfy the burden to make out a prima facie case for obviousness only by "showing some objective teaching

in the prior art or that knowledge generally available to one of ordinary skill in the art would lead the individual to combine the relevant teachings of the references)." Actually, Hempstead does provide support for using an antiferromagnetic exchange film to fix the magnetization of the soft magnetic layer. Specifically, as noted above, Hempstead forms the antiferromagnetic/ferromagnetic film pair in such a way as to obtain the required magnetic spin alignment in the antiferromagnetic film (col. 5, lines 46-54). However, we are not persuaded that Hempstead's invention involves or suggests using an exchange layer adjacent to a soft magnetic biasing layer, as required to satisfy the claim; rather, Hempstead uses an exchange layer adjacent to an MR layer. While Hempstead's antiferromagnetic FeMn layer 28 (Fig. 2) overlies a soft magnetic NiFe layer 27 that is suitable for use as a soft magnetic biasing layer,[4] layer 27 is not described as, and does not appear to be, a biasing layer. Nor do we believe that Hempstead can fairly be construed as suggesting that an

[4] Appellant's specification (at 5) includes among the material suitable for use as the soft magnetic biasing material Permalloy, which is an 80:20 NiFe alloy (Hempstead, col. 11, lines 54-56).

exchange layer can be used adjacent to any exposed soft magnetic layer regardless of that latter's function. Indeed, Hempstead specifically distinguishes his invention in this respect from Bajourek et al. U.S. Patent 3,840,898, which, like the claimed invention, employs an exchange layer adjacent to a soft magnetic biasing layer that is separated from a soft magnetoresistive (MR) layer by a nonmagnetic layer (Hempstead at col. 5, lines 10-35):[5]

> Bajourek et al. . . . teach the use of exchange coupling to produce permanent magnetic bias layers for an MR stripe. They teach the use of exchange coupling between an antiferromagnetic layer such as "$Fe_2O_3$ and a soft magnetic material such as 80:20 NiFe to produce a permanent magnetic film which is then used to bias a second soft magnetic film (the MR stripe) by magnetostatic interaction between the two magnetic films and/or by exchange coupling between the two magnetic films through an insulating layer, for example, via pinholes in the insulating layer as described below. Nowhere do they teach the deliberate exchange between an antiferromagnetic film and an MR stripe itself [for] maintaining the soft magnetic properties of the MR stripe. This is because, in that patent as discussed above, for all known processes the exchange coupling between a soft magnetic film and an antiferromagnetic film caused an increase in the coercivity of the soft magnetic film making it useless as an MR stripe (which requires low coercivity and high permeability) but making

[5] The examiner should consider whether the subject matter of Appellant's claims is anticipated by or rendered obvious by Bajourek et al.

> it useful as a permanent magnet film for biasing a second soft magnetic film which would be the MR stripe as envisioned in the Bajourek patent.

In discussing the rejection of claim 1 in the Answer (at 4-5), the examiner shifted his reliance on Hempstead's Figure 2 to Figure 5 and gave a different motivation for modifying the prior art device in Hempstead:

> Hempstead et al[.] (US 4,103,315) discloses a magnetoresistive read transducer having an exchange layer 55 which contacts a soft active layer 54; see Figure 5. Exchange layers are conventional in the art for capping various magnetoresistive layers, including soft magnetic layers, and achieving desired noise characteristics, saturation levels of layers and overall improved head response.
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> . . . .
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> . . . [O]ne of ordinary skill in the art would have been motivated to provide the magnetoresistive read transducer of the Appellant's Prior Art Figure 1 and pages 1-2 of the specification with an exchange layer which contacts a soft adjacent layer in order to have utilized the exchange layer for capping the soft active layer and keeping the soft layer in saturation.

Although Appellant did not file a reply brief addressing this new rationale, we have considered it on the merits and find it unpersuasive. To the extent the examiner is arguing that Hempstead suggests using an exchange layer adjacent to a soft magnetic biasing layer or adjacent to any exposed soft magnetic layer regardless of its purpose, we disagree for the reasons already discussed. The examiner's alternative

contention that "[e]xchange layers are conventional in the art for capping various magnetoresistive layers, including soft magnetic layers, and achieving desired noise characteristics, saturation levels of layers and overall improved head response" (Answer at 4) will not be considered, because it is not supported by a citation to a specific part of Hempstead or to another reference. Such a citation is necessary where, as here, the allegedly well known subject matter is highly technical.[6] Compare In re Pardo, 684 F.2d 912, 917, 214 USPQ 673, 677 (CCPA 1982), which quotes In re Ahlert, 424 F.2d 1088, 1091, 165 USPQ 418, 420-21 (CCPA 1970) as follows:

> Assertions of technical facts in areas of esoteric technology must always be supported by citation to some reference work recognized as standard in the pertinent art and the appellant given, in the Patent Office, the opportunity to challenge the correctness of the assertion or the notoriety or repute of the cited reference. Cf. In re Cofer, 53 CCPA 830, 354 F.2d 664, 148 USPQ 268 (1966), In re Borst, 52 CCPA 1398, 345 F.2d 851, 145 USPQ 554 (CCPA 1965). Allegations concerning specific "knowledge" of the prior art, which might be peculiar to a particular art, should also be supported and the appellant similarly given the opportunity to make a

[6] Of course, supporting references should be cited prior to the Answer unless they are cited in support of a new ground of rejection given in the Answer.

challenge. See In re Spormann, 53 CCPA 1375, 363 F.2d 444, 150 USPQ 449 (1966).

In the absence of reference support for the examiner's assertion that is was known to use an exchange layer for capping the soft active layer and keeping the soft layer in saturation, the examiner has failed to prima facie establish that this knowledge would have motivated one skilled in the art to add an exchange layer adjacent to the to soft adjacent layer in the prior art device shown in Appellant's Figure 1.

For the foregoing reasons, the rejection of claim 1 under 35 U.S.C. § 103 for obviousness over Appellant's prior art Figure 1 in view of Hempstead is reversed, as is the rejection of dependent claims 2-7, which stand or fall (in this case stand) therewith.

**REVERSED**

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| KENNETH W. HAIRSTON<br>Administrative Patent Judge | ) |
| ERROL A. KRASS<br>Administrative Patent Judge | ) BOARD OF PATENT<br>) APPEALS AND |

)
) INTERFERENCES
)

JOHN C. MARTIN )
Administrative Patent Judge )

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