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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 33

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ATSUO KOBAYASHI and MIKIO MATSUZAKI

Appeal No. 96-3614
Application 08/259,154[1]

HEARD: June 11, 1999

Before MARTIN, JERRY SMITH, and DIXON, *Administrative Patent Judges*.

MARTIN, *Administrative Patent Judge*.

DECISION ON APPEAL

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[1] Application for patent filed June 13, 1994. According to appellants, this application is a continuation of Serial No. 07/928,297, filed August 12, 1992.

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-6, all of the pending claims, under 35 U.S.C. § 103. We reverse the rejections of claims 1 and 3-6 and affirm the rejection of claim 2.

The invention

The invention is a thin film magnetic head. Four different embodiments are disclosed. Referring to the first embodiment (Figs. 1 and 2), the slider 1 includes an electrically conductive substrate 101 and an insulating film 102 formed thereon (hereinafter referred to as a substrate-insulating film to distinguish it from other insulating films) (Spec. at 6, lines 1-4). Figure 2 and the specification (at 6, lines 4-6) give the thickness of the substrate-insulating film 102 as "0.5-3Fm" and "in the range of 0.5 Fm - 3 Fm," respectively, which is stated to be less than the 10 Fm or more thickness this layer has in conventional thin film magnetic heads (Spec. at 8, line 24 to p. 9, line 8). Magnetic film transducing element 2 includes a lower magnetic film 21, upper magnetic film 22, and coil films 23 (Spec. at 6, lines 18-20). The lower magnetic layer 21 is formed on substrate-insulating film 102, whose 0.5 Fm - 3 Fm thickness allows enough leakage current to flow therethrough to reduce the possibility of an electric discharge between the magnetic medium (not shown) and the pole portions 211 and 221 of the lower and upper magnetic films 21 and 22, respectively (Spec. at 7, line 17 to p. 8, line 5).

Disposed on the top surface of lower magnetic film 21 is an insulating film 24 (hereinafter gap-insulating film) which provides the gap between the yoke portions 211 and 221 of the magnetic films (Spec. at 6, line 26 to p. 7, line 1). The coil film 23 is surrounded by insulating films 251-253 (hereinafter coil-insulating films), which may be a made of an organic resin such as novolak resin (Spec. at 7, lines 4-9). The use of an organic resin as the coil insulation material ensures that the "electrical insulation required for the coil films is sufficient even though the thickness of the insulating film 102 is thin" (Spec. at 8, lines 9-14).

The second embodiment, shown in Figures 3 and 4, eliminates the substrate-insulating film 102 and has the lower magnetic film 21 deposited directly on substrate 101. Because the lower and upper magnetic films thus are kept at the same electrical potential as the substrate, there is no danger of an electric discharge between the recording medium and the pole portions 211 and 221 of magnetic films 21 and 22 (Spec. at 10, line 20 to p. 11, line 7). The use of organic insulating resin films 251-253 around the coil film 23 provides sufficient insulation even though the lower magnetic film 21 is in contact with the substrate (Spec. at 11, lines 10-15).

In the third and fourth embodiments (Figs. 5 and 6), the lower magnetic film 21 makes electrical contact with the substrate 111 through a hole 121 in the substrate-insulating film 112, 122, thereby keeping the lower and upper magnetic films 21 and 22 at the same potential as substrate 111 (Spec. at 13, line 25 to p. 15, line 1). In the Figure 5 embodiment, the upper surface of yoke portion 212 of lower magnetic film 21 is "stepwisely depressed" relative to the pole portion 211 as a result of the yoke portion dipping into the hole 121 in the substrate-insulating film 112, 122. In the Figure 6 embodiment, on the other hand, the yoke portion 212 of magnetic film 21 is thicker in the region of the hole 121 so that the upper surface of the yoke portion is "flush," i.e., level with, the pole portion 211. Like the first two embodiments, these embodiments employ organic resin coil-insulating films 251-253.

We note that Figures 5 and 6 do not include notation specifying the thickness of substrate-insulating layer 112, 122, which is shown having a thickness greater than that of substrate-insulating layer 102 in Figure 2, which is labeled "0.5-3Fm." Nor is the thickness of substrate-insulating layer 112, 122 specified in the detailed description of Figures 5 and 6. However, originally filed claims 4-6, which are directed to the Figure 5 and 6 embodiments, depended upon originally filed claim 1, which specified that the substrate-insulating film has a thickness in the range of 0.5 Fm - 3 Fm. This relationship is also set forth in amended claims 1 and 4-6, which are before us on appeal.

The claims

Claims 1-3, the only independent claims, read as follows:

1. A thin film magnetic head which comprises:

a slider and a thin film magnetic transducing element, wherein said slider is provided with an insulating film directly formed on a surface of an electrically conductive substrate, a thickness of said insulating film being in the range of 0.5 Fm

- 3 Fm, and said thin film magnetic transducing element is formed on said insulating film and has a thin film magnetic circuit including a magnetic film and a coil film, wherein said insulating film is formed between said electrically conductive substrate and said magnetic film and allows an equipotential to be formed therebetween because of its thickness, and wherein said coil film is electrically insulated by an organic insulating resinous film having an insulation resistance sufficient to electrically insulate said coil film in view of the thickness of said insulating film.

2. A thin film magnetic head which comprises:

a slider and a thin film transducing element, wherein said slider has an electrically conductive substrate as its major portion, and said thin film magnetic transducing element comprises a magnetic film and a coil film, a surface of said magnetic film being directly formed on said electrically conductive substrate so as to form an equipotential therebetween, and wherein said coil film is electrically insulated by an organic insulating resinous film having an insulation resistance sufficient to electrically insulate said coil film in view of the absence of an insulating film between said magnetic film and said electrically conductive substrate.

3. A thin film magnetic head which comprises:

a slider and a thin film magnetic transducing element, wherein said slider comprises an electrically conductive substrate as its major portion and an insulating film formed on said electrically conductive substrate, a thickness of said insulating film being in the range of 0.5 Fm - 3 Fm, and said thin film magnetic transducing element comprises a magnetic film and a coil film and its [sic, is] formed on said insulating film so that at least a part of said magnetic film is in direct contact with said electrically conductive substrate through a hole formed in said insulating film, wherein said insulating film is formed between said electrically conductive substage [sic, substrate] and said magnetic film and an equipotential is formed therebetween because of said direct contact therebetween via said hole, and wherein said coil film is electrically insulated by an organic insulating resinous film having an insulation resistance sufficient to electrically insulate said coil film in view of the thickness of said insulating film.

The references

The references relied on by the examiner are:

Hirai et al. (Hirai)	4,550,353	Oct. 29, 1985
Schwarz et al. (Schwarz)	4,800,454	Jan. 24, 1989
Diepers	4,853,815	Aug. 1, 1989
Masud et al. (Masud)	4,878,290	Nov. 7, 1989
Lazzari	5,208,716	May 4, 1993
	(§ 102(e) date: Nov. 16, 1990)	

The rejections

The rejections are stated in the Answer as follows:

Claims 1 and 3 are rejected under 35 U.S.C. § 103 as unpatentable over Schwarz in view of Diepers and Hirai (Answer at 4).

Claims 4-6 are rejected under 35 U.S.C. § 103 as unpatentable over Schwarz in view of Diepers and Hirai, further considered in view of Lazzari and Masud (Answer at 6).

Claim 2 is rejected under 35 U.S.C. § 103 as unpatentable over Diepers in view of Schwarz and Hirai (Answer at 9).

Although Hirai was discussed in the final Office action (paper No. 23, at 5 and 7), it was not identified in any of the statements of the rejections in the final Office action (at 2, 4, and 8). Nevertheless, as appellants discussed Hirai in their brief (at 10) and did not file a reply brief objecting to the examiner's reliance on Hirai in the Answer, we will consider that reference in reviewing the rejections.

The rejection of independent claims 1 and 3

Figures 1 and 2 of Schwarz show a thin film transducer 8 mounted on the end surface of a flyer body (i.e., slider) 9, which is insulated from the transducer by an insulating layer 15 of unspecified thickness (col. 3, lines 43-46). The transducer includes a magnetic layer 16 forming a bottom pole, a non-magnetic layer 17 forming a flux gap 10 at the pole tip 27, coil-insulating layers 18 and 19 of unspecified material surrounding a winding 12, and a magnetic layer 14 forming an upper pole (col. 3, line 65 to col. 4, line 21). Furthermore, the first magnetic layer 14 makes direct contact with flyer body (i.e., substrate) 9 through a hole 22 in substrate-insulating layer 15, thereby creating an ohmic contact between the substrate and the lower magnetic pole (col. 4, lines 46-

50). This is described as an alternative to the arrangement shown in Figure 1, wherein an arm 37 of bottom pole 16 extends through an opening 39 in the substrate-insulating layer 15 to form an ohmic contact 38 between the bottom pole and the substrate so as to bleed away electrostatic charges before the voltage on poles 14 and 16 can reach a level which can cause arcing (col. 4, lines 32-45).

Regarding both claims 1 and 3, the examiner states that Schwarz fails to disclose (a) that insulating film 17 can have a thickness in the range of 0.5 Fm - 3 Fm and (b) that the insulating layers 18 and 19 can be formed of an organic resinous film having sufficient insulation resistance (Answer at 5). To remedy the first deficiency, the examiner (Answer at 5) relies on insulating layer 22 in Diepers's thin film magnetic head, which layer is described as providing an air gap 11 having a width w of less than 1 Fm, especially of about 0.5 Fm (col. 4, lines 34-37; col. 5, lines 54-56). However, as appellants correctly note (Brief at 8), Diepers's thin insulating layer 22 is not formed directly on the substrate; instead, it is formed in the region between the upper magnet leg 6 and the lower magnet leg 7 and thus corresponds to

Schwarz's gap-insulating layer 17 rather than to Schwarz's substrate-insulating layer 15. The examiner has not satisfactorily explained, and it is not apparent to us, why one skilled in the art would have been motivated to make Schwarz's substrate-insulating layer 15 as thin as Diepers's gap-insulating layer. The examiner's contention that "it would have been common for one of ordinary skill in the art to utilize what was known about thicknesses of any insulating layers in the art and . . . one of ordinary skill would have been inclined to optimize the insulation layer in question through routine experimentation" (Answer at 11) is unpersuasive for several reasons. The first is that the examiner has not explained which characteristic the artisan would be trying to optimize that would lead him to make Schwarz's substrate-insulating layer thinner than the thickness of 10 Fm or more thickness this layer has in conventional devices (Spec. at 9, lines 6-8). The only characteristic of layer 22 that Diepers mentions is its insulating characteristic, which would not be optimized by making it thinner than its conventional value.

Hirai is relied on only for its disclosure of an organic insulating resin 15 supporting coil 16 (Answer at 5-6), not for any suggestion of a substrate-insulating layer having a thickness in the claimed range. Consequently, the 35 U.S.C. § 103 rejection of claims 1 and 3 is reversed.

The rejection of dependent claims 4-6

Claims 4-6, which depend on claim 1 and thus also require that the substrate-insulating layer have a thickness in the range of 0.5 Fm - 3 Fm, stand rejected over the references applied against claim 1 (i.e., Schwarz, Diepers, and Hirai) further considered with Lazzari and Masud. As neither Lazzari nor Masud are relied on by the examiner as suggesting a substrate- insulating layer having a thickness in the claimed range, the rejection of these claims is also reversed.

The rejection of independent claim 2

Claim 2, which stands rejected under 35 U.S.C. § 103 for unpatentability over Diepers in view of Schwarz and Hirai, does not call for a substrate-insulating film. Instead, it recites a magnetic film "directly formed on the electrically conductive substrate so as to form an equipotential therebetween" and "an organic insulating resinous film having an insulation resistance sufficient to electrically insulate said coil film in view of the absence of an insulating film between said magnetic film and said electrically conductive substrate." The Diepers device does not include a substrate-insulating layer and thus satisfies the claim's requirement that the magnetic film be directly formed on an electrically conductive substrate. Specifically, the lower magnet leg 7, consisting of a magnetic outer layer 15 and an adjacent magnetic layer 21, is formed in a depression 13 in substrate 3 (col. 5, lines 11-38), which is electrically conductive (col. 5, lines 2-7).

The examiner describes the deficiencies of Diepers as follows (Answer at 8): "Diepers does not expressly disclose the establishment of an equipotential between the magnetic film [which is] directly formed on the substrate [and the substrate]. Diepers does not expressly show its coil film being insulated by an organic insulating resinous film with sufficient insulation resistance." Regarding the equipotential limitation, the examiner argues that

> one of ordinary skill in the art would have been motivated to furnish the magnetic head of Diepers with an equipotential established between the magnetic film and

> the electrically conductive substrate via an insulating film as shown by Schwarz et al[.] since such an arrangement would have effectively dissipated any electrostatic charge buildups and reduced leakage current released to the head-recording medium interface. [Answer at 10.]

The examiner's characterization of Schwarz as teaching "an equipotential established between the magnetic film and the electrically conductive substrate <u>via an insulating film</u>" (our emphasis) is not understood. As noted above, Schwarz explains that the direct contact magnetic layer 14 makes with flyer body (i.e., substrate) 9 through hole 22 in substrate-insulating layer 15 creates an ohmic contact between the substrate and the lower magnetic pole (col. 4,[2] lines 46-50). However, even without the benefit of this teaching it is apparent that because Diepers's magnet leg 7 and electrically conductive substrate 3 are in direct contact, they inherently will satisfy the claim's "equipotential" requirement. Appellants do not contend otherwise.

As evidence that it would have been obvious to replace

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[2] The final Office action (at 8) and the Answer (at 9) incorrectly give the location of this teaching as column <u>2</u>, lines 46-50.

Diepers's coil-insulating varnish material with an organic resin having the claimed insulation resistance, the examiner (Answer at 9-10) cites Hirai, which discloses a thin film magnetic head
employing an organic insulating resin 15 (i.e., PIQ, or polyimide isoindroquinazolinedione) to insulate the coil winding 16 (col. 4, lines 47-56). We note that the examiner's reliance on Hirai for this teaching replaces his earlier taking of "official notice" that organic insulating films were old and well known to one of ordinary skill in the art (Final Office action at 8, 10, and 11). We agree with the examiner that it would have been obvious in view of Hirai to make Diepers' coil-insulating material from PIQ rather than varnish. Appellants have not argued, let alone demonstrated, that one skilled in the art would have considered PIQ to be less suitable than varnish for insulating the coil winding 18 in the Diepers device. Instead, Appellants simply argue that "neither Schwarz et al[.] nor Diepers contemplated the formation of a magnetic film on an electrically conductive substrate in conjunction with the organic insulating resinous film of a high resistance to compensate for the reduced

thickness of said insulating layer" (emphasis omitted) (Brief at 11). Because claim 2 does not recite an insulating layer, we assume appellants meant to argue that neither Schwarz nor Diepers contemplated the formation of a magnetic film on an electrically conductive substrate in conjunction with the organic insulating resinous film of a high resistance to compensate for the absence of an insulating layer. This argument is unconvincing because it improperly attacks the references individually rather than addressing their collective teachings. In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981).

For the foregoing reasons, the 35 U.S.C. § 103 rejection of claim 2 for unpatentability over Diepers in view of Schwarz and Hirai is affirmed.

Summary

The 35 U.S.C. § 103 rejections of claims 1, 3, and 4-6 are reversed. The § 103 rejection of claim 2 is affirmed.

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

AFFIRMED-IN -PART

JOHN C. MARTIN Administrative Patent Judge	)	
JERRY SMITH Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JOSEPH L. DIXON Administrative Patent Judge	)	

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