Paper No. 13

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HARDAYAL HARRY SINGH GILL

Appeal No. 2002-1502
Application No. 09/388,885

ON BRIEF

Before KIMLIN, WALTZ and JEFFREY T. SMITH, Administrative Patent Judges.

KIMLIN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1-22, all the claims in the present application.

Claim 1 is illustrative:

1. A magnetic tunnel junction (MTJ) magnetoresistive sensor comprising:

an antiferromagnetic (AFM) layer;

a tunnel barrier layer;

> a pinned layer disposed between the antiferromagnetic layer and the tunnel barrier layer; and
>
> a ferromagnetic free layer formed on the tunnel barrier layer, said free layer comprising:
>
> > a first sublayer formed on the tunnel barrier layer; and
> >
> > a second sublayer formed on the first sublayer, wherein said second sublayer is made of supermalloy (Ni-Fe-Mo) having a thickness in the range of 60-80 Å.

In addition to the admitted prior art, the examiner relies upon the following reference as evidence of obviousness:

Dahlberg et al. (Dahlberg) 5,747,997 May 05, 1998

Appellant's claimed invention is directed to a magnetic tunnel junction (MTJ) magnetorestive sensor comprising, inter alia, a ferromagnetic free layer comprising first and second sublayers, wherein the second sublayer is a supermalloy of (Ni-Fe-Mo). Also, the second sublayer has a thickness in the range of 60-80 Å.

According to appellant, by using the claimed supermalloy having a thickness within the claimed range in place of the conventional layer of Ni-Fe, an increase in the thickness of the

first sublayer is able to be achieved while keeping the value of the effective H_k, and therefore the magnetic stiffness of the free layer unchanged. (See paragraph bridging pages 4-5 of brief).

Appealed claims 1-22 stand rejected under 35 U.S.C. § 103 as being unpatentable over the admitted prior art of specification Figure 3 in view of Dahlberg.

We have thoroughly reviewed the respective positions advanced by appellant and the examiner. In so doing, we find that examiner has failed to establish a prima facie case of obviousness for the claimed subject matter. Accordingly, we will not sustain the examiner's rejection for essentially those reasons expressed in appellant's brief.

The examiner appreciates that the admitted prior art depicted in specification Figure 3 "does not show the details of the free layer", i.e., the composition and thickness of the second sublayer (page 4 of answer, third paragraph). To rectify this deficiency, the examiner relies upon Dahlberg for disclosing a second sublayer (317) of high resistivity soft ferromagnetic material having a thickness of 60-80 Å.

At the outset, we must point out that the section of Dahlberg referenced by the examiner, column 7, lines 45-51, does not expressly disclose a thickness of 60-80 Å but, rather, a thickness within a range of 50-10,000 Å (5-1,000 nm). Moreover, as explained by appellant, Dahlberg is not directed to an MTJ magnetoresistive sensor of the admitted prior art and the present invention, but to a saturation excited spin valve magnetoresistive (SESVMR) sensor. According to appellant, Dahlberg does not mention MTJ sensors, and, significantly, current flows perpendicular to the layers forming an MTJ sensor whereas the sense current flows in the plane of the layers in Dahlberg's SESVMR sensor. Appellant properly maintains that Dahlberg, considered as a whole, teaches that soft ferromagnetic material should have a thickness greater than approximately 100 Å, and the reference exemplifies a Ni-Fe-Mo layer of 1200 Å. According to appellant, "since the sense current in an MTJ sensor flows perpendicularly through the sensor layers, one of ordinary skill in the art would avoid thick, high-resistivity material for the soft (free) layer because it is well known in the art [that] the increased scattering in such a layer reduces the electron mean

free path and consequently reduces the magnetoresistive effect (delta R/R)." (Page 8 of brief, last paragraph).

Hence, although Dahlberg discloses a thickness range for the free layer which somewhat overlaps the claimed range, we find that Dahlberg, considered in its entirety, would not have motivated one of ordinary skill in the art to modify the MTJ sensor of the admitted prior art to arrive at the claimed invention taken as a whole. While the examiner states that "[a]s any one of ordinary skill in the art would have known at the time the invention was made, the characteristics of AMR, Spin Valve (SV) and MTJ MR sensors include well-known layer structures which have been mirrored in each type of sensor due to the similar sensing features each layer structure produces", this does not address appellant's argument that the sensors of the claimed invention and Dahlberg sense current flows in different planes and, therefore, involve different design considerations.

In conclusion, based on the foregoing, the examiner's decision rejecting the appealed claims is reversed.

REVERSED

EDWARD C. KIMLIN Administrative Patent Judge	)	
THOMAS A. WALTZ Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JEFFREY T. SMITH Administrative Patent Judge	)	

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