AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Central District of California on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	8/26/2022	Central District of California

PLAINTIFF	DEFENDANT
MR TECHNOLOGIES, GMBH	WESTERN DIGITAL TECHNOLOGIES, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,978,413	5/22/2018	MR TECHNOLOGIES, GMBH
2	11,133,031	9/8/2021	MR TECHNOLOGIES, GMBH
3	9,928,864	3/27/2018	MR TECHNOLOGIES, GMBH
4	11,138,997	10/5/2021	MR TECHNOLOGIES, GMBH
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

TO:		
	Mail Stop 8 **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:22-cv-00612	6/13/2022	Western District of Texas

PLAINTIFF	DEFENDANT
MR TECHNOLOGIES, GMBH	WESTERN DIGITAL CORPORATION

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,978,413	5/22/2018	MR TECHNOLOGIES, GMBH
2	11,133,031	9/28/2021	MR TECHNOLOGIES, GMBH
3	9,928,864	3/27/2018	MR TECHNOLOGIES, GMBH
4	11,138,997	10/5/2021	MR TECHNOLOGIES, GMBH
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
08/26/2022 Doc #9 NOTICE of Voluntary Dismissal

CLERK	(BY) DEPUTY CLERK	DATE
PHILIP J. DEVLIN		08/26/2022

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

Print Save As... Reset

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:22-cv-00612	6/13/2022	Western District of Texas

PLAINTIFF	DEFENDANT
MR TECHNOLOGIES, GMBH	WESTERN DIGITAL CORPORATION

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,978,413	5/22/2018	MR TECHNOLOGIES, GMBH
2	11,133,031	9/28/2021	MR TECHNOLOGIES, GMBH
3	9,928,864	3/27/2018	MR TECHNOLOGIES, GMBH
4	11,138,997	10/5/2021	MR TECHNOLOGIES, GMBH
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	03/27/2018	9928864	SUSP02US1	9414

143793 7590 03/07/2018

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 378 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Dieter SUESS, Herzogenburg, AUSTRIA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

143793 7590 01/12/2018
Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

TITLE OF INVENTION: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	04/12/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHAU, LISA N	1785	428-827000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 .....
2 .....
3 .....

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☒ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
- ☒ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies .....

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ☐ A check is enclosed.
- ☒ Payment by credit card.
- ☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number ..... (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ☐ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ☐ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ☐ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Gergely T. Zimanyi, Reg. No. 45,754/ Date 02/13/2018

Typed or printed name Gergely T. Zimanyi Registration No. 45,754

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 5 of 519

Electronic Patent Application Fee Transmittal

Application Number:	12619849
Filing Date:	17-Nov-2009
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	Gergely T. Zimanyi/Richard Pask
Attorney Docket Number:	SUSP02US1

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**480**

Electronic Acknowledgement Receipt	
EFS ID:	31771530
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	143793
Filer:	Gergely T. Zimanyi/Richard Pask
Filer Authorized By:	Gergely T. Zimanyi
Attorney Docket Number:	SUSP02US1
Receipt Date:	13-FEB-2018
Filing Date:	17-NOV-2009
Time Stamp:	03:27:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$480
RAM confirmation Number	021318INTEFSW03350500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	1_SUSP02US1_Issue_Fee_Transmittal.pdf	544362 ee3d8cecc6a1e21045a742d47c08b156ce3a5f40	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30535 7b1513b55979b77ddf39a6acaaef9dc253829316	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	574897		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE
COMMISSIONER FOR PATENTS
P.O.BOX 1450
ALEXANDRIA VA 22313-1451

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FIRST-CLASS MAIL
U.S. POSTAGE PAID
POSTEDIGITAL
NNNNN

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

Courtesy Reminder for
Application Serial No: 12/619,849

Attorney Docket No: SUSP02US1
Customer Number: 143793
Date of Electronic Notification: 01/12/2018

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:
gzimanyi@gmail.com
richepask@gmail.com

To view your correspondence online or update your email addresses, please visit us anytime at **https://sportal.uspto.gov/secure/myportal/privatepair.** If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

143793 7590 01/12/2018

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER
CHAU, LISA N

ART UNIT	PAPER NUMBER
1785	

DATE MAILED: 01/12/2018

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

TITLE OF INVENTION: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	04/12/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

143793 7590 01/12/2018
Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

TITLE OF INVENTION: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	04/12/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHAU, LISA N	1785	428-827000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
❑ Issue Fee
❑ Publication Fee (No small entity discount permitted)
❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
❑ A check is enclosed.
❑ Payment by credit card. Form PTO-2038 is attached.
❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
❑ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 12 of 519

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

143793 7590 01/12/2018

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	

DATE MAILED: 01/12/2018

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 12/619,849	Applicant(s) SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *11/12/17*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-3 and 6-25*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 11/12/17
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/Holly Rickman/ Primary Examiner, Art Unit 1785	/LC/ Lisa Chau

REASONS FOR ALLOWANCE

1. The following is an examiner's statement of reasons for allowance:

The closest prior art, D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al."), teaches a magnetic recording medium comprising an exchange coupled magnetic multilayer structure comprising a hard magnetic storage layer having a first coercive field greater than 0.5 T and a nucleation host having a second coercive field, wherein said nucleation host is formed on the hard magnetic storage layer, exchange coupled to the magnetic storage layer, and has a gradient anisotropy (i.e. magnetic moments/vectors in a gradient anisotropy) (Please see Slides 1, 3, and 15).

However, the prior art of record does not teach nor suggest the coercive field relationship between the nucleation host and hard magnetic storage layer *and* a nucleation host comprising multiple ferromagnetic layers with increasing anisotropy constant K from layer to layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	LISA CHAU	1785

CPC- SEARCHED		
Symbol	Date	Examiner
G11B 20/10 and 1217	6/11/17	LC
G11B 2220/235 and 2516	6/11/17	LC
G11B 5/1276,235,3113,314,3146,3153,3163,3929,3983,6088,645,647,70605,70626,708,716,7315,735,85,865	6/11/17	LC

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829 with TEXT	1/12/10	LC

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13 8/22/14 6/24/15 2/23/16 8/29/16	LC
Update	6/11/17	LC

SEARCH NOTES		
Search Notes	**Date**	**Examiner**
All classification was performed with TEXT	6/11/17	LC
Update	1/5/18	LC

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
EAST	USPat and USPGPub	10/2/17	LC

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	LISA CHAU	1785

CPC						
Symbol					**Type**	**Version**
G11B		5	/	66	F	2013-01-01
B82Y		25	/	00	I	2013-01-01
G01R		33	/	093	I	2013-01-01
G01R		33	/	1207	I	2013-01-01
G11B		5	/	64	I	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

/LISA CHAU/ Examiner.Art Unit 1785	1/5/18	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	23	
/HOLLY RICKMAN/ Primary Examiner.Art Unit 1785	01/08/2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	LISA CHAU	1785

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		G	1	1	B	5 / 66 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

/LISA CHAU/ Examiner.Art Unit 1785	1/5/18	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	23	
/HOLLY RICKMAN/ Primary Examiner.Art Unit 1785	01/08/2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	LISA CHAU	1785

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	15	17												
2	2	16	18												
3	3	17	19												
	4	18	20												
	5	19	21												
4	6	20	22												
5	7	21	23												
6	8	22	24												
7	9	23	25												
8	10		26												
9	11		27												
10	12		28												
11	13		29												
12	14		30												
13	15		31												
14	16														

/LISA CHAU/ Examiner.Art Unit 1785	1/5/18	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	23	
/HOLLY RICKMAN/ Primary Examiner.Art Unit 1785	01/08/2018	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52

S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR;	ADJ	ON	2011/01/12 16:38

			FPRS; EPO; JPO; DERWENT			
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43
S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-	ADJ	OFF	2013/11/01

			PGPUB; USPAT; USOCR; EPO; JPO; DERWENT			17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57
S48	47	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/08/22 14:55
S49	1117	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S50	1027	S49 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S51	26	S50 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/12/28 15:58
S52	32	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2015/06/24 17:23
S53	2	Jp "03254421"	US-PGPUB;	ADJ	ON	2016/02/23 16:46

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT			
S54	33	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/02/23 18:20
S55	56	chau near3 lisa	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/08/29 16:26
S56	4	"20010051287"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:25
S57	8	"20050058855"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:39
S58	1161	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/11 17:15
S59	1070	S58 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/11 17:15
S60	34	S59 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2017/06/11 17:15
S68	23	(("20010051287") or ("20040053078") or ("20040057156") or ("20070292720") or	US-PGPUB;	OR	OFF	2017/12/04 12:42

		("5583727") or ("6280813") or ("6383668") or ("6468670") or ("7550210")).PN.	USPAT; USOCR; FPRS; EPO; JPO; DERWENT			

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S61	4074	(coercivity or (coerciv$4 near5 (field for force)) or hc$3 or "h.sub.c"$5) same (magnet$5 or ferro$5magnet$5).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:34
S62	11352	((gradient or gradual$5 or increas$5 or decreas$5) same (anisotrop$5 or anisotrop$5 near5 constant$5 or ku or ku$2 or "ku.sub."$2 or k!)).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:37
S63	39	S61 and S62	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:37
S64	81	grad$4 near3 anisotrop$5.clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:53
S65	38	S64 and (magnet$5 or ferro$5magnet$5).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:54
S66	418	exchange$5 near4 spring.clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:55
S67	10	S61 and S66	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:56

1/5/2018 5:06:30 PM
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RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 30 of 519

PTO/SB/08a (07-09)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 3

Complete if Known	
Application Number	12/619,849
Filing Date	11/17/2009
First Named Inventor	Dieter SUESS
Art Unit	1785
Examiner Name	Lisa N. CHAU
Attorney Docket Number	SUSP02US1

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 2001/0051287	12-13-2001	Kikitsu et al.	
		US- 2004/0053078	03-18-2004	Kikitsu et al.	
		US- 2004/0057156	03-25-2004	Lee et al.	
		US- 2007/0292720 A1	12-20-2007	Dieter Suess	
		US- 5,583,727	12-10-1996	Parkin	
		US- 6,280,813 B1	08-28-2001	Carey et al.	
		US- 6,383,668 B1	05-07-2002	Fullerton et al.	
		US- 6,468,670 B1	10-22-2002	Ikeda, et al.	
		US- 7,550,210 B2	06-23-2009	Berger, et al.	
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	/LISA N CHAU/	Date Considered	01/05/2018

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This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /L.N.C/

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Sheet 2 of 3

Complete if Known	
Application Number	12/619,849
Filing Date	11/17/2009
First Named Inventor	Dieter SUESS
Art Unit	1785
Examiner Name	Lisa N. CHAU
Attorney Docket Number	SUSP02US1

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		C, TANNOUS, et al "The Stoner-Wohlfarth Model of Ferromagnetism," European Journal of Physics 29 (2008) 475-487.	
		D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages.	
		AMIKAM AHARONI; "Introduction to the Theory of Ferromagnetism", Oxford University Press, Walton Street, Oxford OX2 6DP; Published in the United States by Oxford University Press Inc., New York; ©Amikam Aharoni, 1996; 3 pages.	
		D. Suess et al., "Exchange spring media for perpendicular recording," Applied Physics Letters 87(2005): 012504-1 to 012504-3.	
		Suess et al. "Exchange spring recording media for areal densities up to 10 Tbit/in2" Journal of Magnetism and Magnetic Materials (2004): 551-554.	
		JAN-ULRICH THIELE, et al; "FeRh/FePt exchange spring films for thermally assisted magnetic recording media", Applied Physics Letters, Volume 82, No. 17, 28 April 2003, pages 2859-2861.	
		R.H. VICTORA, et al; "Composite Media for Perpendicular Magnetic Recording," IEEE Transactions on Magnetics, Vol. 41, No. 2, pages.537-542, February 2005.	
		JIAN-PING WANG, et al; "Composite media (dynamic tilted media) for magnetic recording," Applied Physics Letters, 86, 2005, pages 142504-1 - 142504-3.	
		Y. INABA, et al; "Preliminary Study on (CoPtCr/NiFe)-SiO2 Hard/Soft-Stacked Perpendicular Recording Media", IEEE Transactions on Magnetics, Vol. 41, No. 10, October 2005, pages 3136-3138.	
		A. Y. DOBIN, et al; "Domain Wall Assisted Magnetic Recording", Cond-mat.mtrl-sci, DOI: 10.1063/1.2335590; arXiv:cond-mat/0605368 v1 15 May 2006, 3 pages.	

Examiner Signature	/LISA N CHAU/	Date Considered	01/05/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

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Sheet 3 of 3

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First Named Inventor	Dieter SUESS
Art Unit	1785
Examiner Name	Lisa N. CHAU
Attorney Docket Number	SUSP02US1

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		P.N. LOXLEY, et al; "Theory of Domain Wall Nucleation in a Two Section Magnetic Wire", IEEE Transactions on Magnetics, Vol. 37, No. 4, July 2001, pages 2098-2100.	
		F.B. HAGEDORN; "Analysis of Exchange-Coupled Magnetic Thin Films," Journal of Applied Physics, Vol. 41, No. 6, May 1970, pages 2491-2502.	
		DIETER SUESS; "Micromagnetics of Exchange Spring Media: Optimization and Limits," Submitted to Journal of Magnetism and Magnetic Materials, Volume 308, Issue 2, January 2007 - magnet.atp.tuwien.ac.at/suess/3/papers/suess_jmmm_final.pdf	
		D. SUESS, et al; "Exchange spring recording media for areal densities up to 10 Tbit/in2", Journal of Magnetism and Magnetic Materials, 290-291 (2005), 551-554; Available online at www.sciencedirect.com	
		D. SUESS; "Multilayer Exchange Spring Media for Magnetic Recording," Submitted to Applied Physics letters, submitted, 2006-06-03, pages 1-9.	
		TERUFUMI SASAKI, et al.; "Magnetic Properties of Fe3Pt Invar Alloy," Journal of the Physical Society of Japan, Vol. 46, No. 6, June 1979, pages 1732-1739.	
		"Introduction to the Theory of Ferromagnetism," in International Series of Monographs on Physics editor Amikan Aharoni, Oxford Science Publication, 1996, 5 pages.	
		D. Suess, et al. "Exchange Spring Media for Perpendicular Recording," Vienna University of Technology of Austria, MMM Conference, San Jose, November 2005, 17 pages.	

Examiner Signature	/LISA N CHAU/	Date Considered	01/05/2018

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 Applicant's unique citation designation number (optional). 2 Applicant is to place a check mark here if English language Translation is attached.

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Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	12/619,849
Filing Date	11/17/2009
First Named Inventor	Dieter Suess
Art Unit	1785
Examiner Name	Lisa N. Chau
Attorney Docket Number	SUSP02US1

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☑ Enclosed

      i. ☐ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☑ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. ☐ The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. _____.

      i. ☑ RCE fee required under 37 CFR 1.17(e)

      ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☐ Other _____

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☑ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature	/Gergely T. Zimanyi/	Date	11/12/2017
Name (Print/Type)	Gergely T. Zimanyi	Registration No.	45,754

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature			
Name (Print/Type)		Date	

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Instruction Sheet for RCEs

(not to be submitted to the USPTO)

NOTES:

An RCE is not a new application, and filing an RCE will not result in an application being accorded a new filing date.

Filing Qualifications:

The application must be a utility or plant application filed on or after June 8, 1995. The application cannot be a provisional application, a utility or plant application filed before June 8, 1995, a design application, or a patent under reexamination. See 37 CFR 1.114(e).

Filing Requirements:

Prosecution in the application must be closed. Prosecution is closed if the application is under appeal, or the last Office action is a final action, a notice of allowance, or an action that otherwise closes prosecution in the application (e.g., an Office action under *Ex parte Quayle*). See 37 CFR 1.114(b).

A submission and a fee are required at the time the RCE is filed. If reply to an Office action under 35 U.S.C. 132 is outstanding (e.g., the application is under final rejection), the submission must meet the reply requirements of 37 CFR 1.111. If there is no outstanding Office action, the submission can be an information disclosure statement, an amendment, new arguments, or new evidence. See 37 CFR 1.114(c). The submission may be a previously filed amendment (e.g., an amendment after final rejection).

WARNINGS:

Request for Suspension of Action:

All RCE filing requirements must be met before suspension of action is granted. A request for a suspension of action under 37 CFR 1.103(c) does not satisfy the submission requirement and does not permit the filing of the required submission to be suspended.

Improper RCE will NOT toll Any Time Period:

Before Appeal - If the RCE is improper (e.g., prosecution in the application is not closed or the submission or fee has not been filed) and the application is not under appeal, the time period set forth in the last Office action will continue to run and the application will be abandoned after the statutory time period has expired if a reply to the Office action is not timely filed. No additional time will be given to correct the improper RCE.

Under Appeal - If the RCE is improper (e.g., the submission or the fee has not been filed) and the application is under appeal, the improper RCE is effective to withdraw the appeal. Withdrawal of the appeal results in the allowance or abandonment of the application depending on the status of the claims. If there are no allowed claims, the application is abandoned. If there is at least one allowed claim, the application will be passed to issue on the allowed claim(s). See MPEP 1215.01.

See MPEP 706.07(h) for further information on the RCE practice.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Dieter SUESS	Examiner:	Lisa N. Chau
Application No.:	12/619,849	Art Unit:	1785
Filing Date:	11/17/2009	Confirmation No.:	9414
		Docket No.:	SUSP02US1
		Customer No.:	143793
		Date:	11/12/2017

Title: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR § 1.97 & § 1.98

Sir:

In accordance with 37 CFR § 1.97-1.98, applicants hereby submit an Information Disclosure Statement, including attached forms(s) PTO/SB/08.

Applicants respectfully request that the listed information be considered by the Examiner and be made of record in the above-identified application. Applicants further request that the Examiner initial and return a copy of the attached form(s) PTO/SB/08 in accordance with MPEP §609.

Applicants reserve the right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and /or to prove that this information may not be enabling for the teachings purportedly offered.

This statement is not intended to represent that a search has been made or that the information cited in the statement is, or is considered to be, prior art or material to patentability as defined in 37 CFR §1.56.

FILING OF INFORMATION DISCLOSURE STATEMENT

☒ **37 CFR §1.97(b)**

This statement is being submitted under 37 CFR §1.97(b) because the IDS is being filed:

☐ **1).** Within 3 months of the application filing date and is other than a continued prosecution application under § 1.53(d), or

☐ **2).** Within 3 months of entry of a national stage as set forth in § 1.491, or

☐ **3).** Before the mail date of a first Office Action on the merits, or

☒ **4).** Before the mailing of a first Office Action after filing a request for continued examination under § 1.114.

☐ **37 CFR § 1.97(c)**

This statement is being filed after the latest of:

☐ **1).** Three months beyond the filing date of a national application, or

☐ **2).** Three months beyond the date of entry of the national stage as set forth in § 1.491 in an international application, or

☐ **3).** The mailing date of a first Office Action on the merits, but before the mailing date of the earlier of a final Office Action under § 1.113 or a Notice of Allowance under § 1.311, and then either:

☐ **A).** A fee of $90.00 as set forth in § 1.17(p) is authorized below, enclosed, or included with the payment of other papers filed together with this statement. or

☐ **B).** A certification as specified in § 1.97(e) is provided below; thus no fee is required.

CONTENT OF INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR § 1.98

☒ **37 CFR §1.98 (a)(2)(ii), U.S. patents or patent application publication(s) cited**

☒ **1).** Since not requested by the Office, U.S. patents and U.S. patent application publications are not included.

☐ **2).** At the request of the Office, a copy of the following U.S. patent or patent application publication is attached:

☐ **3).** Items identified by a double asterisk (**) on the SB08A are *commonly-owned U.S. patents and U.S. patent application publications.

☒ **37 CFR §1.98 (a)(2)(iii) and (d), English language publication (other than U.S. patents, patent applications, or pending unpublished applications) cited**

☒ **1).** A legible copy of each publication or that portion which caused it to be listed is attached.

☐ **2).** A copy of each publication or that portion which caused it to be listed is not submitted because the publication was previously submitted in the IDS of the following, earlier filed application relied on for an earlier effective filing date:

Respectfully submitted,

Date: 11/12/2017

/Gergely T. Zimanyi/
Gergely T. Zimanyi, Ph.D.
Registration No. 45,754
Senior Director, IP

CERTIFICATE OF TRANSMISSION UNDER 37 CFR 1.8
I hereby certify that this correspondence is being transmitted to the USPTO via EFS-Web on 11/12/2017.

/Richard A. Pask/ 11/12/2017
Richard A. Pask Date

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705
Telephone: 530.400.3936
Email: gzimanyi@gmail.com

PTO/SB/08a (07-09)
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Art Unit	1785
Examiner Name	Lisa N. CHAU
Attorney Docket Number	SUSP02US1

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 2001/0051287	12-13-2001	Kikitsu et al.	
		US- 2004/0053078	03-18-2004	Kikitsu et al.	
		US- 2004/0057156	03-25-2004	Lee et al.	
		US- 2007/0292720 A1	12-20-2007	Dieter Suess	
		US- 5,583,727	12-10-1996	Parkin	
		US- 6,280,813 B1	08-28-2001	Carey et al.	
		US- 6,383,668 B1	05-07-2002	Fullerton et al.	
		US- 6,468,670 B1	10-22-2002	Ikeda, et al.	
		US- 7,550,210 B2	06-23-2009	Berger, et al.	
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FOREIGN PATENT DOCUMENTS

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Complete if Known	
Application Number	12/619,849
Filing Date	11/17/2009
First Named Inventor	Dieter SUESS
Art Unit	1785
Examiner Name	Lisa N. CHAU
Attorney Docket Number	SUSP02US1

Sheet 2 of 3

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		C, TANNOUS, et al "The Stoner-Wohlfarth Model of Ferromagnetism," European Journal of Physics 29 (2008) 475-487.	
		D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages.	
		AMIKAM AHARONI; "Introduction to the Theory of Ferromagnetism", Oxford University Press, Walton Street, Oxford OX2 6DP; Published in the United States by Oxford University Press Inc., New York; ©Amikam Aharoni, 1996; 3 pages.	
		D. Suess et al., "Exchange spring media for perpendicular recording," Applied Physics Letters 87(2005): 012504-1 to 012504-3.	
		Suess et al. "Exchange spring recording media for areal densities up to 10 Tbit/in2" Journal of Magnetism and Magnetic Materials (2004): 551-554.	
		JAN-ULRICH THIELE, et al; "FeRh/FePt exchange spring films for thermally assisted magnetic recording media", Applied Physics Letters, Volume 82, No. 17, 28 April 2003, pages 2859-2861.	
		R.H. VICTORA, et al; "Composite Media for Perpendicular Magnetic Recording," IEEE Transactions on Magnetics, Vol. 41, No. 2, pages.537-542, February 2005.	
		JIAN-PING WANG, et al; "Composite media (dynamic tilted media) for magnetic recording," Applied Physics Letters, 86, 2005, pages 142504-1 - 142504-3.	
		Y. INABA, et al; "Preliminary Study on (CoPtCr/NiFe)-SiO2 Hard/Soft-Stacked Perpendicular Recording Media", IEEE Transactions on Magnetics, Vol. 41, No. 10, October 2005, pages 3136-3138.	
		A. Y. DOBIN, et al; "Domain Wall Assisted Magnetic Recording", Cond-mat.mtrl-sci, DOI: 10.1063/1.2335590; arXiv:cond-mat/0605368 v1 15 May 2006, 3 pages.	

Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 3 of 3

Complete if Known	
Application Number	12/619,849
Filing Date	11/17/2009
First Named Inventor	Dieter SUESS
Art Unit	1785
Examiner Name	Lisa N. CHAU
Attorney Docket Number	SUSP02US1

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
		P.N. LOXLEY, et al; "Theory of Domain Wall Nucleation in a Two Section Magnetic Wire", IEEE Transactions on Magnetics, Vol. 37, No. 4, July 2001, pages 2098-2100.	
		F.B. HAGEDORN; "Analysis of Exchange-Coupled Magnetic Thin Films," Journal of Applied Physics, Vol. 41, No. 6, May 1970, pages 2491-2502.	
		DIETER SUESS; "Micromagnetics of Exchange Spring Media: Optimization and Limits," Submitted to Journal of Magnetism and Magnetic Materials, Volume 308, Issue 2, January 2007 - magnet.atp.tuwien.ac.at/suess/3/papers/suess_jmmm_final.pdf	
		D. SUESS, et al; "Exchange spring recording media for areal densities up to 10 Tbit/in2", Journal of Magnetism and Magnetic Materials, 290-291 (2005), 551-554; Available online at www.sciencedirect.com	
		D. SUESS; "Multilayer Exchange Spring Media for Magnetic Recording," Submitted to Applied Physics letters, submitted, 2006-06-03, pages 1-9.	
		TERUFUMI SASAKI, et al.; "Magnetic Properties of Fe3Pt Invar Alloy," Journal of the Physical Society of Japan, Vol. 46, No. 6, June 1979, pages 1732-1739.	
		"Introduction to the Theory of Ferromagnetism," in International Series of Monographs on Physics editor Amikan Aharoni, Oxford Science Publication, 1996, 5 pages.	
		D. Suess, et al. "Exchange Spring Media for Perpendicular Recording," Vienna University of Technology of Austria, MMM Conference, San Jose, November 2005, 17 pages.	

Examiner Signature		Date Considered	

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[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

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Electronic Patent Application Fee Transmittal

Application Number:	12619849
Filing Date:	17-Nov-2009
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	Gergely T. Zimanyi/Richard Pask
Attorney Docket Number:	SUSP02US1

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 2ND AND SUBSEQUENT REQUEST	2820	1	850	850
		Total in USD ($)		**850**

Electronic Acknowledgement Receipt	
EFS ID:	30923394
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	143793
Filer:	Gergely T. Zimanyi/Richard Pask
Filer Authorized By:	Gergely T. Zimanyi
Attorney Docket Number:	SUSP02US1
Receipt Date:	12-NOV-2017
Filing Date:	17-NOV-2009
Time Stamp:	20:44:50
Application Type:	Utility under 35 USC 111(a)

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1	Request for Continued Examination (RCE)	1_SUSP02US1_RCE_Form.pdf	1441718 3a4736d1d541826f28804d8138c21f4eff29d932	no	2
Warnings:					
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Information:					
2	Transmittal Letter	2_SUSP02US1_IDS_Transmittal_Letter.pdf	786681 5890ef39a2aaa39bc6db65df7ed8c19fa4e6ab34	no	3
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3	Information Disclosure Statement (IDS) Form (SB08)	3_SUSP02US1_PTO_SB_08a_b.pdf	2348755 e8d49cc0d25a405d74ed102fa6a970c6f529c7bb	no	3
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		Total Files Size (in bytes):	19821033		

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Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

Courtesy Reminder for
Application Serial No: 12/619,849

Attorney Docket No: SUSP02US1
Customer Number: 143793
Date of Electronic Notification: 10/13/2017

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gzimanyi@gmail.com
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12/619,849	SUESS, Dieter
	Examiner	Art Unit
	LISA CHAU	1785

CPC						
Symbol					Type	Version
G11B	/	5	/	66	F	2013-01-01
B82Y	/	25	/	00	I	2013-01-01
G01R	/	33	/	093	I	2013-01-01
G01R	/	33	/	1207	I	2013-01-01
G11B	/	5	/	64	I	2013-01-01

CPC Combination Sets								
Symbol					Type	Set	Ranking	Version
	/		/					

/LC/ Lisa Chau (Assistant Examiner)	02 October 2017 (Date)	**Total Claims Allowed:** 23	
/HOLLY C RICKMAN/ Primary Examiner, Art Unit 1785 (Primary Examiner)	10 October 2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office — Part of Paper No.: 20171002

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 50 of 519

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12/619,849	SUESS, Dieter
	Examiner	Art Unit
	LISA CHAU	1785

INTERNATIONAL CLASSIFICATION					
CLAIMED					
G11B	/	5	/	66	

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

/LC/ Lisa Chau (Assistant Examiner)	02 October 2017 (Date)	Total Claims Allowed: 23	
/HOLLY C RICKMAN/ Primary Examiner, Art Unit 1785 (Primary Examiner)	10 October 2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12/619,849	SUESS, Dieter
	Examiner	Art Unit
	LISA CHAU	1785

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	8	10	17	19		28								
2	2	9	11	18	20		29								
3	3	10	12	19	21		30								
	4	11	13	20	22		31								
	5	12	14	21	23										
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5	7	14	16	23	25										
6	8	15	17		26										
7	9	16	18		27										

/LC/ Lisa Chau (Assistant Examiner)	02 October 2017 (Date)	**Total Claims Allowed:** 23	
/HOLLY C RICKMAN/ Primary Examiner, Art Unit 1785 (Primary Examiner)	10 October 2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

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RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 52 of 519

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12/619,849	SUESS, Dieter
	Examiner	Art Unit
	LISA CHAU	1785

CPC - Searched*		
Symbol	**Date**	**Examiner**
G11B 20/10 and 1217	6/11/17	LC
G11B 2220/235 and 2516	6/11/17	LC
G11B 5/ 1276,235,3113,314,3146,3153,3163,3929,3983,6088,645,647,70605,70626,708,716,7315,735,85,865	6/11/17	LC

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**
428	827, 828, 828.1, and 829 with TEXT	1/12/10	LC

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13 8/22/14 6/24/15 2/23/16 8/29/16	LC
Update	6/11/17	LC
All classification was performed with TEXT	6/11/17	LC

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 53 of 519

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12/619,849	SUESS, Dieter
	Examiner	Art Unit
	LISA CHAU	1785

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
EAST	USPat and USPGPub	10/02/2017	LC

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 54 of 519

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NOTICE OF ALLOWANCE AND FEE(S) DUE

143793 7590 10/13/2017

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	

DATE MAILED: 10/13/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

TITLE OF INVENTION: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	01/16/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

143793 7590 10/13/2017
Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

TITLE OF INVENTION: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	01/16/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
CHAU, LISA N	1785	428-827000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29
  NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27
  NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status.
  NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 56 of 519

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

143793 7590 10/13/2017

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	

DATE MAILED: 10/13/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 12/619,849	Applicant(s) SUESS, Dieter	
	Examiner LISA CHAU	Art Unit 1785	AIA Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 9/18/17 .
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____ .

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-3 and 6-25 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____ .
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____ .

/LC/ Lisa Chau	/HOLLY C RICKMAN/ Primary Examiner, Art Unit 1785

Reasons for Allowance

1. The following is an examiner's statement of reasons for allowance:

The closest prior art, D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al."), teaches a magnetic recording medium comprising an exchange coupled magnetic multilayer structure comprising a hard magnetic storage layer having a first coercive field greater than 0.5 T and a nucleation host having a second coercive field, wherein said nucleation host is formed on the hard magnetic storage layer, exchange coupled to the hard magnetic storage layer, and has a gradient anisotropy (i.e. magnetic moments/vectors in a gradient anisotropy) (Please see Slides 1, 3, and 15).

However, the prior art of record does not teach or suggest the coercive field relationship between the nucleation host and hard magnetic storage layer *and* a nucleation host comprising multiple ferromagnetic layers with increasing anisotropy constant K from layer to layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 11 AM-730 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272-1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau
Art Unit 1785

/HOLLY C RICKMAN/
Primary Examiner, Art Unit 1785

OK TO ENTER: /L.N.C/

Docket No.: SUSP02US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Dieter Suess	Examiner:	Lisa N. Chau
Application No.:	12/619,849	Art Unit:	1785
Filing Date:	11/17/2009	Confirmation No.:	9414
		Docket No.:	SUSP02US1
		Customer No.:	143793
		Date:	09/18/2017

Title: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO ADVISORY ACTION

Dear Examiner Chau:

This is a Response to the Advisory Action, dated 09/05/2017. Since this Response is filed on 09/18/2017, a Petition for a one-month extension of time is hereby attached. The Advisory Action referenced the telephonic interview of 08/22/2017 between the Examiner and Applicant. In this interview, Examiner Chau explained to Applicant that the amended paragraphs of the Specification needed to be numbered according to the Application as filed, not as published. Applicant pledged to resubmit the amendment with the Specification's paragraphs numbered accordingly, in a timely manner. It was Applicant's understanding that the rest of the Response was entered with the date of 08/13/2017. For the completeness of the record, Applicant hereby resubmits all the Amendments and Remarks of 08/13/2017, together with the renumbered paragraphs.

In this Response, Applicant renumbered all paragraphs, as agreed in the 08/22/2017 telephonic interview, and implemented all the amendments agreed upon during the very helpful telephonic interview on 07/25/2017, or required by the Final Office Action, dated 06/15/2017. Applicant does not traverse any of the rejections or objections. Therefore, Applicant respectfully believes that the present Response brings the pending Application into a condition of allowability.

Amendments to the Specification start on p. 2.

Amendments to the Claims start on p. 6.

Remarks start on p. 11.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08

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S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR;	ADJ	ON	2011/01/12 16:38

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			FPRS; EPO; JPO; DERWENT			
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43
S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-	ADJ	OFF	2013/11/01

			PGPUB; USPAT; USOCR; EPO; JPO; DERWENT			17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57
S48	47	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/08/22 14:55
S49	1117	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S50	1027	S49 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S51	26	S50 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/12/28 15:58
S52	32	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2015/06/24 17:23
S53	2	Jp "03254421"	US-PGPUB;	ADJ	ON	2016/02/23 16:46

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT			
S54	33	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/02/23 18:20
S55	56	chau near3 lisa	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/08/29 16:26
S56	4	"20010051287"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:25
S57	8	"20050058855"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:39
S58	1161	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/11 17:15
S59	1070	S58 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/11 17:15
S60	34	S59 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2017/06/11 17:15

EAST Search History (Interference)

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Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S61	4074	(coercivity or (coerciv$4 near5 (field for force)) or hc$3 or "h.sub.c"$5) same (magnet$5 or ferro$5magnet$5).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:34
S62	11352	((gradient or gradual$5 or increas$5 or decreas$5) same (anisotrop$5 or anisotrop$5 near5 constant$5 or ku or ku$2 or "ku.sub."$2 or k!)).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:37
S63	39	S61 and S62	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:37
S64	81	grad$4 near3 anisotrop$5.clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:53
S65	38	S64 and (magnet$5 or ferro$5magnet$5).clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:54
S66	418	exchange$5 near4 spring.clm.	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:55
S67	10	S61 and S66	US-PGPUB; USPAT	ADJ	ON	2017/10/02 15:56

10/2/2017 5:19:21 PM
C:\Users\lchau5\Documents\EAST\Workspaces\12619849\12619849.wsp

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Dieter Suess	Examiner:	Lisa N. Chau
Application No.:	12/619,849	Art Unit:	1785
Filing Date:	11/17/2009	Confirmation No.:	9414
		Docket No.:	SUSP02US1
		Customer No.:	143793
		Date:	09/18/2017

Title: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO ADVISORY ACTION

Dear Examiner Chau:

This is a Response to the Advisory Action, dated 09/05/2017. Since this Response is filed on 09/18/2017, a Petition for a one-month extension of time is hereby attached. The Advisory Action referenced the telephonic interview of 08/22/2017 between the Examiner and Applicant. In this interview, Examiner Chau explained to Applicant that the amended paragraphs of the Specification needed to be numbered according to the Application as filed, not as published. Applicant pledged to resubmit the amendment with the Specification's paragraphs numbered accordingly, in a timely manner. It was Applicant's understanding that the rest of the Response was entered with the date of 08/13/2017. For the completeness of the record, Applicant hereby resubmits all the Amendments and Remarks of 08/13/2017, together with the renumbered paragraphs.

In this Response, Applicant renumbered all paragraphs, as agreed in the 08/22/2017 telephonic interview, and implemented all the amendments agreed upon during the very helpful telephonic interview on 07/25/2017, or required by the Final Office Action, dated 06/15/2017. Applicant does not traverse any of the rejections or objections. Therefore, Applicant respectfully believes that the present Response brings the pending Application into a condition of allowability.

Amendments to the Specification start on p. 2.

Amendments to the Claims start on p. 6.

Remarks start on p. 11.

SPECIFICATION

Please amend paragraph [0028] as follows:

"[0028] The recording media includes hard magnetic storage layer 24 and softer nucleation host 21. Hard magnetic storage layer 24 can be a ferromagnet, ferrimagnet, antiferromagnet, or any other synthetic antiferromagnetic structure. The coupling between the nucleation host and the hard magnetic storage layer may be ferromagnetic or antiferromagnetic. Hard magnetic storage layer 24 maybe formed from any material that has large perpendicular anisotropy. These materials include tetragonal[[:]] $L1_0$-ordered phase materials, CoPt and FePt based alloys, CoPtCr alloys, including CoPtCrB, CoPtCrTa, ~~and~~ CoCr based granular media-, ~~Other high anisotropy materials suitable for the recording layer 16 include~~ pseudo-binary alloys based on the FePt and CoPt $L1_0$ phase, i.e., FePt--X and CoPt--X, where the element X may be Ni, Au, Cu, Pd or Ag, as well as granular composite materials such as FePt--C, FePt--ZrO, FePt--MgO, FePt--B_2O_3, materials containing at least one of B, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Pd, Sm, Nd, Dy, Hf, Mn, Ni and other similar composites."

Please insert the below new paragraphs [0057]-[0081] after present paragraph [0056] and before present paragraph [0057]. Since the entire text of paragraphs [0057]-[0081] is new, for clarity's sake, the underlining of the entire text has been omitted.

"[0057] In some embodiments, as described throughout this specification, a magnetic recording medium is comprising: an essentially non-magnetic substrate; and an exchange coupled magnetic multilayer structure, comprising: a nucleation host with an anisotropy varying in the film normal direction; and a hard magnetic storage layer; wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host.

[0058] In some embodiments of the magnetic recording medium, an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7<M_z/M_s<0.7$, wherein:

$$k = \frac{dM}{dH}\frac{H_c}{M_s}$$

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M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, dM/dH being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

[0059] In some embodiments of the magnetic recording medium, the nucleation host and the hard magnetic storage layer are in direct contact.

[0060] In some embodiments of the magnetic recording medium, the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

[0061] In some embodiments of the magnetic recording medium, the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

[0062] In some embodiments of the magnetic recording medium, the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

[0063] In some embodiments of the magnetic recording medium, the hard magnetic storage layer comprises at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

[0064] In some embodiments of the magnetic recording medium, a coercive field of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

[0065] In some embodiments of the magnetic recording medium, a $H_c(\alpha=20^\circ)<H_c(\alpha=45^\circ)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

[0066] In some embodiments of the magnetic recording medium, a $H_m(\alpha=20^\circ)<H_c(\alpha=45^\circ)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

[0067] In some embodiments of the magnetic recording medium, the nucleation host comprises at least one of Fe, Ni, Al, Si, B, Co, Cr, Pt, Ta, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn, Ni and O.

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[0068] In some embodiments of the magnetic recording medium, the nucleation host has a thickness smaller than 30 nm.

[0069] In some embodiments of the magnetic recording medium, the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

[0070] In some embodiments of the magnetic recording medium, a height of a plurality of grains is greater than a diameter of the grains.

[0071] In some embodiments of the magnetic recording medium, the nucleation host is in direct contact with the hard magnetic storage layer.

[0072] In some embodiments of the magnetic recording medium, the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5 nm.

[0073] In some embodiments of the magnetic recording medium, the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

[0074] In some embodiments of the magnetic recording medium, the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

[0075] In some embodiments of the magnetic recording medium, parameters of the medium comprise: a anisotropy constant in the nucleation host K^n_1 as a function of the layer depth a hard magnetic storage layer anisotropy constant K^h_1; a nucleation host grain diameter; a hard magnetic storage layer grain diameter; an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer; a saturation polarization in the nucleation host as a function of the layer depth; a saturation polarization of the hard magnetic storage layer; a layer thickness of the nucleation host; a layer thickness of the magnetic storage layer and an exchange constant between the nucleation host and the hard magnetic layer.

[0076] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

[0077] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic

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storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

[0078] In some embodiments of the magnetic recording medium, an energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage layer on the non-magnetic substrate; removing the nucleation host from the multilayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

[0079] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

[0080] In some embodiments of the magnetic recording medium, the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

[0081] In some embodiments of the magnetic recording medium, the recording medium is usable for at least one of perpendicular recording or recording on patterned elements."

Further, to accommodate the insertion of new paragraphs [0057]-[0081], please renumber original paragraph [0057] to [0082], without any modification to its text, as follows:

"~~[0057]~~ [0082] While the present invention has been particularly shown and described with reference to certain embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention. Accordingly, the disclosure was intended merely as illustrative and the scope of the invention is limited only as specified in the appended claims."

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CLAIMS

1. (Currently amended) A magnetic recording medium, comprising:

an essentially non-magnetic substrate;

an underlayer formed on the non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including

a hard magnetic storage layer, having a first coercive field H_s>0.5 T, formed on the underlayer; and

a nucleation host, having a second coercive field H_n without the hard magnetic storage layer, lower than the first coercive field, H_n<H_s, wherein

said nucleation host

is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,

is exchange coupled to the hard magnetic storage layer, and

comprises ferromagnetic layers with increasing anisotropy constant K from layer to layer.

2. (Previously amended) The magnetic recording medium of claim 1, wherein:

an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that a derivative k of a normalized magnetization with respect to an external magnetic field, normalized to a coercive field of the recording medium, does not change by more than a factor of 3 in a magnetization interval -0.7 < M_z/M_s< 0.7, wherein

$$k = \frac{dM}{dH}\frac{H_c}{M_s},$$

M being a magnetization of the recording medium, M_z being a component of M perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the recording medium, $\frac{dM}{dH}$ being a derivative of the magnetization of the recording medium with respect to the external magnetic field, H_c being the coercive field of the recording medium, M_s being a saturation magnetization of the recording medium.

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3. (Previously amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer are in direct contact.

4-5. (Cancelled)

6. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer comprise ferromagnetic layers with increasing anisotropy constant K values.

7. (Previously amended) The magnetic recording ~~of~~ medium of claim 1, wherein:
the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (Previously amended) The magnetic recording medium of claim 1, wherein:
the coercive field of the nucleation host H_n without the hard magnetic storage layer is less than ½ of the coercive field of the hard magnetic storage layer H_s.

9. (Previously amended) The magnetic recording medium of claim 1 wherein:
$H_c(\alpha=20^\circ) < H_c(\alpha=45^\circ)$, wherein $H_c(\alpha)$ is a coercive field of the recording medium if an angle between an external field and a normal of the recording medium is α.

10. (Previously amended) The magnetic recording medium of claim 1 wherein:
$H_m(\alpha=20^\circ) < H_m(\alpha=45^\circ)$, wherein $H_m(\alpha)$ is a field to reduce a normalized magnetization from a saturation to -0.5 if an angle between an external field and a normal of the recording medium is α.

11. (Previously amended) The magnetic recording medium of claim 1, wherein:
the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (Previously amended) The magnetic recording medium of claim 1, wherein:

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the nucleation host has a thickness smaller than 30 nm.

13. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (Previously amended) The magnetic recording medium of claim 1, wherein:

a height of a plurality of grains is greater than a diameter of the grains.

15. (Previously amended) The magnetic recording medium of claim 1, wherein:

a coupling layer is disposed between the nucleation host and the hard magnetic storage layer.

16. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is coupled to the hard magnetic storage layer by an exchange coupling layer to provide an exchange coupling sufficiently strong to enable a formation of a domain wall across an interface of the hard magnetic storage layer and the nucleation host during reversal.

18. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (Previously amended) The magnetic recording medium of claim 1, where parameters of the recording medium comprise:

an anisotropy constant in the nucleation host K^n_1 as a function of a layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

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an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic storage layer.

20. (Currently amended) The magnetic recording medium of claim 19, wherein:

a parameter of the ~~recording medium~~ magnetic multilayer structure has a value such that a coercive field of the hard magnetic storage layer ~~recording medium H_c~~ is less than ½ of the coercive field of the hard magnetic storage layer without the nucleation host.

21. (Previously amended) The magnetic recording medium of claim 19, wherein:

a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (Previously amended) The magnetic recording medium of claim 19, wherein:

the energy barrier of the hard magnetic storage layer is determined by at least one of

depositing only the hard magnetic storage on the non-magnetic substrate;

removing the nucleation host from a multilayer structure; and

performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (Previously amended) The magnetic recording medium of claim 19, wherein:

a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

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24. (Previously amended) The magnetic recording medium of claim 1, wherein:

a thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (Previously amended) The magnetic recording medium of claim 1, wherein:

the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

26-31. (Cancelled)

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REMARKS

Claims 1-3, and 6-25 are pending in the present Application. With this Response, Applicant amends claims 1, 6, and 20, and cancels claim 4-5, and 26-31. Further, Applicant also amends paragraph, [0028], adds paragraphs [0057]-[0081], and renumbers previous paragraph [0057] to [0082]. All amendments are fully supported by the originally filed Application. No new matter has been added.

RESPONSE TO THE OFFICE ACTION'S RESPONSE TO ARGUMENTS

The Office Action responded to Applicant's previously presented arguments as follows:

> "Applicant's arguments are unpersuasive … However, the Examiner notes that all independent claims requiring the nucleation host comprising ferromagnetic layers with increasing anisotropy values (per Claim 6) or anisotropy constants (K) from layer to layer will overcome the prior art of record and coercive field relationship between the nucleation host and the hard magnetic storage layer." (emphasis in original)

Applicant requested a telephonic interview with Examiner Chau, asking for clarification regarding this rejection. In this interview of 07/25/2017, Applicant understood the Examiner summarizing this section of the Office Action as follows.

(1) Amending claim 1 from reciting "increasing anisotropy" to recite "increasing anisotropy constant K" will make claim 1 allowable.

(2) The phrase "… and coercive field relationship between the nucleation host and the hard magnetic storage layer" meant that the coercive field relationship between the nucleation host and the hard magnetic storage layer that was recited in claim 1 ("a hard magnetic storage layer, having a first coercive field H_s>0.5 T, and a nucleation host, having a second coercive field H_n without the hard magnetic storage layer, lower than the first coercive field, H_n<H_s"), shall be amended into the other independent claims 26, 30, and 31. Doing so will make those claims allowable as well.

This understanding is fully consistent with the "Allowable Subject Matter" section's requirements on p. 11. In response, Applicant hereby

(1) amends all claims that recited "anisotropy" to recite "anisotropy constant K";

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(2) amends independent claims 26, 30, and 31 to recite the same "coercive field relationship" as claim 1.

OBJECTIONS - SPECIFICATION

The Office Action objected the Specification for failing to provide proper antecedent basis for claims 8, 12-14, 16, 20, 23 and 24.

In response, Applicant first states that the subject matter of all these claims was already expressly described in the originally filed claims 1-25. Applicant then points to MPEP 2163.I that provides:

> "While early opinions suggested that the Patent and Trademark Office was unwilling to find written descriptive support when the only description was found in the claims, this viewpoint was rejected. See *In re Koller*, 613 F.2d 819, 204 USPQ 702 (CCPA 1980) (original claims constitute their own description); accord *In re Gardner*, 475 F.2d 1389, 177 USPQ 396 (CCPA 1973); *accord In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). It is now well accepted that a satisfactory description may be in the claims or any other portion of the originally filed specification".

With this guidance by the MPEP, Applicant argues that the originally filed claims constituted their own description, and thus "provided proper antecedent basis for the claimed subject matter".

MPEP 2163.I.B further provides that Applicant can make the presence of support even clearer by "amend[ing] the specification to include the claimed subject matter":

> "The claims as filed in the original specification are part of the disclosure and, therefore, if an application as originally filed contains a claim disclosing material not found in the remainder of the specification, the applicant may amend the specification to include the claimed subject matter. *In re Benno*, 768 F.2d 1340, 226 USPQ 683 (Fed. Cir. 1985)."

With this Response, Applicant adopts and follows the instructions of MPEP 2163.I.B and copies the text of originally filed claims 1-25 into the Specification as paragraphs [0057]-[0081], with only minimal modifications required by grammatical considerations.

With this preparation, Applicant responds to the above objections by furnishing a list of paragraphs of the just-amended Specification that provide antecedent basis for the objected claims.

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Providing these sections is not meant to represent that these would be the only places providing support for the claimed subject matter. On the contrary, other paragraphs and sections may offer additional support for the claims. Therefore, the list below is presented as a list of examples where support for the identified claims has been described in the Specification.

Claim 8: example of antecedent basis - paragraph [0064];

Claim 12: example of antecedent basis - paragraph [0068];

Claim 13: example of antecedent basis - paragraph [0069];

Claim 14: example of antecedent basis - paragraph [0070];

Claim 16: example of antecedent basis - paragraph [0072];

Claim 20: example of antecedent basis - paragraph [0076];

Claim 23: example of antecedent basis - paragraph [0079]; and

Claim 24: example of antecedent basis - paragraph [0080].

OBJECTIONS-DRAWINGS

The drawings were objected for not showing "recording layer 16", mentioned in paragraph [0028].

In response, Applicant deletes the reference to the recording layer 16 in paragraph [0028].

REJECTIONS UNDER 35 U.S.C. § 112

Claim 5, 20, 27, 29, and 30 stand rejected because allegedly failing to comply with the written description requirement. Applicant respectfully addresses these rejections as follows.

Claim 5: In response, Applicant cancelled claim 5.

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Claim 20: In response, Applicant restored the originally filed language of claim 20. Moreover, at newly numbered paragraph [0076], Applicant amended the Specification to recite the same, thereby providing clear support for claim 20, restored to its original form.

Claim 27: In response, Applicant cancelled claim 27.

Claim 29: In response, Applicant cancelled claim 29.

Claim 30: In response, Applicant cancelled claim 30.

Claim 4, 26, 28, 29, and 31 stand rejected because allegedly being indefinite.

In response, Applicant cancelled all rejected claims 4, 26, 28, 29, and 31.

REJECTIONS UNDER 35 U.S.C. § 103

On p. 7, the Office Action repeated the 35 U.S.C. § 103 rejections issued at previous stages of the prosecution. However, the "Response to Arguments" section on p. 2, and the "Allowable subject matter" section on p. 11 did not point to these 35 U.S.C. § 103 rejections when summarizing the steps necessary to make the claims allowable over the prior art.

Applicant again sought clarification regarding this issue from Examiner Chau during the interview on 7/25/2017. In response, Examiner Chau confirmed that complying with the requirements stated in the "Allowable Subject Matter" section by itself will make "all claims … allowable", and no separate response was required to overcome the 35 U.S.C. § 103 rejections.

Accordingly, Applicant submits that the many responsive steps and amendments, presented in this Response, address all requirements listed in the "Allowable Subject Matter" section.

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CONCLUSIONS

In view of the foregoing, Applicant respectfully requests the reconsideration of the pending claims and the withdrawal of the present rejections. All of the claims in the application are now believed to be allowable. Favorable consideration and a Notice of Allowance are therefore earnestly solicited. If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is kindly requested to contact the undersigned Dr. Gergely T. Zimanyi, at 530-400-3936, who is readily available to discuss the steps necessary for bringing the Application in condition for allowance.

Respectfully submitted,

Date: 09/18/2017

/Gergely T. Zimanyi/
Gergely T. Zimanyi, Ph.D.
Registration No. 45,754

CERTIFICATE OF TRANSMISSION UNDER 37 CFR 1.8
I hereby certify that this correspondence is being transmitted to the USPTO via EFS-Web on 09/18/2017.

/Richard A. Pask/ 09/18/2017
Richard A. Pask Date

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705
Telephone: 530.400.3936
Email: gzimanyi@gmail.com

Electronic Patent Application Fee Transmittal

Application Number:	12619849
Filing Date:	17-Nov-2009
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	Gergely T. Zimanyi/Richard Pask
Attorney Docket Number:	SUSP02US1

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	2251	1	100	100
Miscellaneous:				
		Total in USD ($)		**100**

Electronic Acknowledgement Receipt

EFS ID:	30401368
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	143793
Filer:	Gergely T. Zimanyi/Richard Pask
Filer Authorized By:	Gergely T. Zimanyi
Attorney Docket Number:	SUSP02US1
Receipt Date:	18-SEP-2017
Filing Date:	17-NOV-2009
Time Stamp:	23:37:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$100
RAM confirmation Number	091917INTEFSW23471800
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Extension of Time	1_SUSP02US1_EOT.pdf	472654 83f0609f3eda68870e48827c59384f66d6bca68c	no	1
Warnings:					
Information:					
2		2_SUSP02US1_2017_09_05_RAA.pdf	4515782 323d10b551f65d4e6eecff03c2e0726faa444697	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Specification	2	5
	Claims	6	10
	Amendment/Req. Reconsideration-After Non-Final Reject	11	15

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30785 7559aa040a8467e7a402c2222b88d4967c5cdf81	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	5019221		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/22 (03-13)
Approved for use through 7/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) SUSP02US1
Application Number 12/619,849	Filed 11/17/2009
For MULTILAYER EXCHANGE SPRING RECORDING MEDIA	
Art Unit 1785	Examiner LISA N. CHAU

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☑	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 100
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☐	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 45,754.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Gergely T. Zimanyi/	09/18/2017
Signature	Date
Gergely T. Zimanyi	(530) 400-3936
Typed or printed name	Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	09/18/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 23	Minus	** 34	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	***4	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
JAMES TUNSTALL

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

143793 7590 09/05/2017

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
09/05/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

gzimanyi@gmail.com
richepask@gmail.com

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 12/619,849	**Applicant(s)** SUESS, DIETER	
	Examiner LISA CHAU	**Art Unit** 1785	**AIA (First Inventor to File) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 03 August 2017 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;

   (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

   a) ☐ The period for reply expires _____months from the mailing date of the final rejection.

   b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☐ For purposes of appeal, the proposed amendment(s): (a) ☐ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:

    _____.

13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____

14. ☒ Other: See Continuation Sheet.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:

    Claim(s) allowed: 1-3 and 6-25.
    Claim(s) objected to: .
    Claim(s) rejected: .
    Claim(s) withdrawn from consideration: .

/LC/ Lisa Chau	/Holly Rickman/ Primary Examiner, Art Unit 1785

Continuation of 14. Other: On 8/22/17, the Examiner contacted Gergely Zimanyi about the filed Specification 8/13/17. However, it appears the proposed changes are directed to the published Application and not to the as-filed Specification. For Example, inserting new paragraphs between paragraphs [0059] and [0060] is impossible because paragraphs [0059] and [0060] do not exist. We agreed to enter the after-final amendment 8/13/17 in parts, and the Examiner awaits for Applicant to resubmit the amended Specification with the correct paragraph numbering.

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SPECIFICATION

Please amend paragraph [0031] as follows:

"[0031] The recording media includes hard magnetic storage layer 24 and softer nucleation host 21. Hard magnetic storage layer 24 can be a ferromagnet, ferrimagnet, antiferromagnet, or any other synthetic antiferromagnetic structure. The coupling between the nucleation host and the hard magnetic storage layer may be ferromagnetic or antiferromagnetic. Hard magnetic storage layer 24 maybe formed from any material that has large perpendicular anisotropy. These materials include tetragonal[[:]] $L1_0$-ordered phase materials, CoPt and FePt based alloys, CoPtCr alloys, including CoPtCrB, CoPtCrTa, ~~and~~ CoCr based granular media~~.~~, ~~Other high anisotropy materials suitable for the recording layer 16 include~~ pseudo-binary alloys based on the FePt and CoPt $L1_0$ phase, i.e., FePt--X and CoPt--X, where the element X may be Ni, Au, Cu, Pd or Ag, as well as granular composite materials such as FePt--C, FePt--ZrO, FePt--MgO, FePt--B_2O_3, materials containing at least one of B, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Pd, Sm, Nd, Dy, Hf, Mn, Ni and other similar composites."

Please insert the below new paragraphs [0060]-[0084] after present paragraph [0059] and before present paragraph [0060]. Since the entire text of paragraphs [0060]-[0084] is new, for clarity's sake, the underlining of the entire text has been omitted.

"[0060] In some embodiments, as described throughout this specification, a magnetic recording medium is comprising: an essentially non-magnetic substrate; and an exchange coupled magnetic multilayer structure, comprising: a nucleation host with an anisotropy varying in the film normal direction; and a hard magnetic storage layer; wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host.

[0061] In some embodiments of the magnetic recording medium, an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7<M_z/M_s<0.7$, wherein:

$$k = \frac{dM}{dH}\frac{H_c}{M_s}$$

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M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, dM/dH being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

[0062] In some embodiments of the magnetic recording medium, the nucleation host and the hard magnetic storage layer are in direct contact.

[0063] In some embodiments of the magnetic recording medium, the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

[0064] In some embodiments of the magnetic recording medium, the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

[0065] In some embodiments of the magnetic recording medium, the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

[0066] In some embodiments of the magnetic recording medium, the hard magnetic storage layer comprises at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

[0067] In some embodiments of the magnetic recording medium, a coercive field of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

[0068] In some embodiments of the magnetic recording medium, a $H_c(\alpha=20°)<H_c(\alpha=45°)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

[0069] In some embodiments of the magnetic recording medium, a $H_m(\alpha=20°)<H_c(\alpha=45°)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

[0070] In some embodiments of the magnetic recording medium, the nucleation host comprises at least one of Fe, Ni, Al, Si, B, Co, Cr, Pt, Ta, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn, Ni and O.

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[0071] In some embodiments of the magnetic recording medium, the nucleation host has a thickness smaller than 30 nm.

[0072] In some embodiments of the magnetic recording medium, the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

[0073] In some embodiments of the magnetic recording medium, a height of a plurality of grains is greater than a diameter of the grains.

[0074] In some embodiments of the magnetic recording medium, the nucleation host is in direct contact with the hard magnetic storage layer.

[0075] In some embodiments of the magnetic recording medium, the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5 nm.

[0076] In some embodiments of the magnetic recording medium, the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

[0077] In some embodiments of the magnetic recording medium, the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

[0078] In some embodiments of the magnetic recording medium, parameters of the medium comprise: a anisotropy constant in the nucleation host K^n_1 as a function of the layer depth a hard magnetic storage layer anisotropy constant K^h_1; a nucleation host grain diameter; a hard magnetic storage layer grain diameter; an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer; a saturation polarization in the nucleation host as a function of the layer depth; a saturation polarization of the hard magnetic storage layer; a layer thickness of the nucleation host; a layer thickness of the magnetic storage layer and an exchange constant between the nucleation host and the hard magnetic layer.

[0079] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

[0080] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic

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storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

[0081] In some embodiments of the magnetic recording medium, an energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage layer on the non-magnetic substrate; removing the nucleation host from the multilayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

[0082] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

[0083] In some embodiments of the magnetic recording medium, the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

[0084] In some embodiments of the magnetic recording medium, the recording medium is usable for at least one of perpendicular recording or recording on patterned elements."

Further, to accommodate the insertion of new paragraphs [0060]-[0084], please renumber original paragraph [0060] to [0085], without any modification to its text, as follows:

"~~[0060]~~ [0085] While the present invention has been particularly shown and described with reference to certain embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention. Accordingly, the disclosure was intended merely as illustrative and the scope of the invention is limited only as specified in the appended claims."

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ENTER IN PART: /L.N.C/ Docket No.: SUSP02US1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Dieter Suess	Examiner:	Lisa N. Chau
Application No.:	12/619,849	Art Unit:	1785
Filing Date:	11/17/2009	Confirmation No.:	9414
		Docket No.:	SUSP02US1
		Customer No.:	143793
		Date:	08/13/2017

Title: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Dear Examiner Chau:

This is a Response to the Final Office Action, dated 06/15/2017. Applicant gratefully thanks Examiner Chau to have granted a very helpful telephonic interview on 07/25/2017. In this Response, Applicant implemented all the amendments agreed upon during the interview, or required by the Office Action, and does not traverse any of the rejections or objections. Therefore, Applicant respectfully believes that the present Response brings the pending Application into a condition of allowability. Applicant further notes that the present Response is filed on 08/13/20217, within two months of the mailing date of this Final Office Action.

Applicant respectfully requests the reconsideration of the pending claims in light of the herewith submitted amendments and remarks.

Amendments to the Specification start on p. 2.

Amendments to the Claims start on p. 6.

Remarks start on p. 11.

CLAIMS

1. (Currently amended) A magnetic recording medium, comprising:

an essentially non-magnetic substrate;

an underlayer formed on the non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including

a hard magnetic storage layer, having a first coercive field H_s>0.5 T, formed on the underlayer; and

a nucleation host, having a second coercive field H_n without the hard magnetic storage layer, lower than the first coercive field, H_n<H_s, wherein

said nucleation host

is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,

is exchange coupled to the hard magnetic storage layer, and

comprises ferromagnetic layers with increasing anisotropy constant K from layer to layer.

2. (Previously amended) The magnetic recording medium of claim 1, wherein:

an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that a derivative k of a normalized magnetization with respect to an external magnetic field, normalized to a coercive field of the recording medium, does not change by more than a factor of 3 in a magnetization interval -0.7 < M_z/M_s< 0.7, wherein

$$k = \frac{dM}{dH}\frac{H_c}{M_s},$$

M being a magnetization of the recording medium, M_z being a component of M perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the recording medium, $\frac{dM}{dH}$ being a derivative of the magnetization of the recording medium with respect to the external magnetic field, H_c being the coercive field of the recording medium, M_s being a saturation magnetization of the recording medium.

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3. (Previously amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer are in direct contact.

4-5. (Cancelled)

6. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer comprise ferromagnetic layers with increasing anisotropy constant K values.

7. (Previously amended) The magnetic recording ~~of~~ medium of claim 1, wherein:
the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (Previously amended) The magnetic recording medium of claim 1, wherein:
the coercive field of the nucleation host H_n without the hard magnetic storage layer is less than ½ of the coercive field of the hard magnetic storage layer H_s.

9. (Previously amended) The magnetic recording medium of claim 1 wherein:
$H_c(\alpha=20^\circ) < H_c(\alpha=45^\circ)$, wherein $H_c(\alpha)$ is a coercive field of the recording medium if an angle between an external field and a normal of the recording medium is α.

10. (Previously amended) The magnetic recording medium of claim 1 wherein:
$H_m(\alpha=20^\circ) < H_m(\alpha=45^\circ)$, wherein $H_m(\alpha)$ is a field to reduce a normalized magnetization from a saturation to -0.5 if an angle between an external field and a normal of the recording medium is α.

11. (Previously amended) The magnetic recording medium of claim 1, wherein:
the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (Previously amended) The magnetic recording medium of claim 1, wherein:

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the nucleation host has a thickness smaller than 30 nm.

13. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (Previously amended) The magnetic recording medium of claim 1, wherein:

a height of a plurality of grains is greater than a diameter of the grains.

15. (Previously amended) The magnetic recording medium of claim 1, wherein:

a coupling layer is disposed between the nucleation host and the hard magnetic storage layer.

16. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is coupled to the hard magnetic storage layer by an exchange coupling layer to provide an exchange coupling sufficiently strong to enable a formation of a domain wall across an interface of the hard magnetic storage layer and the nucleation host during reversal.

18. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (Previously amended) The magnetic recording medium of claim 1, where parameters of the recording medium comprise:

an anisotropy constant in the nucleation host K^n_1 as a function of a layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

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an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic storage layer.

20. (Currently amended) The magnetic recording medium of claim 19, wherein:

a parameter of the ~~recording medium~~ magnetic multilayer structure has a value such that a coercive field of the hard magnetic storage layer ~~recording medium H_c~~ is less than ½ of the coercive field of the hard magnetic storage layer without the nucleation host.

21. (Previously amended) The magnetic recording medium of claim 19, wherein:

a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (Previously amended) The magnetic recording medium of claim 19, wherein:

the energy barrier of the hard magnetic storage layer is determined by at least one of

depositing only the hard magnetic storage on the non-magnetic substrate;

removing the nucleation host from a multilayer structure; and

performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (Previously amended) The magnetic recording medium of claim 19, wherein:

a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

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24. (Previously amended) The magnetic recording medium of claim 1, wherein:

a thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (Previously amended) The magnetic recording medium of claim 1, wherein:

the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

26-31. (Cancelled)

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Dieter Suess	Examiner:	Lisa N. Chau
Application No.:	12/619,849	Art Unit:	1785
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RESPONSE TO OFFICE ACTION

Dear Examiner Chau:

This is a Response to the Final Office Action, dated 06/15/2017. Applicant gratefully thanks Examiner Chau to have granted a very helpful telephonic interview on 07/25/2017. In this Response, Applicant implemented all the amendments agreed upon during the interview, or required by the Office Action, and does not traverse any of the rejections or objections. Therefore, Applicant respectfully believes that the present Response brings the pending Application into a condition of allowability. Applicant further notes that the present Response is filed on 08/13/20217, within two months of the mailing date of this Final Office Action.

Applicant respectfully requests the reconsideration of the pending claims in light of the herewith submitted amendments and remarks.

Amendments to the Specification start on p. 2.

Amendments to the Claims start on p. 6.

Remarks start on p. 11.

SPECIFICATION

Please amend paragraph [0031] as follows:

"[0031] The recording media includes hard magnetic storage layer 24 and softer nucleation host 21. Hard magnetic storage layer 24 can be a ferromagnet, ferrimagnet, antiferromagnet, or any other synthetic antiferromagnetic structure. The coupling between the nucleation host and the hard magnetic storage layer may be ferromagnetic or antiferromagnetic. Hard magnetic storage layer 24 maybe formed from any material that has large perpendicular anisotropy. These materials include tetragonal[[:]] $L1_0$-ordered phase materials, CoPt and FePt based alloys, CoPtCr alloys, including CoPtCrB, CoPtCrTa, ~~and~~ CoCr based granular media-, ~~Other high anisotropy materials suitable for the recording layer 16 include~~ pseudo-binary alloys based on the FePt and CoPt $L1_0$ phase, i.e., FePt--X and CoPt--X, where the element X may be Ni, Au, Cu, Pd or Ag, as well as granular composite materials such as FePt--C, FePt--ZrO, FePt--MgO, FePt--B_2O_3, materials containing at least one of B, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Pd, Sm, Nd, Dy, Hf, Mn, Ni and other similar composites."

Please insert the below new paragraphs [0060]-[0084] after present paragraph [0059] and before present paragraph [0060]. Since the entire text of paragraphs [0060]-[0084] is new, for clarity's sake, the underlining of the entire text has been omitted.

"[0060] In some embodiments, as described throughout this specification, a magnetic recording medium is comprising: an essentially non-magnetic substrate; and an exchange coupled magnetic multilayer structure, comprising: a nucleation host with an anisotropy varying in the film normal direction; and a hard magnetic storage layer; wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host.

[0061] In some embodiments of the magnetic recording medium, an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7<M_z/M_s<0.7$, wherein:

$$k = \frac{dM}{dH}\frac{H_c}{M_s}$$

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M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, dM/dH being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

[0062] In some embodiments of the magnetic recording medium, the nucleation host and the hard magnetic storage layer are in direct contact.

[0063] In some embodiments of the magnetic recording medium, the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

[0064] In some embodiments of the magnetic recording medium, the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

[0065] In some embodiments of the magnetic recording medium, the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

[0066] In some embodiments of the magnetic recording medium, the hard magnetic storage layer comprises at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

[0067] In some embodiments of the magnetic recording medium, a coercive field of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

[0068] In some embodiments of the magnetic recording medium, a $H_c(\alpha=20^\circ)<H_c(\alpha=45^\circ)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

[0069] In some embodiments of the magnetic recording medium, a $H_m(\alpha=20^\circ)<H_c(\alpha=45^\circ)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

[0070] In some embodiments of the magnetic recording medium, the nucleation host comprises at least one of Fe, Ni, Al, Si, B, Co, Cr, Pt, Ta, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn, Ni and O.

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[0071] In some embodiments of the magnetic recording medium, the nucleation host has a thickness smaller than 30 nm.

[0072] In some embodiments of the magnetic recording medium, the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

[0073] In some embodiments of the magnetic recording medium, a height of a plurality of grains is greater than a diameter of the grains.

[0074] In some embodiments of the magnetic recording medium, the nucleation host is in direct contact with the hard magnetic storage layer.

[0075] In some embodiments of the magnetic recording medium, the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5 nm.

[0076] In some embodiments of the magnetic recording medium, the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

[0077] In some embodiments of the magnetic recording medium, the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

[0078] In some embodiments of the magnetic recording medium, parameters of the medium comprise: a anisotropy constant in the nucleation host K^n_1 as a function of the layer depth a hard magnetic storage layer anisotropy constant K^h_1; a nucleation host grain diameter; a hard magnetic storage layer grain diameter; an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer; a saturation polarization in the nucleation host as a function of the layer depth; a saturation polarization of the hard magnetic storage layer; a layer thickness of the nucleation host; a layer thickness of the magnetic storage layer and an exchange constant between the nucleation host and the hard magnetic layer.

[0079] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

[0080] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic

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storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

[0081] In some embodiments of the magnetic recording medium, an energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage layer on the non-magnetic substrate; removing the nucleation host from the multilayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

[0082] In some embodiments of the magnetic recording medium, a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

[0083] In some embodiments of the magnetic recording medium, the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

[0084] In some embodiments of the magnetic recording medium, the recording medium is usable for at least one of perpendicular recording or recording on patterned elements."

Further, to accommodate the insertion of new paragraphs [0060]-[0084], please renumber original paragraph [0060] to [0085], without any modification to its text, as follows:

"~~[0060]~~ [0085] While the present invention has been particularly shown and described with reference to certain embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention. Accordingly, the disclosure was intended merely as illustrative and the scope of the invention is limited only as specified in the appended claims."

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CLAIMS

1. (Currently amended) A magnetic recording medium, comprising:

an essentially non-magnetic substrate;

an underlayer formed on the non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including

a hard magnetic storage layer, having a first coercive field H_s>0.5 T, formed on the underlayer; and

a nucleation host, having a second coercive field H_n without the hard magnetic storage layer, lower than the first coercive field, H_n<H_s, wherein

said nucleation host

is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,

is exchange coupled to the hard magnetic storage layer, and

comprises ferromagnetic layers with increasing anisotropy constant K from layer to layer.

2. (Previously amended) The magnetic recording medium of claim 1, wherein:

an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that a derivative k of a normalized magnetization with respect to an external magnetic field, normalized to a coercive field of the recording medium, does not change by more than a factor of 3 in a magnetization interval -0.7 < M_z/M_s< 0.7, wherein

$$k = \frac{dM}{dH}\frac{H_c}{M_s},$$

M being a magnetization of the recording medium, M_z being a component of M perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the recording medium, $\frac{dM}{dH}$ being a derivative of the magnetization of the recording medium with respect to the external magnetic field, H_c being the coercive field of the recording medium, M_s being a saturation magnetization of the recording medium.

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3. (Previously amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer are in direct contact.

4-5. (Cancelled)

6. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer comprise ferromagnetic layers with increasing anisotropy constant K values.

7. (Previously amended) The magnetic recording ~~of~~ medium of claim 1, wherein:
the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (Previously amended) The magnetic recording medium of claim 1, wherein:
the coercive field of the nucleation host H_n without the hard magnetic storage layer is less than ½ of the coercive field of the hard magnetic storage layer H_s.

9. (Previously amended) The magnetic recording medium of claim 1 wherein:
$H_c(\alpha=20^\circ) < H_c(\alpha=45^\circ)$, wherein $H_c(\alpha)$ is a coercive field of the recording medium if an angle between an external field and a normal of the recording medium is α.

10. (Previously amended) The magnetic recording medium of claim 1 wherein:
$H_m(\alpha=20^\circ) < H_m(\alpha=45^\circ)$, wherein $H_m(\alpha)$ is a field to reduce a normalized magnetization from a saturation to -0.5 if an angle between an external field and a normal of the recording medium is α.

11. (Previously amended) The magnetic recording medium of claim 1, wherein:
the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (Previously amended) The magnetic recording medium of claim 1, wherein:

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the nucleation host has a thickness smaller than 30 nm.

13. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (Previously amended) The magnetic recording medium of claim 1, wherein:

a height of a plurality of grains is greater than a diameter of the grains.

15. (Previously amended) The magnetic recording medium of claim 1, wherein:

a coupling layer is disposed between the nucleation host and the hard magnetic storage layer.

16. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is coupled to the hard magnetic storage layer by an exchange coupling layer to provide an exchange coupling sufficiently strong to enable a formation of a domain wall across an interface of the hard magnetic storage layer and the nucleation host during reversal.

18. (Previously amended) The magnetic recording medium of claim 1, wherein:

the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (Previously amended) The magnetic recording medium of claim 1, where parameters of the recording medium comprise:

an anisotropy constant in the nucleation host K^n_1 as a function of a layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

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an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic storage layer.

20. (Currently amended) The magnetic recording medium of claim 19, wherein:

a parameter of the ~~recording medium~~ magnetic multilayer structure has a value such that a coercive field of the hard magnetic storage layer ~~recording medium H_c~~ is less than ½ of the coercive field of the hard magnetic storage layer without the nucleation host.

21. (Previously amended) The magnetic recording medium of claim 19, wherein:

a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (Previously amended) The magnetic recording medium of claim 19, wherein:

the energy barrier of the hard magnetic storage layer is determined by at least one of

depositing only the hard magnetic storage on the non-magnetic substrate;

removing the nucleation host from a multilayer structure; and

performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (Previously amended) The magnetic recording medium of claim 19, wherein:

a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

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24. (Previously amended) The magnetic recording medium of claim 1, wherein:

a thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (Previously amended) The magnetic recording medium of claim 1, wherein:

the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

26-31. (Cancelled)

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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REMARKS

Claims 1-3, and 6-25 are pending in the present Application. With this Response, Applicant amends claims 1, 6, and 20, and cancels claim 4-5, and 26-31. Further, Applicant also amends paragraphs [0031] and [0085], and adds paragraphs [0060]-[0084]. All amendments are fully supported by the originally filed Application. No new matter has been added.

RESPONSE TO THE OFFICE ACTION'S RESPONSE TO ARGUMENTS

The Office Action responded to Applicant's previously presented arguments as follows:

> "Applicant's arguments are unpersuasive … However, the Examiner notes that all independent claims requiring the nucleation host comprising ferromagnetic layers with increasing anisotropy values (per Claim 6) or anisotropy constants (K) from layer to layer will overcome the prior art of record and coercive field relationship between the nucleation host and the hard magnetic storage layer." (emphasis in original)

Applicant requested a telephonic interview with Examiner Chau, asking for clarification regarding this rejection. In this interview of 07/25/2017, Applicant understood the Examiner summarizing this section of the Office Action as follows.

(1) Amending claim 1 from reciting "increasing anisotropy" to recite "increasing anisotropy constant K" will make claim 1 allowable.

(2) The phrase "… and coercive field relationship between the nucleation host and the hard magnetic storage layer" meant that the coercive field relationship between the nucleation host and the hard magnetic storage layer that was recited in claim 1 ("a hard magnetic storage layer, having a first coercive field H_s>0.5 T, and a nucleation host, having a second coercive field H_n without the hard magnetic storage layer, lower than the first coercive field, H_n<H_s"), shall be amended into the other independent claims 26, 30, and 31. Doing so will make those claims allowable as well.

This understanding is fully consistent with the "Allowable Subject Matter" section's requirements on p. 11. In response, Applicant hereby

(1) amends all claims that recited "anisotropy" to recite "anisotropy constant K";

(2) amends independent claims 26, 30, and 31 to recite the same "coercive field

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relationship" as claim 1.

OBJECTIONS - SPECIFICATION

The Office Action objected the Specification for failing to provide proper antecedent basis for claims 8, 12-14, 16, 20, 23 and 24.

In response, Applicant first states that the subject matter of all these claims was already expressly described in the originally filed claims 1-25. Applicant then points to MPEP 2163.I that provides:

> "While early opinions suggested that the Patent and Trademark Office was unwilling to find written descriptive support when the only description was found in the claims, this viewpoint was rejected. See *In re Koller*, 613 F.2d 819, 204 USPQ 702 (CCPA 1980) (original claims constitute their own description); accord *In re Gardner*, 475 F.2d 1389, 177 USPQ 396 (CCPA 1973); *accord In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). It is now well accepted that a satisfactory description may be in the claims or any other portion of the originally filed specification".

With this guidance by the MPEP, Applicant argues that the originally filed claims constituted their own description, and thus "provided proper antecedent basis for the claimed subject matter".

MPEP 2163.I.B further provides that Applicant can make the presence of support even clearer by "amend[ing] the specification to include the claimed subject matter":

> "The claims as filed in the original specification are part of the disclosure and, therefore, if an application as originally filed contains a claim disclosing material not found in the remainder of the specification, the applicant may amend the specification to include the claimed subject matter. *In re Benno*, 768 F.2d 1340, 226 USPQ 683 (Fed. Cir. 1985)."

With this Response, Applicant adopts and follows the instructions of MPEP 2163.I.B and copies the text of originally filed claims 1-25 into the Specification as paragraphs [0060]-[0084], with only minimal modifications required by grammatical considerations.

With this preparation, Applicant responds to the above objections by furnishing a list of paragraphs of the just-amended Specification that provide antecedent basis for the objected claims. Providing these sections is not meant to represent that these would be the only places providing

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support for the claimed subject matter. On the contrary, other paragraphs and sections may offer additional support for the claims. Therefore, the list below is presented as a list of examples where support for the identified claims has been described in the Specification.

Claim 8: example of antecedent basis - paragraph [0067];

Claim 12: example of antecedent basis - paragraph [0071];

Claim 13: example of antecedent basis - paragraph [0072];

Claim 14: example of antecedent basis - paragraph [0073];

Claim 16: example of antecedent basis - paragraph [0075];

Claim 20: example of antecedent basis - paragraph [0079];

Claim 23: example of antecedent basis - paragraph [0082]; and

Claim 24: example of antecedent basis - paragraph [0083].

OBJECTIONS-DRAWINGS

The drawings were objected for not showing "recording layer 16", mentioned in paragraph [0031].

In response, Applicant deletes the reference to the recording layer 16 in paragraph [0031].

REJECTIONS UNDER 35 U.S.C. § 112

Claim 5, 20, 27, 29, and 30 stand rejected because allegedly failing to comply with the written description requirement. Applicant respectfully addresses these rejections as follows.

Claim 5: In response, Applicant cancelled claim 5.

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Claim 20: In response, Applicant restored the originally filed language of claim 20. Moreover, at newly numbered paragraph [0079], Applicant amended the Specification to recite the same, thereby providing clear support for claim 20, restored to its original form.

Claim 27: In response, Applicant cancelled claim 27.

Claim 29: In response, Applicant cancelled claim 29.

Claim 30: In response, Applicant cancelled claim 30.

Claim 4, 26, 28, 29, and 31 stand rejected because allegedly being indefinite.

In response, Applicant cancelled all rejected claims 4, 26, 28, 29, and 31.

REJECTIONS UNDER 35 U.S.C. § 103

On p. 7, the Office Action repeated the 35 U.S.C. § 103 rejections issued at previous stages of the prosecution. However, the "Response to Arguments" section on p. 2, and the "Allowable subject matter" section on p. 11 did not point to these 35 U.S.C. § 103 rejections when summarizing the steps necessary to make the claims allowable over the prior art.

Applicant again sought clarification regarding this issue from Examiner Chau during the interview on 7/25/2017. In response, Examiner Chau confirmed that complying with the requirements stated in the "Allowable Subject Matter" section by itself will make "all claims … allowable", and no separate response was required to overcome the 35 U.S.C. § 103 rejections.

Accordingly, Applicant submits that the many responsive steps and amendments, presented up to now in this Response, address all requirements listed in the "Allowable Subject Matter" section.

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 118 of 519

CONCLUSIONS

In view of the foregoing, Applicant respectfully requests the reconsideration of the pending claims and the withdrawal of the present rejections. All of the claims in the application are now believed to be allowable. Favorable consideration and a Notice of Allowance are therefore earnestly solicited. If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is kindly requested to contact the undersigned Dr. Gergely T. Zimanyi, at 530-400-3936, who is readily available to discuss the steps necessary for bringing the Application in condition for allowance.

Respectfully submitted,

Date: 08/13/2017

/Gergely T. Zimanyi/
Gergely T. Zimanyi, Ph.D.
Registration No. 45,754

CERTIFICATE OF TRANSMISSION UNDER 37 CFR 1.8
I hereby certify that this correspondence is being transmitted to the USPTO via EFS-Web on 08/13/2017.

/Richard A. Pask/ 08/13/2017
Richard A. Pask Date

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705
Telephone: 530.400.3936
Email: gzimanyi@gmail.com

Electronic Acknowledgement Receipt

EFS ID:	30063408
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	143793
Filer:	Gergely T. Zimanyi/Richard Pask
Filer Authorized By:	Gergely T. Zimanyi
Attorney Docket Number:	SUSP02US1
Receipt Date:	13-AUG-2017
Filing Date:	17-NOV-2009
Time Stamp:	22:14:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		1_SUSP02US1_Response_to_Final_Office_Action.pdf	4474443 08595b3d79ffae1f7fd6bfa573aabee69d630d35	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Specification	2	5
	Claims	6	10
	Applicant Arguments/Remarks Made in an Amendment	11	15
Warnings:			
Information:			
	Total Files Size (in bytes):	4474443	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	08/13/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 23	Minus	** 31	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 1	Minus	***4	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

SLIE
ISAAC CLARK

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

143793 7590 08/09/2017

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
08/09/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

gzimanyi@gmail.com
richepask@gmail.com

Applicant-Initiated Interview Summary	**Application No.** 12/619,849	**Applicant(s)** SUESS, DIETER	
	Examiner LISA CHAU	**Art Unit** 1785	

All participants (applicant, applicant's representative, PTO personnel):

(1) *LISA CHAU*. (3)_____.

(2) *Gergely Zimanyi* . (4)_____.

Date of Interview: *25 July 2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *all pending*.

Identification of prior art discussed: *n/a*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

We discussed the entire Office Action dated 6/15/17. Specifically, the changes needed to have the case in condition for allowance.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/LC/ Lisa Chau	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

143793 7590 06/15/2017

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
06/15/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

gzimanyi@gmail.com
richepask@gmail.com

Office Action Summary	Application No. 12/619,849	Applicant(s) SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/26/17*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-31* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-31* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☒ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *11/17/09* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Response to Amendment

2. Examiner acknowledges amended Claims 1-26 and new Claims 27-31 in the response filed on 2/26/17.

Response to Arguments

3. Applicant's arguments and Interview Agenda filed on 2/26/17 and 4/3/17 have been fully considered but they are not persuasive. Applicant argues that indeed, slides 1, 3, or 15 do not show the anisotropy increasing either from layer to layer, But that the direction of the magnetic moments change from point to point in a soft-hard bilayer. In general, the direction of the magnetic moments at each point is determined as a compromise between the competing anisotropy, exchange fields, demagnetizing field and external field, typically all trying to orient the magnetic moments into different directions. Therefore, the direction of the magnetic moments can, and do, change from point to point even in a constant-anisotropy system, as the other fields change from point-to-point.

However, Applicant's arguments are unpersuasive. Regarding the limitation(s) "increasing anisotropy from layer to layer" in the claims, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description

in Applicants' specification as it would be interpreted by one of ordinary skill in the art. In re Morris, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); In re Donaldson Co., Inc., 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, the Examiner notes that this can refer to a graded anisotropy structure, which Suess teaches with its magnetic moments having different directions within its nucleation host (Slide 15). However, the Examiner notes that all independent claims requiring the nucleation host comprising ferromagnetic layers with increasing anisotropy values (per Claim 6) or anisotropy constants (K) from layer to layer will overcome the prior art of record and coercive field relationship between the nucleation host and the hard magnetic storage layer.

Specification

4. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Please provide antecedent basis for Claims 8, 12-14, 16, 20, 23, and 24.

Drawings

5. The drawings are objected to under 37 CFR 1.83(a) because they fail to show recording layer **16** as described in the specification ([0032] in Applicant's published application). Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing

sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 5, 20, 27, 29, and 30 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the

specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

With regards to Claim 5, the instant claim requires the nucleation host to comprise a ferromagnetic layer with a continuous change of anisotropy. Due to Claim 5 being dependent on Claim 1, the overall structure of the nucleation host is a multilayered ferromagnetic structure with increasing anisotropy from layer to layer, wherein within one ferromagnetic layer also has a continuous change of anisotropy. The instant limitation is not described in the Specification, and thus considered new matter.

With regards to Claim 20, the instant claim requires the coercive field of the recording medium is less than ½ of the coercive field of the hard magnetic storage layer *Hs*. However, the instant limitation is not described in the Specification. Originally filed Claim 20 is directed to the hard magnetic storage layer only, not the recording medium.

With regards to Claim 27, the instant claim is considered new matter. Applicant cited paragraph [0012] for support, however, paragraph [0012] discloses that the coercive field can be reduced by a factor of up to five when the nucleation host has the same magnetization as the hard magnetic storage layer and consisting only of one layer.

With regards to Claim 29, the limitation requiring a coercive field of the softest of the ferromagnetic layers is greater than 0.25 T is considered new matter. Applicant merely has support for the general broad teaching of a "soft" magnetic layer having a coercivity of less than 0.5 T.

With regards to Claim 30, the limitation reciting a hard magnetic storage layer having a first coercivity and a nucleation host having a second coercivity lower than the first coercivity is considered new matter. The Specification does not provide explicit support for this *broad* relationship. However, Applicant do have support for a hard nucleation host layer and an even harder magnetic storage layer, wherein the coercivity for both layers is greater than 0.5 T (please see [0011] and [0034] in Applicant's published application).

Appropriate clarification and/or correction are required in the next response.

8. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 4, 26, 28, 29, and 31 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out

and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

With regards to Claims 4 and 28, the limitation requiring an anisotropy rising/increasing with a z depth and having plateaus is considered indefinite. The instant claim does not define what a z depth is and what exactly are the plateaus created in the ferromagnetic layers. The Examiner suggest to better format the claim based on the teachings in paragraphs [0052] and [0053] in Applicant's published application.

With regards to Claims 26 and 31, the limitation, "an anisotropy of the softest of the ferromagnetic layers is positive" is indefinite. The Examiner suggest to amend the instant limitation in view of the teachings based on paragraph [0048] in Applicant's published application. Furthermore, Claims 26 and 31 recite the limitation "the softest". There is insufficient antecedent basis for this limitation in the claim.

Claims 29 recite the limitation "the softest". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

10. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject

matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. **Claims 1-31 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") in view of US Pub. No. 20050058855 ("Girt").**

With regards to Claims 1, 4-7, 11, 15-18, and 25, Suess et al. teaches a perpendicular magnetic recording medium comprising an exchange coupled magnetic multilayer structure comprising a hard magnetic storage layer having a first coercive field of greater than 0.5 T and a nucleation host having a second coercive field, wherein said nucleation host is formed on the hard magnetic storage layer, exchange coupled to the hard magnetic storage layer, and has a gradient anisotropy (Please see Slides 1, 3, and 15).

Due to Suess et al.'s hard magnetic storage layer being harder than the nucleation host, Suess et al. intrinsically teaches its hard magnetic storage layer having a first coercive field and a nucleation host having a second coercive field lower than the first coercive field (hardness of the storage layer has a larger coercivity than the nucleation host due to the uppermost layer being "softer") (Please see Slide 15 in Suess et al. and [0033] in Applicant's published application).

Suess et al. teaches a gradient anisotropy in its nucleation host (Slide 15 demonstrating the magnetic moments/vectors gradually changing within its layer), which reads into the claimed nucleation host having a ferromagnetic layer with a continuous

change of anisotropy in the film normal direction and assumes more than one value. While Suess et al. does not explicitly teach its nucleation host comprising ferromagnetic layers with increasing anisotropy from layer to layer, forming arbitrarily strata lines between each magnetic moment/vector within Suess et al.'s nucleation host yields the same structure as claimed (i.e. multiple magnetic layers that are the same and in contact with each other can be construed as a single magnetic layer).

Suess et al. does not teach a nominal non-magnetic substrate, underlayer, its hard magnetic storage layer and nucleation host comprising the claimed magnetic materials, and a less than 5nm thick antiferromagnetic coupling layer between the nucleation host and the hard magnetic storage layer.

However, Girt et al. teaches a perpendicular magnetic recording medium comprising a substrate and an underlayer (Fig. 5, [0005], and [0043]). Girt further teaches a first Fe magnetic layer (6), about 2 to about 20 Å thick antiferromagnetic coupling layer (7), and a second Fe magnetic layer (5), wherein said coupling layer antiferromagnetically couples the two magnetic layers (Fig. 5 and [0044]-[0046]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a substrate and underlayer into Suess et al.'s magnetic recording medium to provide a support/base for subsequently deposited layers and to control crystallinity [0043]. It would also have been obvious to one of ordinary skill in the art at the time of the invention was made to use the convention magnetic materials, as demonstrated by Girt, and incorporate an antiferromagnetic coupling layer between

Suess et al.'s hard magnetic storage layer and nucleation host in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

With regards to Claim 2, 8-10, 19-24, and 27-29, it is intrinsic that the modified recording medium has those properties as well. The properties set forth in these claims are material properties. The aforementioned combination of references use substantially the same materials as claimed with substantially the same structure and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

With regards to Claim 3, Suess et al. teaches its nucleation host and the hard magnetic storage layer are in direct contact (Slide 15).

With regards to Claim 12, Suess et al. teaches the nucleation host has a thickness of 5.3 nm (Slide 15).

With regards to Claims 13 and 14, Suess et al. teaches its grains having an average diameter greater than 2 nm and less than 10 nm, wherein a height of a plurality of grains is greater than a diameter of the grains (Slides 10 and 15).

With regards to Claims 26, 30, and 31, please see rejected Claims 1, 4-6, and 11 above.

Allowable Subject Matter

12. All claims would be allowable if rewritten or amended to overcome the 35 U.S.C. 112 (pre-AIA), 1st/2nd paragraphs rejections and all independent claims are rewritten or amended to include the ferromagnetic layers in the nucleation host increases in anisotropy values/anisotropy constant (K) from layer to layer *and* containing the coercive field relationship between the nucleation host and hard magnetic storage layer.

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52

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S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08

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S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR;	ADJ	ON	2011/01/12 16:38

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			FPRS; EPO; JPO; DERWENT			
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43
S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-	ADJ	OFF	2013/11/01

			PGPUB; USPAT; USOCR; EPO; JPO; DERWENT			17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57
S48	47	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/08/22 14:55
S49	1117	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S50	1027	S49 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S51	26	S50 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/12/28 15:58
S52	32	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2015/06/24 17:23
S53	2	Jp "03254421"	US-PGPUB;	ADJ	ON	2016/02/23 16:46

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT			
S54	33	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/02/23 18:20
S55	56	chau near3 lisa	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/08/29 16:26
S56	4	"20010051287"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:25
S57	8	"20050058855"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:39
S58	1161	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/11 17:15
S59	1070	S58 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2017/06/11 17:15
S60	34	S59 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2017/06/11 17:15

EAST Search History (Interference)

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6/ 11/ 2017 5:28:43 PM
C:\ Users\ lchau5\ Documents\ EAST\ Workspaces\ 12619849\ 12619849.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011	07/12/2011	11/01/2013	08/22/2014	06/24/2015	02/23/2016	08/29/2016	06/11/2017	
	1	✓	✓	✓	✓	✓	✓	✓	✓	
	2	✓	✓	✓	✓	✓	✓	✓	✓	
	3	✓	✓	✓	✓	✓	✓	✓	✓	
	4	✓	✓	✓	✓	✓	✓	✓	✓	
	5	✓	✓	✓	✓	✓	✓	✓	✓	
	6	✓	✓	✓	✓	✓	✓	✓	✓	
	7	✓	✓	✓	✓	✓	✓	✓	✓	
	8	✓	✓	✓	✓	✓	✓	✓	✓	
	9	✓	✓	✓	✓	✓	✓	✓	✓	
	10	✓	✓	✓	✓	✓	✓	✓	✓	
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	14	✓	✓	✓	✓	✓	✓	✓	✓	
	15	✓	✓	✓	✓	✓	✓	✓	✓	
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	19	✓	✓	✓	✓	✓	✓	✓	✓	
	20	✓	✓	✓	✓	✓	✓	✓	✓	
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	24	✓	✓	✓	✓	✓	✓	✓	✓	
	25	✓	✓	✓	✓	✓	✓	✓	✓	
	26				✓	✓	✓	✓	✓	
	27								✓	
	28								✓	
	29								✓	
	30								✓	
	31								✓	

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

CPC- SEARCHED		
Symbol	Date	Examiner
G11B 20/10 and 1217	6/11/17	LC
G11B 2220/235 and 2516	6/11/17	LC
G11B 5/1276,235,3113,314,3146,3153,3163,3929,3983,6088,645,647,70605,70626,708,716,7315,735,85,865	6/11/17	LC

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829 with TEXT	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13 8/22/14 6/24/15 2/23/16 8/29/16	LC
Update	6/11/17	LC
All classification was performed with TEXT	6/11/17	LC

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	SUSP02US1	9414

143793 7590 04/03/2017

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
04/03/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

gzimanyi@gmail.com
richepask@gmail.com

Applicant-Initiated Interview Summary	**Application No.** 12/619,849	**Applicant(s)** SUESS, DIETER	
	Examiner LISA CHAU	**Art Unit** 1785	

All participants (applicant, applicant's representative, PTO personnel):

(1) *LISA CHAU*. (3) *Gergely Zimanyi*.

(2) *Dieter Suess*. (4)_____.

Date of Interview: *20 March 2017*.

Type: ☐ Telephonic ☐ Video Conference
☒ Personal [copy given to: ☒ applicant ☒ applicant's representative]

Exhibit shown or demonstration conducted: ☒ Yes ☐ No.
If Yes, brief description: *Powerpoint Presentation*.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *all pending*.

Identification of prior art discussed: *prior art of record*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

We discussed the background, Applicant's claimed invention, and the prior art of record as shown in the presentation slides. No agreement was reached.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☒ Attachment

/LC/ Lisa Chau	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

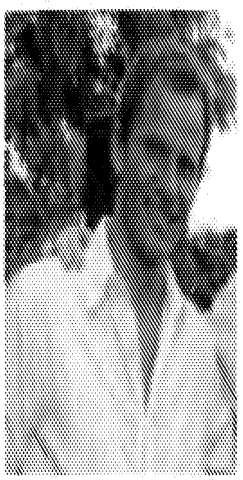
If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Interview presentation regarding pending US patent applications 11/424,859 and 12/619,849

Inventor: Dr. Dieter Suess

Patent agent: Dr. Gergely T. Zimanyi

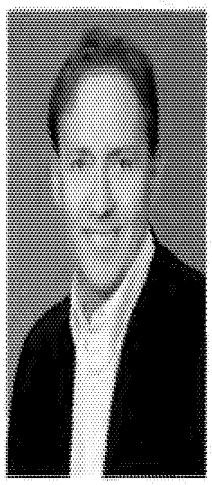
USPTO, March 20, 2017



Inventor: Dr. Dieter Suess
Professor of Physics
University of Vienna, Austria

166 papers
3700 citations
60 invited talks, colloquia, seminars

One of only 3 theoreticians in industry trend-setting IDEMA (Int'l Disc Drive Equipment & Materials Association)
Inventor on 15 issued patent families
Founder and CEO, SuessCo
Lifetime grant awards: $5M

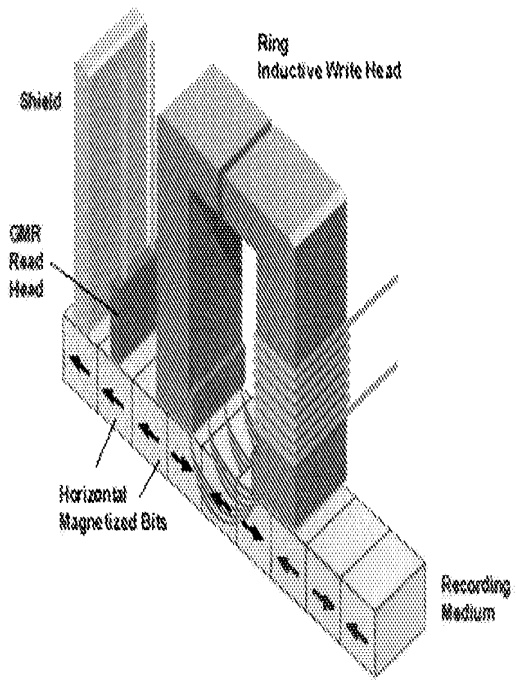


Patent Agent: Dr. Gergely T. Zimanyi
Professor of Physics
University of California, Davis

128 papers
4700 citations
100 invited talks, colloquia, seminars

Patent agent at Skjerven Morrill LLP	2001-2003
Patent agent at Sidley Austin LLP	2003-2009
Director of IP, LenSx Lasers, Inc.	2009-2010
Director of IP, Alcon LenSx, Inc.	2010-2016
Senior Director of IP, RxSight, Inc.	2016-present

PROBLEM BEING SOLVED: SUPERPARAMAGNETIC LIMIT



Previous technology: Longitudinal recording

(1) Data is recorded by magnetizing bits of a single magnetic recording layer

(2) Bits are magnetized in plane of the recording medium

Problem: Superparamagnetic limit

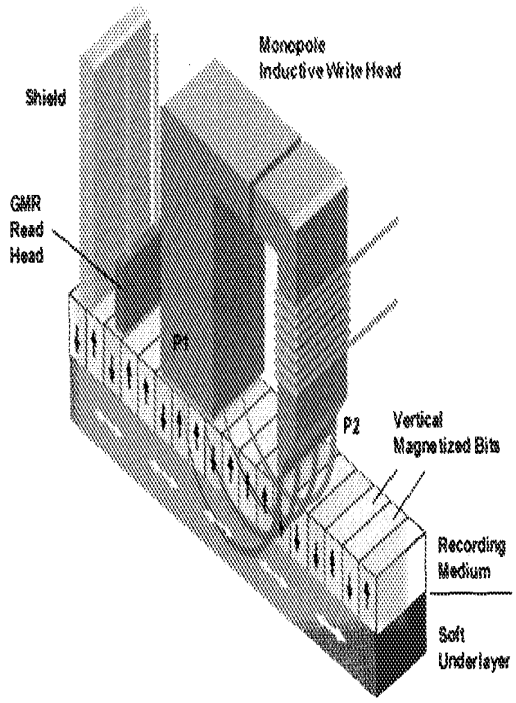
(1) Increasing recording densities requires smaller bits

(2) Smaller bits lose their magnetization to thermal fluctuations too fast

(3) If bits are made more thermally stable by increasing anisotropy, then the write fields needed to write them become too high for the recording heads.

"[0004] Further increase of the areal density is believed to be limited by the superparamagnetic limit. This limit represents that as the size of the magnetic grains in the media decrease, at some grain size the thermal fluctuations at room temperature $k_B T_{RM}$ become capable of overcoming the energy barrier $\Delta E = KV$, which separates the two magnetization directions of an isolated grain with a volume V and an uniaxial anisotropy constant K. This superparamagnetic limit, or thermal instability, can be overcome by increasing the anisotropy K, according to the Stoner-Wohlfarth theory. However, such an increase also results in an unfavourable increase of the coercivity H_c. As a consequence, these grains are thermally stable but can not be written with existing recording heads."

PROGRESS BEFORE SUESS INVENTION



New technology: perpendicular recording

(1) Bits are magnetized perpendicular to plane of recording medium

(2) Data is recorded by magnetizing a single magnetic recording layer, with auxiliary longitudinal soft underlayer only to guide field, not to record

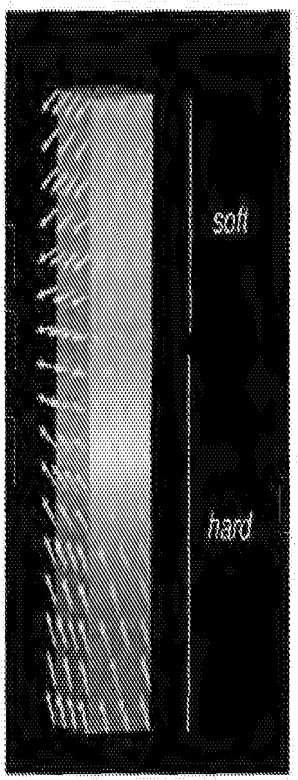
Improvement

(1) Stronger coupling of head field into recording layer

(2) Heads can write into harder layer

EXCHANGE SPRING MEDIA – ABSTRCT CONCEPT: SUESS 2005

Natural idea: reduce write field by adding soft nucleation layer to hard recording layer



EXCHANGE SPRING MEDIA – THE '859 AND '849 PATENT APPLICATIONS

Counterintuitive innovation: Further reducing write field by making nucleation layer harder

In all previous systems, coercivity was coupled with stability: the stability of the media could be increased only by increasing their coercivity. Unfortunately, the increased coercivity also increased their write fields.

Embodiments of the '859 and '849 patents decouple coercivity from stability based on new physical insights. These patents break through the superparamagnetic limit and transcend the competition of stability and writeability, and thus can

(1) increase the thermal stability of the recording media without increasing the write field, or
(2) decrease the write field without decreasing the thermal stability.

Embodiments of the '859 and '849 applications achieve this decoupling as follows.

'859 embodiments include*:

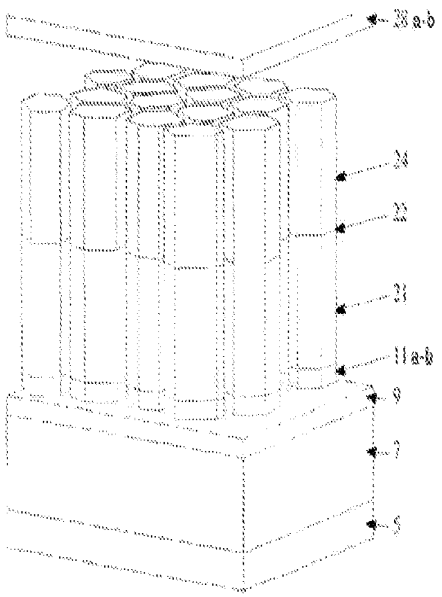
(1) the counterintuitive innovation of making the nucleation layer harder to further reduce the write field
(2) an exchange coupling layer between the nucleation and storage layers to enable the exchange spring mechanism.

'849 embodiments include*:

(1) ferromagnetic layers with increasing anisotropy from layer to layer in the nucleation host to fully decouple coercivity from stability.

*The listed features are specific to specific embodiments and are not limiting generally.

11/424,859: MULTILAYER EXCHANGE SPRING RECORDING MEDIA



26. A magnetic recording medium, comprising:

an essentially non-magnetic substrate; and

a magnetic bilayer, the magnetic bilayer including

a granular hard magnetic storage layer with perpendicular anisotropy having a coercive field of H_s without another magnetic layer and a thickness between 3 nm and 30 nm; and

a granular hard magnetic nucleation host with perpendicular anisotropy, disposed on the hard magnetic storage layer in a columnar manner, having a coercive field H_n without the hard magnetic storage layer, wherein

$0.5\ T < H_n < H_s$;

the nucleation host has a magnetic polarization $J_s = \mu_0 M_S$ between 0.3 T and 1.0 T;

the nucleation host and the hard magnetic storage layer are separated by a coupling layer between 0.1 nm and 3 nm thickness;

the coupling layer is directly between the nucleation host and the storage layer; and

the coupling between the nucleation host and the hard magnetic storage layer is ferromagnetic.

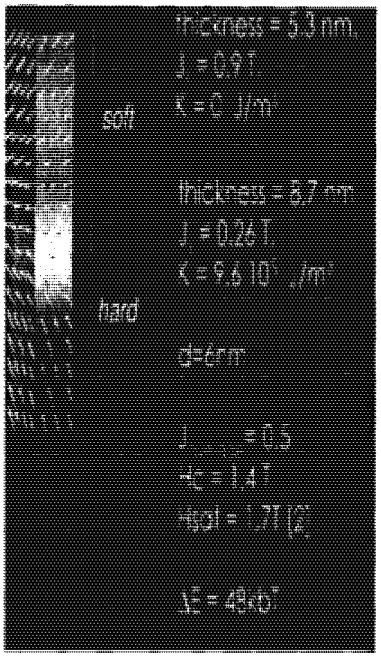
TRAVERSAL OF REJECTIONS UNDER 35 U.S.C. §103
1.1.a-b. Suess 2005 does not have a hard nucleation layer

Claim 26 is rejected over Suess 2005, in view of US 20010051287 to Kikitsu.

The rejection is respectfully traversed for at least the following reasons.

(a) The Office Action did not demonstrate that Suess 2005 had a hard nucleation layer. The Office Action referred to "Suess et al.'s granular hard magnetic nucleation host" on slide 15. However, slide 15 of Suess 2005 describes the nucleation host as <u>soft</u>, and also as having K=0 J/m^3. Both of these are clear statements that the nucleation host is not hard.

(b) Suess 2005 only described a soft nucleation layer everywhere else as well. Slides 3, 9, all 12 all identify the top nucleation layer as "soft".



1.1.c. Making the nucleation layer hard is counterintuitive

(c) Making the nucleation layer harder is counterintuitive. The simple expectation is that increasing the coercivity of the soft nucleation layer should increase the write field.

In contrast, '859 reports the discovery that increasing K_{soft} from 0 to 0.2 MJ/m^3 in fact reduces the write field.

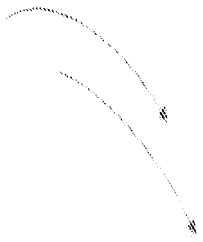
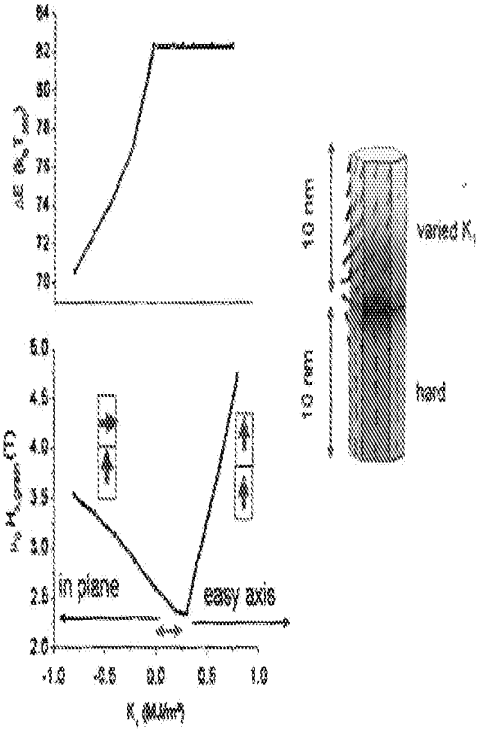


FIG. 2

A detailed study of this counter-intuitive effect shows that the write field is reduced the most by a nucleation layer anisotropy K_1 not at 0, but in a vicinity of 0.25 MJ/m^3



D. Suess et al. Journal of Magnetism and Magnetic Materials, 321, 545 (2009).

1.1.d. Making the nucleation layer hard turns non-functional Suess 2005 functional

(d) Making non-functional Suess 2005 functional: In Suess 2005 the nucleation layer is soft. When Suess 2005 analyzed the behavior of his column/grain, it neglected the demagnetizing fields of the other columns/grains. When the demagnetizing fields of the other columns/grains of the recording media were not neglected, then it has been shown that the magnetization in the nucleation layer tends to rotate in-plane, thus losing the data recorded in the bit. (see Fig. on side)

Making the nucleation layer harder prevents the nucleation layer magnetization from losing the recorded bit data by rotating in-plane. In this sense, making the soft nucleation layer of Suess 2005 harder turned the non-functional abstract idea of Suess 2005 into a functional recording media.

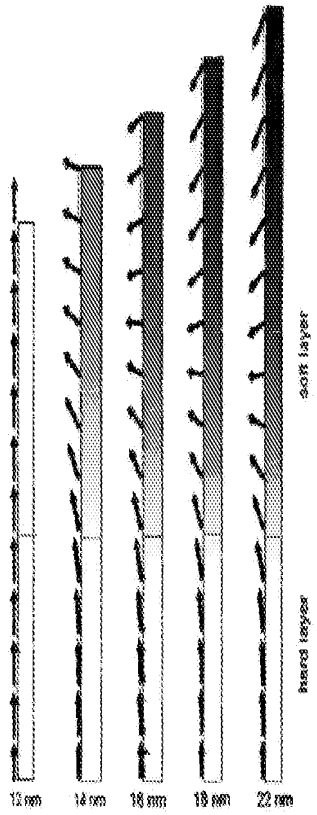


Fig. 12. The remanence state of the Suess structure for different soft layer thickness is shown. The magnetization is shown along a line perpendicular to the film plane. After saturation in the up direction, the magnetization configuration under the influence of the saturation field was calculated.

D. Suess / Journal of Magnetism and Magnetic Materials 308 (2007) 183–197

1.2. Suess 2005 does not have an exchange coupling layer between the storage layer and the nucleation layer

(a) The Office Action admitted that Suess 2005 did not have an exchange coupling layer between the storage layer and the nucleation layer. It combined Suess 2005 with Kikitsu for this limitation.

(b) '859 discussed and claimed several aspects and embodiments of the media with an exchange coupling layer.

"[0055] ... The exchange constant in the coupling layer is varied from $A=1x10^{-12}J/m$ to the bulk value of the exchange in the nucleation layer and the storage layer which is $A=1x10^{-11}J/m$. The hysteresis lops show that with increasing coupling the coercive field decreases."

"[0036] ... Optional coupling layer 22 may provide an exchange constant A in excess of $A=10^{-14}J/m$."

Fig. 4

1.3. Kikitsu cannot be used to cure the missing coupling layer of Suess 2005 because Kikitsu teaches away from Suess' structure

The Office Action pointed to the eighth embodiment of Kikitsu to cure the missing exchange coupling layer in Suess.

(a) However, Kikitsu cannot be properly combined with Suess 2005. Kikitsu's structure includes a "recording layer 104" on top a softer "functional layer 103, comprising a magnetic material". This is in reverse order from Suess 2005, who has the recording layer under the softer nucleation layer.

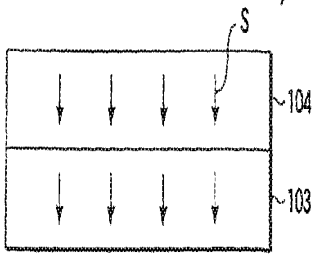


FIG. 22

Therefore, Kikitsu cannot be used to cure Suess, unless there is teaching or motivation to reverse the order of the layers.

(b) However, Kikitsu teaches away from reversing the order of his layers.

Indeed, Kikitsu teaches at [0219] that:

> "In the magnetic recording medium according to the eighth embodiments ... It should be noted that, if Ku_{FL} of the functional layer is larger than Ku_{RL} of the recording layer, the coercive force of the entire structure is not lowered, making it impossible to achieve recording with the magnetic head widely used nowadays."

Here Kikitsu clearly teaches that if the bottom functional layer 103 is harder than the top recording layer 104 ("Ku_{FL} of the functional layer is larger than Ku_{RL} of the recording layer"), then it is "impossible to achieve recording." Thus, Kikitsu teaches away from making the bottom layer harder than the top layer. However, this is exactly the design of Suess 2005, and therefore Kikitsu teaches away from the structure of Suess 2005.

2. Independent claim 39: The claimed angle dependence of $H_c(\alpha)$ is not in any cited prior art, and is not inherent either

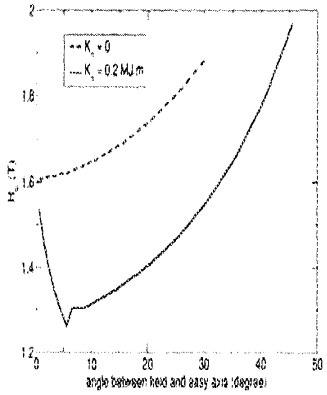
Claim 39 recites the angle dependence of the coercive field $H_c(\alpha)$ as:

"$H_c(\alpha=20°) < H_c(\alpha=45°)$, wherein $H_c(\alpha)$ is a coercive field of the recording medium if an angle between an external magnetic field and a normal of the magnetic bilayer is α".

Applicant explained in [0053] that the angle dependence of the claimed recording media is starkly different from the previously known single phase media:

"[0053] ...In contrast to [the previously used] single phase media, the coercive field does not have a minimum for a field angle of 45°. The pinning force to depin the domain wall at the hard/soft interfaces depends inversely from the cosine of the angle between the easy axis and the external field. It can be seen that the coercive field $H_c(\alpha=20°)$ is smaller than $H_c(\alpha=45°)$."

Therefore, the claimed angle dependence is neither an inherent material property, as the Office Action asserted, nor obvious.



$H_c(\alpha=20°) < H_c(\alpha=45°)$

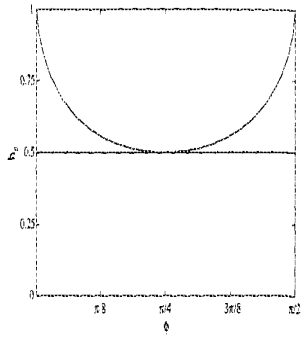
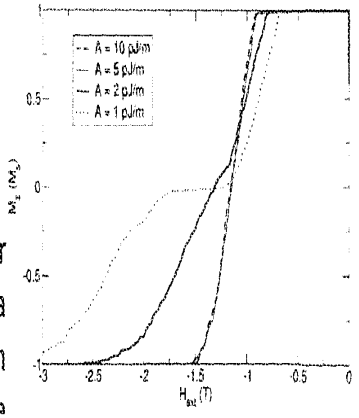


Figure 6. Normalized critical field H_c/H_K versus angle ϕ showing that the a

$H_c(\alpha=20°) > H_c(\alpha=45°)$

3. Independent claim 48: The claimed normalized derivative *k* is neither in any cited prior art, nor is it inherent

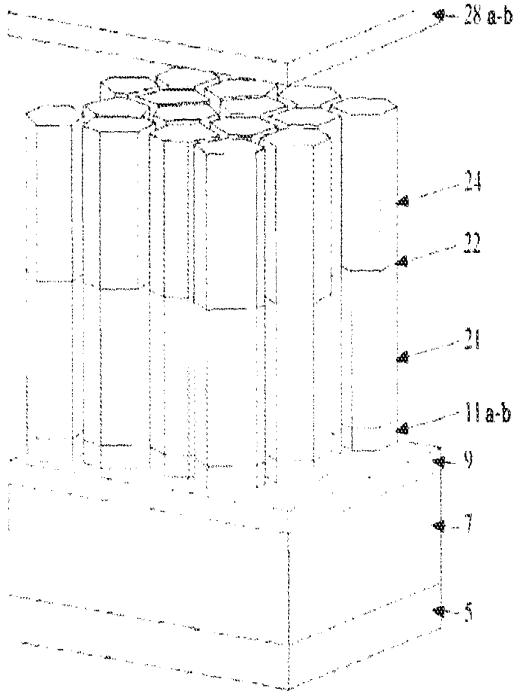
Claim 48 recites the behavior of the normalized derivative k as:
"an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that a derivative k of a normalized magnetization with respect to an external magnetic field, normalized to a coercive field of the recording medium, does not change by more than a factor of 3 in a magnetization interval of -0. 7 < M_z/M_s < 0.7, wherein: $k = \frac{dM}{dH}\frac{H_C}{M_S}$, ..."



In recording media this behavior is far from obvious, and even farther from inherent. For weak exchange coupling between the layers (dotted line) the hysteresis loop shows a two-step reversal behavior: *dM(H)/dH* varies from large values to near zero. Systems with such two-step reversals are unfit for recording applications. The claimed derivative is the consequence of several factors:

(3.1) The inventive nucleation layer-recording layer architecture, the opposite of which is taught by Kikitsu.
(3.2) The inventive reversal mechanism, not discovered or understood by Kikitsu or others.
(3.3) The discovery that a sufficiently strong coupling is needed between the recording and the nucleation layers, because otherwise the shape of the hysteresis curve (as captured by the large variation of the normalized derivative *k*) makes it unfit for recording, not discovered by Suess.

11/424,849: MULTILAYER EXCHANGE SPRING RECORDING MEDIA



1. A magnetic recording medium, comprising:

an essentially non-magnetic substrate;

an underlayer formed on the non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including

a hard magnetic storage layer, having a first coercive field H_s>0.5 T, formed on the underlayer; and

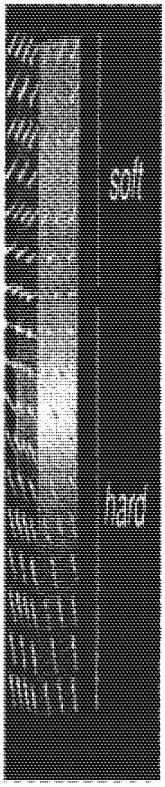
a nucleation host, having a second coercive field H_n without the hard magnetic storage layer, lower than the first coercive field, H_n<H_s, wherein said nucleation host

is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,

is exchange coupled to the hard magnetic storage layer, and

comprises ferromagnetic layers with increasing anisotropy from layer to layer.

1. The soft layer of Suess 2005 does not have "ferromagnetic layers with increasing anisotropy from layer to layer", because Suess does not have "a gradient anisotropy"



Claim 1 is rejected over Suess 2005, in view of US 20050058855 to Girt.
The rejection is respectfully traversed in light of the following remarks.

The Office Action argued:

> "Suess ... teaches ... a nucleation host..., wherein said nucleation host ... has a gradient anisotropy (Please see Slides 1, 3, and 15)".

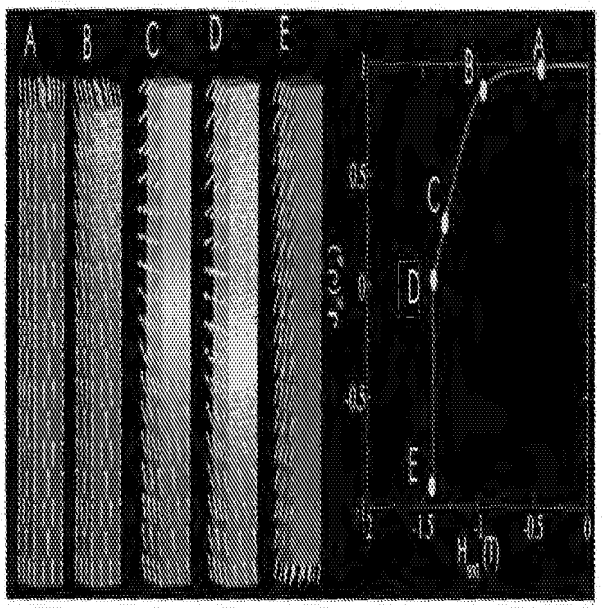
The limitation of claim 4 having been amended into claim 1, the Office Action additionally rejected claim 4 as:

> "With regards to Claim 4-6, Suess teaches a gradient anisotropy in its nucleation host (Slide 15 demonstrating the magnetic moments/vectors gradually changing within its layer), which reads into the claimed nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction and assumes more than one value."

(a) However, slides 1, 3, or 15 do not show the anisotropy increasing from layer to layer. Slides 3 and 15 only show the direction of the magnetic moments changing from point to point.

1. The soft layer of Suess 2005 does not have "ferromagnetic layers with increasing anisotropy from layer to layer", because Suess does not have "a gradient anisotropy"

(b) The figures of Suess 2005 illustrate two layers, each with its own constant, non-varying anisotropy. Only their magnetic moments are shown to vary.

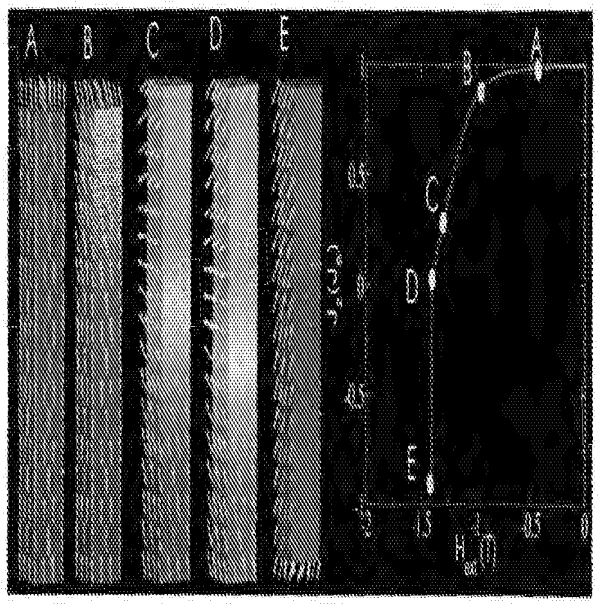


(c) The magnetic moments at the same locations point to different directions at different times, or in different states. Obviously, the direction of the anisotropy of the layer does not change with time or state. Therefore, the illustrated time-dependent change of the direction of the magnetic moments cannot possibly indicate an "increasing anisotropy from layer to layer".

2. Suess 2005 does not have "arbitrary strata lines yielding ... multiple magnetic layers"

The Office Action rejected claim 4 (now part of claim 1) for the following additional reason:

> "While Suess et al. does not explicitly teach its nucleation host comprising ferromagnetic layers with increasing anisotropy from layer to layer, forming arbitrarily strata lines between each magnetic moment/vector within Suess et al.'s nucleation host yields the same structure as claimed (i.e. multiple magnetic layers that are the same and in contact with each other can be construed as a single magnetic layer)."

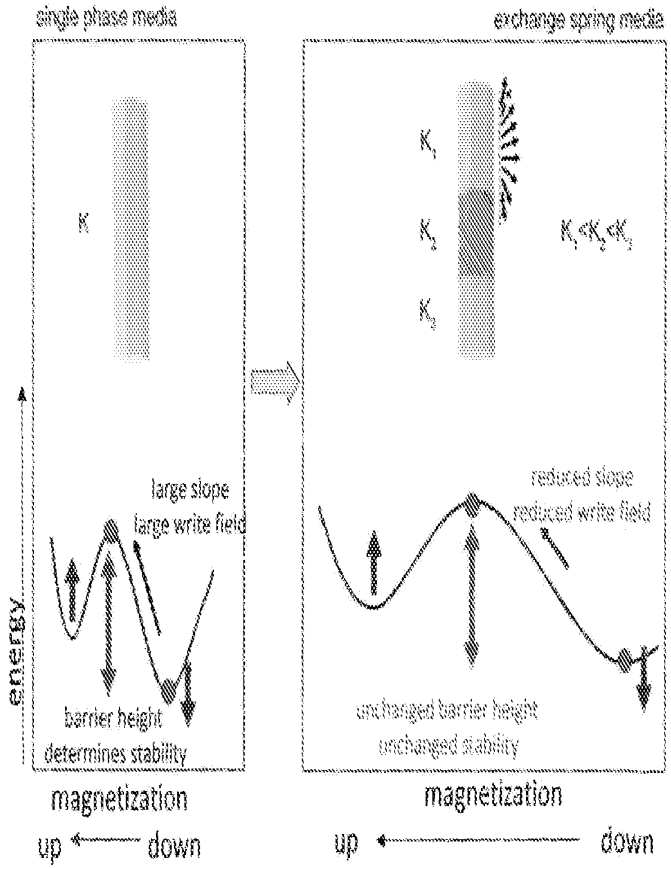


Applicant respectfully traverses this rejection on a basis analogous to section 1. The varying magnetic moments of Suess 2005 do not describe layers with increasing anisotropy. On the contrary, they represent a soft layer and a hard layer, each with its own constant anisotropy.

3.1. Suess 2005 having "ferromagnetic layers with increasing anisotropy from layer to layer" is built on a novel physical insight

Thermal stability is determined by energy barrier height: Multilayer embodiments of Suess '849 have same barrier height, and thus the same stability as single phase media.

Write field is determined not by height, but by slope of energy barrier. The layers with increasing anisotropies reduce the slope without reducing height of barrier. Therefore, Suess '849 can reduce the write field without reducing the thermal stability, and thus break the superparamagnetic limit.

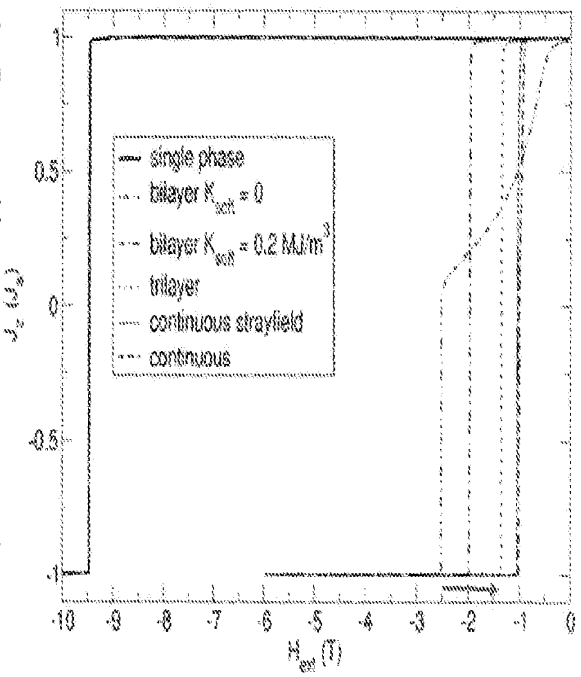


3.2. Multiple magnetic layers in the nucleation host with the claimed anisotropy profile deliver qualitatively new and better results

The incorporated Suess et al., App. Phys. Lett. article described the state of art of the recording field: "The maximum fields achievable with perpendicular writing head are limited [by] to about 1.7T." (p. 012504-1, left col., l. 9)

The bilayer in FIG. 2 has a nucleation host with constant anisotropy and H_c=2-2.5T. Thus, it was unwriteable with the existing H<1.7T write heads.

However, when the anisotropy of the nucleation host was varied spatially by adding a second layer to form the trilayer, this reduced the coercive field to H_c=1.4T. The spatial variation of the nucleation host anisotropy reduced the coercivity from H_c=2-2.5T to H_c=1.4T, and thus **changed the unwriteable bilayer into a writeable trilayer media.**



END

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	Dieter Suess	Examiner:	Lisa N. Chau
Application No.:	12/619,849	Art Unit:	1785
Filing Date:	11/17/2009	Confirmation No.:	9414
		Docket No.:	SUSP02US1
		Customer No.:	143793
		Date:	02/26/2017

Title: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Dear Examiner:

This is a Response to the Office Action, dated 09/08/2016. Since this Response is filed on 02/26/2017, a Request for a three month extension of time is respectfully submitted hereby.

Applicant respectfully requests the reconsideration of the pending claims in light of the herewith submitted amendments and remarks.

Amendments to the Claims start on p. 2.

Remarks start on p. 9.

PTO/SB/22 (03-13)
Approved for use through 3/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional): SUSP02US1

Application Number: 12/619,849 | Filed: 11/17/2009

For: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Art Unit: 1785 | Examiner: Lisa N. Chau

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☑	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$ 700.00
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration number 45,754.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Gergely T. Zimanyi/ — Signature

02/26/2017 — Date

Gergely T. Zimanyi — Typed or printed name

(530) 400-3936 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	12619849
Filing Date:	17-Nov-2009
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	Gergely T. Zimanyi/Richard Pask
Attorney Docket Number:	SUSP02US1

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	5	40	200
INDEPENDENT CLAIMS IN EXCESS OF 3	2201	1	210	210
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
		Total in USD ($)		**1110**

Electronic Acknowledgement Receipt

EFS ID:	28462294
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	143793
Filer:	Gergely T. Zimanyi/Richard Pask
Filer Authorized By:	Gergely T. Zimanyi
Attorney Docket Number:	SUSP02US1
Receipt Date:	26-FEB-2017
Filing Date:	17-NOV-2009
Time Stamp:	20:22:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1110
RAM confirmation Number	022717INTEFSW20240400
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SUSP02US1_Response_to_Office_Action.pdf	6403080 4ee48a3aadb2e6eaa33beb0a23fe38b70ce7baf0	yes	20

Multipart Description/PDF files in .zip description

Document Description	Start	End
Applicant Arguments/Remarks Made in an Amendment	9	20
Claims	2	8
Amendment/Req. Reconsideration-After Non-Final Reject	1	1

Warnings:

Information:

2	Extension of Time	SUSP02US1_Petition_for_Extension_of_Time.pdf	501027 94197f00ee17b08301baab3a5b320b2d356c41dc	no	1

Warnings:

Information:

3	Fee Worksheet (SB06)	fee-info.pdf	33910 1f314c0f3216007d2efc516669123ef0e6c6b5d1	no	2

Warnings:

Information:

Total Files Size (in bytes):	6938017

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

Claims 1-31 are pending in the present Application. With this Response, Applicant amended claims 1-26 and introduced new claims 27-31. All amendments are fully supported by the Specification. No new matter has been added.

Out of abundance of caution, Applicant starts with the general remark that the present patent document describes several inventive embodiments and concepts. Some of these inventive concepts and embodiments are being captured and characterized in other co-pending patent applications, such as in US patent application 11/424,859, filed on 06/17/2006. None of the statements and characterizations made in the present Response shall be construed as limiting for the embodiments claimed in the other co-pending applications. The statements made in the present Response are meant to be limiting exclusively for the embodiments claimed in the present patent application.

SUPPORT

Applicant hereby lists some of the paragraphs where support for the amendments and new claims can be found, the numbers referring to the published patent application US 2010/0062286.

Claim 1: "a nucleation host, having a second coercive field ... lower than the first coercive field" - see paragraphs in sections 2.2.-2.5 on p. 10-11 of this Response.

Claims 26, 31: "an anisotropy of the softest of the ferromagnetic layers is positive" – [0048]: "the anisotropy of the m-th layer assumes the value $K^m=(m-1)K_{hard}/(N-1)$." This means that for the first, m=1 layer $K^0=0$. A bilayer with K=0 has in fact been simulated, as shown in FIGS. 2-3. Thus, the specification describes embodiments with the softest layer having an anisotropy as low as 0.

Claim 27: "factor up to five" – range described in [0012].

Claim 28 - combination of [0011], [0053], and [0057].

Claim 29: "a coercive field of the softest of the ferromagnetic layers is greater than 0.25 T" - see paragraphs in section 2.4 on p. 11 of this Response.

Claims 30, 31 - see paragraphs in section 2.4-2.5 on p. 11 of this Response.

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CLAIM OBJECTIONS

(1) The Office Action stated that "should Claim 15 be found allowable, Claim 17 will be objected to under 37 CFR 1.75 as being a substantial duplicated thereof."

In response, Applicant amended claim 17 to recite:

> "exchange coupling layer to provide an exchange coupling sufficiently strong to enable a formation of a domain wall across an interface of the hard magnetic storage layer and the nucleation host during reversal."

With this amendment, claim 17 is not a duplicate of claim 15. Indeed, the "coupling layer" of claim 15 could provide a weak exchange coupling that is not strong enough to enable a formation of a domain wall and thus the scope of claim 15 is broader than the scope of claim 17.

(2) The Office Action objected claim 22 for reciting a "multiplayer structure". In response, Applicant amended "multiplayer" to "multilayer".

REJECTIONS UNDER 35 U.S.C. § 112

Claims 1-26 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement.

1. The Office Action did not find support for the recently-introduced claim limitation "anisotropy increasing towards the non-magnetic substrate".

In response, Applicant deleted this limitation. This deletion was done solely to move the prosecution forward expediently and shall not be construed as Applicant conceding the lack of support for this limitation.

2. The Office Action also stated that "a hard magnetic layer storage layer having a first coercivity and a nucleation host having a second coercivity lower than the first coercivity" is new matter.

In response, Applicant amended claim 1 to recite, in pertinent part:

> "a hard magnetic storage layer, having a first coercive field~~ity~~ $H_c \geq 0.5$ T, formed on the underlayer;

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a nucleation host, having a second coercive fieldity H_n without the hard magnetic storage layer lower than the first coercive fieldity, $H_n<H_s$, ..."

The Office Action stated that there is sufficient support for "a hard nucleation layer and an even harder magnetic storage layer, wherein the coercivity for both layers is greater than 0.5 T", and invited Applicant to insert the limitation that both coercive fields are greater than 0.5 T.

Applicant respectfully believes that claim 1, as herein amended, is well-supported by the Specification for at least the following reasons.

2.1. Support for "hard magnetic storage layer"

2.1.1. Paragraph [0034] provides that "In some embodiments a magnetic material is referred to as "hard" if its coercive field H_c>0.5 T". Therefore, amending claim 1 to recite a "hard magnetic storage layer, having a first coercive field H_s>0.5 T" defines embodiments of the hard magnetic storage layer that are consistent with the definition of "hard", given by paragraph [0034].

2.1.2. Applicant further points out that the term "hard" has been defined in the patent application in at least four different ways:

> "[0034] ... In some embodiments a magnetic material is referred to as "hard" if its coercive field Hc>0.5T, and "soft" if its coercive field is Hc<0.5T. In some embodiments these terms are defined in a relative sense: the coercive field of (soft) nucleation host 21 can be half of the coercive field of hard magnetic storage layer 24. In other embodiments this ratio can be different. In some embodiments a layer is referred to as "hard", $\Delta k_{max}/k_{min}<0.5$."

Overall, the term "hard" was used 117 times in the application, most of the time without limiting it to any of these four embodiments, or to any other specific numerical value or range. Therefore, Applicant respectfully argues that the Specification does provide support for "a hard magnetic storage layer" in general, even without limiting this term to any one of the above for definitions, such as H_c>0.5 T. Rather, the Specification provides support for a "hard magnetic storage layer" with a scope that includes all four definitions, as well as the "ordinary meaning" of the term, as it would be construed by a person of ordinary skill in the art in claims 1, 26, 30, and 31.

2.2. Support for "nucleation host"

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2.2.1. Paragraph [0034] provides that "the coercive field of (soft) nucleation host 21 can be half of the coercive field of hard magnetic storage layer 24."

(i) First, this description identifies some embodiments of the nucleation host as "soft". Therefore, these nucleation hosts can have coercive fields less than that of the hard layer, according to any of its definitions.

(ii) Second, the description proceeds to quantify this softness by describing some embodiments of the nucleation host as having a coercive field as low as "half of the coercive field of the hard magnetic storage layer". Since the lowest coercive field of some embodiments of the hard storage magnetic layer was described as H_s=0.5 T, the described embodiments of the nucleation host can have coercive fields as low as H_n=(1/2)*0.5 T =0.25 T.

2.2.2. As MPEP 2163 confirms, "it is now well accepted that a satisfactory [written] description may be in the claims". Accordingly, originally filed claim 8 that recited "a coercive field of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer", does provide further support for embodiments where H_n is equal, or even less than (1/2)*0.5 T =0.25 T in embodiments where H_s=0.5 T.

Applicant respectfully submits that examples in sections 2.2.1.-2.2.2. provide descriptions where the nucleation host has a coercive field H_n<0.5 T, including 0.25 T, distinguishably less than the 0.5 T, suggested by the Examiner. Further, if other definitions of the hard magnetic storage layer are used from [0034], then these are descriptions of the coercive field of the nucleation layer being even lower. These descriptions support the amendment of claim 1, and new claim 30.

2.3. Support for "softest layer of nucleation host"

2.3.1. The Abstract and paragraph [0011] both describe the softest layer of the nucleation host: "The anisotropy in the softest layer of the nucleation host can be two times smaller than that of the hard magnetic storage layer", and "[t]he anisotropy of the softest layer in the nucleation host is significantly smaller than in the hard layer. In some embodiments, the ratio of anisotropies can reach a factor of 2." Since the coercive field typically tracks the anisotropy, this statement also translates to the coercive field of the softest layer of the nucleation layer being smaller than the coercive field of the hard storage layer "by a factor of 2". These are descriptions of two embodiments of the softest layer of the nucleation host having coercive fields as low as (1/2)*0.5T

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=0.25 T. As before, if other definitions of the "hard magnetic storage layer" are used from [0034], then these are descriptions of the coercive field of the softest nucleation layer being even lower.

2.3.2. Paragraph [0048] provides: "the anisotropy of the m-th layer assumes the value $K^m=(m-1)K_{hard}/(N-1)$." This means that for the first, m=1 layer of this embodiment $K^0=0$. Correspondingly, a bilayer with K=0 has in fact been simulated, as shown in FIGS. 2-3. Thus, the Specification describes embodiments with the softest layer having an anisotropy as low as 0. In general, the coercive field of zero anisotropy layers tends to be very small or even zero.

Therefore, the examples in 2.3.1. provide support for a "coercive field of the softest of the ferromagnetic layers is greater than 0.25 T", and the example in 2.3.2. provides support for an even broader scope that includes "an anisotropy of the softest of the ferromagnetic layers is positive" in general.

Claims 2, 8-10, 19-20 and 24 have been rejected for insufficient antecedent basis for various claim limitations.

In response, Applicant amended these claims to cure the lack of antecedent basis as appropriate. In particular, in claims 2, 9, 10, 19, and 24, the definite articles of many limitations have been replaced with indefinite articles. In claim 2, "the layers" and "the coercive fields", in claims 8 and 20 "the coercive fields", and in claims 9-10 "the film" have been properly amended.

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REJECTION UNDER 35 U.S.C. § 103

Claims 1-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over the document "Optimization of Exchange Spring Perpendicular Recording Media", by D. Suess et al., Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria (18 powerpoint printout pages) ("Suess"), in view of US Pub. No. 20050058855 ("Girt").

Currently amended claim 1 recites:

> "1. A magnetic recording medium, comprising:
> an essentially non-magnetic substrate;
> an underlayer formed on the non-magnetic substrate; and
> an exchange coupled magnetic multilayer structure, including ~~comprising:~~
> a hard magnetic storage layer, having a first coercive~~ity~~ field $H_s > 0.5$ T, formed on the underlayer;
> a nucleation host, having a second coercive~~ity~~ field H_n without the hard magnetic storage layer lower than the first coercive field~~ity~~, $H_n < H_s$, wherein
> said nucleation host[[:]]
> is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,
> is exchange coupled to the hard magnetic storage layer, and
> comprises ferromagnetic layers with increasing anisotropy from layer to layer ~~has an anisotropy increasing towards the non-magnetic substrate~~."

Applicant respectfully traverses the rejections in light of the following remarks.

1. The soft layer of Suess does not have "ferromagnetic layers with increasing anisotropy from layer to layer", because Suess does not have "a gradient", or "continuous change" of "anisotropy"

The Office Action rejected claim 1 as:

"With regards to claim 1, Suess … teaches … a nucleation host…, wherein said nucleation host … has a gradient anisotropy (Please see Slides 1, 3, and 15)". (emphasis added, *p. 7)*

The limitation of claim 4 having been amended into claim 1, the Office Action additionally rejected claim 4 as:

> "With regards to Claim 4-6, Suess teaches a gradient anisotropy in its nucleation host (Slide 15 demonstrating the magnetic moments/vectors gradually changing within its layer), which reads into the claimed nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction and assumes more than one value." (emphasis added, *p. 9)*

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Applicant respectfully traverses this rejection by pointing out that this is a misinterpretation of Suess. Indeed, slides 1, 3, or 15 do not show the anisotropy increasing either from layer to layer, as recited by claim 1, or continuously. What slides 3 and 15 do show is that the directions of the magnetic moments change from point to point in a soft-hard bilayer. In general, the direction of the magnetic moments at each point is determined as a compromise between the competing anisotropy, exchange fields, demagnetizing field and external field, typically all trying to orient the magnetic moments into different directions. Therefore, the direction of the magnetic moments can, and do, change from point to point even in a constant-anisotropy system, as the other fields change from point-to-point.

Suess specifically demonstrates the magnetic moments forming a domain wall as a result of the competition of the above fields. In general, domain walls can be generated in a magnetic sample, such as a layer, column, or grain, having a fixed, constant anisotropy by first applying a large enough external field to magnetize the sample homogenously, and then reversing the direction of the external field. The reversed field generates a domain wall at an edge of the sample, which then propagates across the sample, reversing its magnetization.

Slides 13 and 15 of Suess show the result of a numerical simulation of a domain wall in an exchange spring bilayer with anisotropies K(soft) = 0 J/m^3, and K(hard) = $9.6x10^5$ J/m^3 in the layers. These anisotropies are constant in each layer. Slide 13 shows that the bilayer was started from a homogeneously magnetized state A. State B shows that, as the external magnetic field was reversed, first the moments in the soft layer rotated. State C shows that a domain wall was formed as the reversed domain in the soft layer extended to the soft-hard interface. State D shows the moment, or "saddle point" configuration, when the domain wall was forced from the soft layer into the hard layer. Finally, state E shows when the domain wall entered into the hard layer, then it propagated across it with ease, reversing the entire bilayer in the process. A domain wall "formed across the hard/soft interface during reversal" has been described at several loci in the present application as well, including in paragraphs [0011] and [0046]. However, the above description makes clear that none the states B-D illustrate varying anisotropies. They all illustrate two layers, each with its own constant, non-varying anisotropy, only their magnetic moments varying.

The misinterpretation of Suess is even clearer from another viewpoint. The magnetic moments at the same locations point to different directions at different times, represented by the

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states A-E on p. 13 of Suess. Now, obviously, the direction of the anisotropy of the layer does not change with time. Therefore, the illustrated time-dependent change of the direction of the magnetic moments cannot possibly indicate an "increasing anisotropy from layer to layer".

In sum, the magnetic moments of Suess varying point-to-point, or "continuously", are no evidence for the anisotropy varying point-to-point, layer-to-layer, continuously, or in any other way. To the contrary, the soft layer and the hard layer each have their own, constant anisotropies, expressly given by Suess. Accordingly, the soft layer of Suess does not have the claimed "ferromagnetic layers with increasing anisotropy from layer to layer", not even the previously recited "continuous change of anisotropy", as asserted by the Office Action.

To complete the argument, Girt does not cure this deficiency of Suess either. Indeed, the Office Action did not even attempt to assert Girt doing so.

2. The soft layer of Suess does not have "ferromagnetic layers with increasing anisotropy from layer to layer" because Suess does not have "arbitrary strata lines yield[ing] ... multiple magnetic layers"

The Office Action rejected claim 4 (now part of claim 1) for the following additional reason:

> "While Suess et al. does not explicitly teach its nucleation host comprising ferromagnetic layers with increasing anisotropy from layer to layer, forming arbitrarily strata lines between each magnetic moment/vector within Suess et al.'s nucleation host yields the same structure as claimed (i.e. multiple magnetic layers that are the same and in contact with each other can be construed as a single magnetic layer)."

Applicant respectfully traverses this rejection on a basis analogous to section 1. The varying magnetic moments of Suess do not describe layers with increasing anisotropy. On the contrary, they represent a soft layer and a hard layer, each with its own constant anisotropy. The spatially varying magnetic moments only represent a domain wall at the interface of two layers, each having different but constant anisotropies. Thus, "forming arbitrarily strata lines between each magnetic moment/vector within Suess et al.'s nucleation host" would only "yield" magnetic layers with identical, constant anisotropies inside the soft layer, and thus would not "yield the same structure as claimed, i.e. multiple magnetic layers ... [with increasing anisotropy from layer to layer]".

As before, Girt does not cure the missing description of Suess.

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3. It is far from "obvious to try" to make the nucleation host to comprise ferromagnetic layers with increasing anisotropy from layer to layer

One could attempt to argue that even though Suess did not describe the claimed nucleation host, it would have been obvious to try to form multiple magnetic layers inside his soft layer. While the Office Action did not develop a rejection along these lines, Applicant wishes to preempt such a rejection by presenting the following considerations.

Before proceeding, and out of abundance of caution, Applicant reiterates that the arguments made in the present Response are meant to be limiting only the embodiments claimed in the present patent application, and are not limiting the distinctly different embodiments, characterized in co-pending patent applications, such as in US patent application 11/424,859, filed on 06/17/2006.

3.1. It is a new scientific discovery that introducing multiple magnetic layers with the right anisotropies into a nucleation host decouples the coercive field from the thermal stability of the recording medium

Paragraph [0004] explained the crucial limitation of the state of art in magnetic recording at the time of filing: the "superparamagnetic limit" seemed to pose an unsurmountable limit for the recording densities. The recording densities having reached the superparamagnetic limit, it was believed that increasing the recording densities beyond this limit would have resulted in thermally unstable grains. On the other hand, attempting to cure this thermal instability by increasing the coercivity of the medium would have made the grains impossible to write:

> "[0004] Modern magnetic recording media reaches ever higher recording densities. Further increase of the areal density is believed to be limited by the superparamagnetic limit. This limit represents that as the size of the magnetic grains in the media decrease, at some grain size the thermal fluctuations … become capable of overcoming the energy barrier ... which separates the two magnetization directions of an isolated grain …. This superparamagnetic limit, or thermal instability, can be overcome by increasing the anisotropy K ... However, such an increase also results in an unfavourable increase of the coercivity H_c. As a consequence, these grains are thermally stable but cannot be written with existing recording heads."

Paragraphs [0017]-[0018] then explained one of the crucial insights of some of the embodiments that emerged from Applicant's research: Spatially varying the anisotropy of the nucleation host was able to transcend the superparamagnetic limit because it removed "the

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proportionality of the energy barrier to the coercive field". It was recognized that varying the anisotropy of the nucleation host with an inventive spatial profile could increase the thermal stability without making the grains unwriteable:

> "[0017] Generally, the above embodiments provide marked improvement against the super-paramagnetic limit as the coercive field is reduced by the spatially varying anisotropy in the nucleation host, while the thermal stability is determined only by the domain wall energy in the hardest magnetic storage layer, which is not influenced by the variations of the anisotropy of the nucleation host.
>
> [0018] This is achieved because the new architecture removes the proportionality of the energy barrier to the coercive field. In some cases the coercive field can be inversely proportional to the layer thickness while the energy barrier remains independent of it. Therefore, with these new architectures embodiments overcome the writeability problem of extremely hard magnetic storage layers with high thermal stability."

This research had at least the following inventive achievements.

(1) The research conceived a spatially varying anisotropy for the nucleation host as a potential solution to transcend the superparamagnetic limit.

(2) The research developed tools and methods to analyze the effect of the spatially varying anisotropy on the coercivity of the recording medium.

(3) The research discovered that particular spatial variations of the anisotropy of the nucleation host could indeed transcend the superparamagnetic limit by decoupling the thermal stability from the writeability "by removing their proportionality".

The steps of this research led to a genuine scientific discovery and technological breakthrough that was far from obvious to try.

3.2. Incorporating multiple magnetic layers into the nucleation host with the claimed anisotropy profile delivered qualitatively new and qualitatively better results

The technical article, incorporated into the present patent document in its entirety by reference, entitled "Exchange spring media for perpendicular recording" by Suess et al., App. Phys. Lett. Vol. 87, 012504 (2005) described the state of art of the recording field, among others. Regarding the writing fields, Suess et al. (2005) said: "The maximum fields achievable with perpendicular writing head are limited [by] to about 1.7 T." (p. 012504-1, left col., l. 9)

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FIG. 2 of the present patent document illustrates the magnetic performance of a single layer, a bilayer, and a trilayer, wherein the last, trilayer structure is consistent with claimed embodiments, as the two softer layers of the trilayer can be an embodiment of the claimed nucleation host with "ferromagnetic layers with increasing anisotropy from layer to layer".

The bilayer in FIG. 2 has a nucleation host with constant anisotropy that leads to a coercive field of the bilayer of H_c=2-2.5 T, and thus it was unwriteable with the existing write heads that could not generate write fields higher than 1.7 T. However, when the anisotropy of the nucleation host was varied spatially by adding a second layer, forming the "trilayer" of FIG. 2, this reduced the coercive field from H_c=2-2.5 T to H_c=1.4 T. Since the maximum write fields of the write heads at the time of filing were about 1.7 T, the spatial variation of the nucleation host anisotropy by the addition of a second layer reduced the coercivity from H_c=2-2.5 T to H_c=1.4 T, and thus changed the unwriteable bilayer into a writeable recording (trilayer) media.

In simplified terms: Applicant's project discovered that spatially varying the anisotropy of the nucleation host, notably by including "ferromagnetic layers with increasing anisotropy from layer to layer", was able to transcend the superparamagnetic limit, and was the breakthrough that turned unwriteable bilayers into writeable recording media. This was clearly a qualitatively new result, and opened a qualitatively new chapter in the field of magnetic recording.

Applicant respectfully summarizes that claim 1 is allowable over the combination of Suess and Girt at least for the above described reasons 1-3.

Dependent claims 2-25 and 27-29 are allowable at least because they depend from allowable independent claim 1.

Independent claims 26, 30 and 31 are allowable at least for reasons analogous to the reasons discussed in relation to claim 1.

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CONCLUSIONS

In view of the foregoing, Applicant respectfully requests the reconsideration of the pending claims and the withdrawal of the present rejection. All of the claims in the application are now believed to be allowable. Favorable consideration and a Notice of Allowance are therefore earnestly solicited. If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is kindly requested to contact the undersigned Gergely T. Zimanyi, at 530-400-3936, who is readily available to discuss the steps necessary for bringing the Application in condition for allowance.

Respectfully submitted,

Date: 02/26/2017

/Gergely T. Zimanyi/
Gergely T. Zimanyi, Ph.D.
Registration No. 45,754

CERTIFICATE OF TRANSMISSION UNDER 37 CFR 1.8
I hereby certify that this correspondence is being transmitted to the USPTO via EFS-Web on 02/26/2017.

/Richard A. Pask/ 02/26/2017
Richard A. Pask Date

Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705
Telephone: 530.400.3936
Email: gzimanyi@gmail.com

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CLAIMS

1. (Currently amended) A magnetic recording medium, comprising:

an essentially non-magnetic substrate;

an underlayer formed on the non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including ~~comprising:~~

a hard magnetic storage layer, having a first coercive field~~ity~~ H_c>0.5 T, formed on the underlayer; and

a nucleation host, having a second coercive field~~ity~~ H_n without the hard magnetic storage layer, lower than the first coercive field~~ity~~, $H_n<H_s$, wherein

said nucleation host[[:]]

is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,

is exchange coupled to the hard magnetic storage layer, and

comprises ferromagnetic layers with increasing anisotropy from layer to layer ~~has an anisotropy increasing towards the non-magnetic substrate~~.

2. (Currently amended) The magnetic recording medium of claim 1, wherein:

an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that ~~the~~ a derivative k of ~~the~~ a normalized magnetization with respect to ~~the~~ an external magnetic field, normalized to ~~the~~ a coercive field of the recording medium, does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$, wherein[[:]]

$$k = \frac{dM}{dH}\frac{H_c}{M_s},$$

M being a magnetization of the recording medium, M_z being a component of M ~~the magnetization~~ perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the recording medium ~~layers~~, $\frac{dM}{dH}$ being ~~the~~ a derivative of the magnetization of the recording medium with respect to the external magnetic field, H_c being ~~a~~ the coercive field of the recording medium, M_s being a saturation magnetization of the recording medium.

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3. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer are in direct contact.

4. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host ~~, comprises of ferromagnetic layers with increasing anisotropy from layer to layer~~ has an anisotropy rising with a z depth, having plateaus in the ferromagnetic layers.

5. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host[[,]] comprises a ferromagnetic layer with a continuous change of anisotropy in ~~the~~ a film normal direction.

6. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host and the hard magnetic storage layer[[s]] comprise ferromagnetic layers with increasing anisotropy values.

7. (Currently amended) The magnetic recording ~~of~~ medium of claim 1, wherein:
the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (Currently amended) The magnetic recording medium of claim 1, wherein:
~~a~~ the coercive field of the nucleation host H_n without the hard magnetic storage layer is less than ½ of ~~a~~ the coercive field of the hard magnetic storage layer H_s.

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9. (Currently amended) The magnetic ~~structure~~ recording medium of claim 1 wherein;
[[a]] $H_c(\alpha=20^o) < H_c(\alpha=45^o)$, wherein $H_c(\alpha)$ is ~~the~~ a coercive field of the recording medium if ~~the~~ an angle between ~~the~~ an external field and ~~the film~~ a normal of the recording medium is α.

10. (Currently amended) The magnetic ~~structure~~ recording medium of claim 1 wherein;
[[a]] $H_m(\alpha=20^o) < H_m(\alpha=45^o)$, wherein $H_m(\alpha)$ is ~~the~~ a ~~required~~ field to reduce ~~the~~ a normalized magnetization from ~~the~~ a saturation to -0.5 if ~~the~~ an angle between ~~the~~ an external field and ~~the film~~ a normal of the recording medium is α.

11. (Currently amended) The magnetic recording medium of claim 1, wherein;
the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (Currently amended) The magnetic recording medium of claim 1, wherein;
the nucleation host has a thickness smaller than 30 nm.

13. (Currently amended) The magnetic recording medium of claim 1, wherein;
the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (Currently amended) The magnetic recording medium of claim 1, wherein;
a height of a plurality of grains is greater than a diameter of the grains.

15. (Currently amended) The magnetic recording medium of claim 1, wherein;
a coupling layer is disposed between the nucleation host and the hard magnetic storage layer.

16. (Currently amended) The magnetic recording medium of claim 1, wherein;
the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

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17. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host is coupled to the hard magnetic storage layer by an ~~strong~~ exchange coupling layer to provide an exchange coupling sufficiently strong to enable a formation of a domain wall across an interface of the hard magnetic storage layer and the nucleation host during reversal.

18. (Currently amended) The magnetic recording medium of claim 1, wherein:
the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (Currently amended) The magnetic recording medium of claim 1, where parameters of the recording medium comprise:

an anisotropy constant in the nucleation host K^n_1 as a function of ~~the~~ a layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic storage layer.

20. (Currently amended) The magnetic recording medium of claim 19, wherein:
a parameter of the recording medium ~~magnetic multilayer~~ has a value such that a coercive ~~magnetic~~ field of the recording medium H_c ~~hard magnetic storage layer~~ is less than ½ of the coercive ~~magnetic~~ field of the hard magnetic storage layer H_s without the nucleation host.

21. (Currently amended) The magnetic recording medium of claim 19, wherein:
a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

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22. (Currently amended) The magnetic recording medium of claim 19, wherein;
the energy barrier of the hard magnetic storage layer is determined by at least one of:

depositing only the hard magnetic storage on the non-magnetic substrate; removing the nucleation host from a multi[[p]]layer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (Currently amended) The magnetic recording medium of claim 19, wherein;
a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (Currently amended) The magnetic recording medium of claim 1, wherein;
~~the~~ a thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (Currently amended) The magnetic recording medium of claim 1, wherein;
the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

26. (Currently amended) A magnetic recording medium, comprising:

a non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including ~~comprising:~~

a hard magnetic storage layer having a coercive field greater than 0.5 T; and

a nucleation host,

deposited on the hard magnetic storage layer,

comprising ferromagnetic layers with increasing anisotropy from layer to layer, wherein

an anisotropy of the softest of the ferromagnetic layers is positive, ~~with an anisotropy varying in the film a normal direction., wherein~~

~~the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn; and~~

~~a hard magnetic storage layer having a coercivity greater than a coercivity of the nucleation host;~~

~~wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,~~

~~wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer,~~

~~wherein the nucleation host comprises a plurality of layers in which anisotropy increases towards the substrate from one layer of the nucleation host to the next layer of the nucleation host.~~

27. (New) The magnetic recording medium of claim 1, wherein:
the coercive field of the nucleation host, H_n is small enough to cause a coercive field of the recording medium H_c to decrease below that of the magnetic storage layer H_s by a factor up to five.

28. (New) The magnetic recording medium of claim 1, wherein:
the anisotropy of the ferromagnetic layers increases with a z depth.

29. (New) The magnetic recording medium of claim 1, wherein:
a coercive field of the softest of the ferromagnetic layers is greater than 0.25 T.

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30. (New) A magnetic recording medium, comprising:

an essentially non-magnetic substrate;

an underlayer formed on the non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including

a hard magnetic storage layer, having a first coercive field, formed on the underlayer; and

a nucleation host, having a second coercive field-without the hard magnetic storage layer, lower than the first coercive field, wherein

said nucleation host

is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,

is exchange coupled to the hard magnetic storage layer, and

comprises ferromagnetic layers with increasing anisotropy from layer to layer.

31. (New) A magnetic recording medium, comprising:

a non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, including

a hard magnetic storage layer; and

a nucleation host, softer than the hard magnetic storage layer,

deposited on the hard magnetic storage layer,

comprising ferromagnetic layers with increasing anisotropy from layer to layer, wherein

an anisotropy of the softest of the ferromagnetic layers is positive.

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	02/26/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 31	Minus	** 26	= 5	X $40 =	200
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 3	= 1	X $210 =	210
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**410**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
CAROLYN THOMAS

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/619,849	11/17/2009	Dieter SUESS	7304-002

CONFIRMATION NO. 9414

POWER OF ATTORNEY NOTICE

24112
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

OC000000086472888

Date Mailed: 10/14/2016

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/09/2016.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/zabraha/

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/619,849	11/17/2009	Dieter SUESS	P02US1

CONFIRMATION NO. 9414

143793
Gergely T. Zimanyi
11 Dartmouth Drive
Berkeley, CA 94705

POA ACCEPTANCE LETTER

OC000000086472935

Date Mailed: 10/14/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 10/09/2016.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/zabraha/

PTO/SB/81 (01-09)
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POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	12/619,849
Filing Date	11-17-2009
First Named Inventor	Dieter Suess
Title	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
Art Unit	1785
Examiner Name	CHAU, LISA
Attorney Docket Number	P02US1

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

143793

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☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

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Please recognize or change the correspondence address for the above-identified application to:

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I am the:

☒ Applicant/Inventor.

OR

☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____

SIGNATURE of Applicant or Assignee of Record

Signature	Dieter Suess	Date	23.9.2016
Name	Dr. Dieter Suess	Telephone	+436508333999
Title and Company			

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☒ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Acknowledgement Receipt

EFS ID:	27162199
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	24112
Filer:	Gergely T. Zimanyi/Richard Pask
Filer Authorized By:	Gergely T. Zimanyi
Attorney Docket Number:	7304-002
Receipt Date:	09-OCT-2016
Filing Date:	17-NOV-2009
Time Stamp:	20:11:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	P02US1_Power_of_Attorney.pdf	1147236 c818fc0ae0c9aa478b43a126ddf8af17de3aa7a8	no	1

Warnings:

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	7304-002	9414

24112 7590 09/08/2016
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

MAIL DATE	DELIVERY MODE
09/08/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 12/619,849	Applicant(s) SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *8/10/16*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-26* is/are rejected.

8)☒ Claim(s) *17 and 22* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/10/16 has been entered.

Response to Amendment

3. Examiner acknowledges amended Claims 1, 8, and 26 in the response filed on 8/10/16.

Response to Arguments

4. Applicant's arguments with respect to claims have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Examiner's Note / Claim Objections

5. Applicant is advised that should Claim 15 be found allowable, Claim 17 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two

claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim 22 is objected to because of the following informalities: The Examiner believes "*a multiplayer* structure" should be "*the multilayer* structure". Appropriate correction is required.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1-26 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

With regards to Claims 1 and 26, as noted by the office action dated 7/6/15, the Examiner was unable to find support for the anisotropy of the nucleation host to increase *towards* the non-magnetic substrate. While Applicants cited paragraphs [0008] and [0022] to provide support, the cited portions merely discloses that the host layer comprises more than one layer, wherein the anisotropy increases from one layer to the next layer (currently claimed in Claim 4). The Examiner further notes that the claims filed on 12/1/15 with the "Original" identifier for Claim 1 is not actual part of the original disclosure. Thus, the instant limitation is considered new matter. For the purpose of evaluating prior art, any magnetic structure that has a gradient anisotropy meets the instant limitation.

Further, the limitation reciting a hard magnetic storage layer having a first coercivity and a nucleation host having a second coercivity lower than the first coercivity is considered new matter. The Specification does not provide explicit support for this *broad* relationship. However, Applicant do have support for a hard nucleation host layer and an even harder magnetic storage layer, wherein the coercivity for both layers is greater than 0.5 T (please see [0011] and [0034] in Applicant's published application).

Appropriate clarification and/or correction are required in the next response.

8. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 2, 8, 9, 10, 19, 20, and 24 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 2 recites the limitations, "**the** derivative k of **the** normalized magnetization with respect to **the** external field normalized to **the** coercive field … M_z being a component of the magnetization perpendicular to a plane of the recording medium, *H* being an external magnetic field parallel to a normal of **the** layers, dM/dH being **the** derivative of the magnetization with respect to **the** external magnetic field …" (emphasis added). There is insufficient antecedent basis for this limitation in the claims. It is unclear to Examiner what layers the Applicant is referring to in the underlined portion above. Considering that there are two coercivities in Claim 1 (i.e. first coercivity or second coercivity), it is unclear which coercivity Applicant is referring to in “the coercive field” (if it is referring to Claim 1).

With regards to Claims 8 and 20, Applicant further claims another coercivity for its nucleation host and hard magnetic storage layer. Examiner suggests to amend so that the coercive field in Claims 8 and 20 respectively refers back to the coercivities in Claim 1.

Claim 9 recites the limitation "**the** coercive field if **the** angle between **the** external field and **the** film normal is ϑ" (emphasis added). There is insufficient antecedent basis

for this limitation in the claims. Furthermore, it is unclear what film the Applicant is referring to in the underlined portion above. It is also unclear which coercive field Applicant is referring to (either the nucleation host or hard magnetic storage layer).

Claim 10 recites the limitation "**the** required field to reduce **the** normalized magnetization from the saturation to -0.5 if **the** angle between **the** external field and **the** film normal is α" (emphasis added). There is insufficient antecedent basis for this limitation in the claim. Furthermore, it is unclear what film the Applicant is referring to in the underlined portion above.

Claim 19 recites the limitation "the layer depth" in Lines 3 and 9. There is insufficient antecedent basis for this limitation in the claim. In order to have all nomenclature be consistent throughout the claims, please amend “the hard magnetic layer” in line 13 to “the hard magnetic storage layer”.

Claim 24 recites the limitation "the thickness". There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

10. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject

matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. **Claims 1-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") in view of US Pub. No. 20050058855 ("Girt").**

With regards to Claims 1, 7, 11, 15-18, and 25, Suess et al. teaches a perpendicular magnetic recording medium comprising an exchange coupled magnetic multilayer structure comprising a hard magnetic storage layer having a first coercivity and a nucleation host having a second coercivity, wherein said nucleation host is formed on the hard magnetic storage layer, exchange coupled to the hard magnetic storage layer, and has a gradient anisotropy (Please see Slides 1, 3, and 15).

Due to Suess et al.'s hard magnetic storage layer being harder than the nucleation host, Suess et al. intrinsically teaches its hard magnetic storage layer having a first coercivity and a nucleation host having a second coercivity lower than the first coercivity (hardness of the storage layer has a larger coercivity than the nucleation host due to the uppermost layer being "softer") (Please see Slide 15 in Suess et al. and [0033] in Applicant's published application).

Suess et al. does not teach a nominal non-magnetic substrate, underlayer, its hard magnetic storage layer and nucleation host comprising the claimed magnetic materials, and a less than 5nm thick antiferromagnetic coupling layer between the nucleation host and the hard magnetic storage layer.

However, Girt et al. teaches a perpendicular magnetic recording medium comprising a substrate and an underlayer (Fig. 5, [0005], and [0043]). Girt further teaches a first Fe magnetic layer (6), about 2 to about 20 Å thick antiferromagnetic coupling layer (7), and a second Fe magnetic layer (5), wherein said coupling layer antiferromagnetically couples the two magnetic layers (Fig. 5 and [0044]-[0046]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to include a substrate and underlayer into Suess et al.'s magnetic recording medium to provide a support/base for subsequently deposited layers and to control crystallinity [0043]. It would also have been obvious to one of ordinary skill in the art at the time of the invention was made to use the convention magnetic materials, as demonstrated by Girt, and incorporate an antiferromagnetic coupling layer between Suess et al.'s hard magnetic storage layer and nucleation host in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

With regards to Claim 2, 8-10, and 19-24, it is intrinsic that the modified recording medium has those properties as well. The properties set forth in these claims are material properties. The aforementioned combination of references use substantially the same materials as claimed with substantially the same structure and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted

to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

With regards to Claim 3, Suess et al. teaches its nucleation host and the hard magnetic storage layer are in direct contact (Slide 15).

With regards to Claim 4-6, Suess et al. teaches a gradient anisotropy in its nucleation host (Slide 15 demonstrating the magnetic moments/vectors gradually changing within its layer), which reads into the claimed nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction and assumes more than one value. While Suess et al. does not explicitly teach its nucleation host comprising ferromagnetic layers with increasing anisotropy from layer to layer, forming arbitrarily strata lines between each magnetic moment/vector within Suess et al.'s nucleation host yields the same structure as claimed (i.e. multiple magnetic layers that are the same and in contact with each other can be construed as a single magnetic layer).

With regards to Claim 12, Suess et al. teaches the nucleation host has a thickness of 5.3 nm (Slide 15).

With regards to Claims 13 and 14, Suess et al. teaches its grains having an average diameter greater than 2 nm and less than 10 nm, wherein a height of a plurality of grains is greater than a diameter of the grains (Slides 10 and 15).

With regards to Claim 26, please see rejected Claims 1, 4-6, and 11 above.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13 8/22/14 6/24/15 2/23/16 8/29/16	LC

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52

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S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08

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S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR;	ADJ	ON	2011/01/12 16:38

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			FPRS; EPO; JPO; DERWENT			
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43
S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-	ADJ	OFF	2013/11/01

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			PGPUB; USPAT; USOCR; EPO; JPO; DERWENT			17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57
S48	47	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/08/22 14:55
S49	1117	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S50	1027	S49 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S51	26	S50 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/12/28 15:58
S52	32	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2015/06/24 17:23
S53	2	Jp "03254421"	US-PGPUB;	ADJ	ON	2016/02/23 16:46

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			USPAT; USOCR; FPRS; EPO; JPO; DERWENT			
S54	33	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/02/23 18:20
S55	56	chau near3 lisa	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/08/29 16:26
S56	4	"20010051287"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:25
S57	8	"20050058855"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2016/08/29 19:39

EAST Search History (Interference)

< This search history is empty>

8/29/2016 8:36:17 PM
C:\Users\lchau5\Documents\EAST\Workspaces\12619849\12619849.wsp

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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Page 224 of 519

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011	07/12/2011	11/01/2013	08/22/2014	06/24/2015	02/23/2016	08/29/2016		
	1	✓	✓	✓	✓	✓	✓	✓		
	2	✓	✓	✓	✓	✓	✓	✓		
	3	✓	✓	✓	✓	✓	✓	✓		
	4	✓	✓	✓	✓	✓	✓	✓		
	5	✓	✓	✓	✓	✓	✓	✓		
	6	✓	✓	✓	✓	✓	✓	✓		
	7	✓	✓	✓	✓	✓	✓	✓		
	8	✓	✓	✓	✓	✓	✓	✓		
	9	✓	✓	✓	✓	✓	✓	✓		
	10	✓	✓	✓	✓	✓	✓	✓		
	11	✓	✓	✓	✓	✓	✓	✓		
	12	✓	✓	✓	✓	✓	✓	✓		
	13	✓	✓	✓	✓	✓	✓	✓		
	14	✓	✓	✓	✓	✓	✓	✓		
	15	✓	✓	✓	✓	✓	✓	✓		
	16	✓	✓	✓	✓	✓	✓	✓		
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	21	✓	✓	✓	✓	✓	✓	✓		
	22	✓	✓	✓	✓	✓	✓	✓		
	23	✓	✓	✓	✓	✓	✓	✓		
	24	✓	✓	✓	✓	✓	✓	✓		
	25	✓	✓	✓	✓	✓	✓	✓		
	26				✓	✓	✓	✓		

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/619,849	11/17/2009	Dieter SUESS	7304-002

CONFIRMATION NO. 9414

24112
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

POA ACCEPTANCE LETTER

OC000000085078179

Date Mailed: 08/12/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/03/2016.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/qtran/

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	12619849	Filing Date	2009-11-17	Docket Number (if applicable)	7304-002	Art Unit	1785
First Named Inventor	Dieter Suess			Examiner Name	Lisa N. Chau		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No 181167

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/David E. Bennett, Reg. No. 32,194/	Date (YYYY-MM-DD)	2016-08-10
Name	David E. Bennett	Registration Number	32194

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	12619849
Filing Date:	17-Nov-2009
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	David E. Bennett/Karen Nelson
Attorney Docket Number:	CU-7887 ZBF

Filed as Micro Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 2 months with $0 paid	3252	1	150	150
Miscellaneous:				
RCE- 2nd and Subsequent Request	3820	1	425	425
		Total in USD ($)		**575**

Electronic Acknowledgement Receipt	
EFS ID:	26597978
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Correspondence Address:	DR. DIETER SUESS - Mattiellistrasse 3/30 - Wien - 1040 AT 436508333999 dietersuess@gmail.com or dietersuess@suessco.com
Filer:	David E. Bennett/Karen Nelson
Filer Authorized By:	David E. Bennett
Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	10-AUG-2016
Filing Date:	17-NOV-2009
Time Stamp:	10:21:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	$575

RAM confirmation Number	7698
Deposit Account	
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		7304-002_Amendment_accompanying_RCE.pdf	76568 f60a6b70f7dbcfc56621cbc9e82d855f453507b5	yes	12

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment Submitted/Entered with Filing of CPA/RCE	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	12

Warnings:					
Information:					
2	Request for Continued Examination (RCE)	7304-002_RCE_Transmittal.pdf	697803 7e6a5fbd66a26dc21d40c657ac6a58dbc5aa47ad	no	3
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32684 fe6eed7267f72a07fc18576c42ca9f1037694333f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	807055		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of **Dieter Suess**	)	
	)	
Serial No.: **12/619,849**	)	
	)	Examiner: Lisa N. Chau
Filed: **November 17, 2009**	)	
	)	Group Art Unit: 1785
For: **Multilayer Exchange Spring Recording Media**	)	
	)	Confirmation No.: 9414
	)	
Docket No: **7304-002**	)	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

10 August 2016

AMENDMENT ACCOMPANYING REQUEST FOR CONTINUED EXAMINATION

This paper is being filed along with a request for continued examination. Reconsideration of the application in light of the amendments and/or remarks below is respectfully requested. **A two-month time extension is requested, and the corresponding fee is submitted herewith.** The Office is hereby authorized to charge any fees required for entry of this paper to Deposit Account 18-1167.

CLAIMS LISTING

1. (Currently amended) A magnetic recording medium, comprising:

an essentially non-magnetic substrate;

an underlayer formed on the non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a hard magnetic storage layer[[,]] having a first coercivity formed on the underlayer;

a nucleation host[[,]] having a second coercivity lower than the first coercivity, wherein said nucleation host:

is formed on the hard magnetic storage layer such that the hard magnetic storage layer is between the nucleation host and the non-magnetic substrate,

is exchange coupled to the hard magnetic storage layer,

~~with~~ has an anisotropy increasing towards the non-magnetic substrate~~, and the nucleation host is softer than the hard magnetic storage layer~~.

2. (Original) The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$, wherein: $k = \frac{dM}{dH}\frac{H_c}{M_s}$, M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to

a normal of the layers, $\frac{dM}{dH}$ being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. (Original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

4. (Original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. (Original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. (Original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

7. (Original) The magnetic recording of medium of claim 1, wherein the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (Currently Amended) The magnetic recording medium of claim 1, wherein a coercive [filed] field of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

9. (Original) The magnetic structure of claim 1 wherein a $H_c(\alpha=20^o) < H_c(\alpha=45^o)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

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10. (Original) The magnetic structure of claim 1 wherein a $H_m(\alpha=20^\circ) < H_m(\alpha=45^\circ)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. (Previously Presented) The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (Original) The magnetic recording medium of claim 1, wherein the nucleation host has thickness smaller than 30 nm.

13. (Original) The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (Original) The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. (Previously Presented) The magnetic recording medium of claim 1, wherein a coupling layer is between the nucleation host and the hard magnetic storage layer.

16. (Original) The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (Original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

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18. (Original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (Previously Presented) The magnetic recording medium of claim 1, where parameters of the medium comprise:

an anisotropy constant in the nucleation host K^n_1 as a function of the layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic layer.

20. (Original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. (Original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage

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layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (Previously Presented) The magnetic recording medium of claim 19, wherein the energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage on the non-magnetic substrate; removing the nucleation host from a multiplayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (Original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (Original) The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (Original) The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

26. (Currently amended) A magnetic recording medium, comprising:

a non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn; and

a hard magnetic storage layer having a coercivity greater than a coercivity of the nucleation host;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer,

wherein the nucleation host comprises a plurality of layers in which anisotropy increases towards the substrate from one layer of the nucleation host to the next layer of the nucleation host.

REMARKS

In response to the Official Office Action dated March 10, 2016, claims 1, 8 and 29 have been amended. Claim 8 has been amended as suggested by the Examiner to correct a minor typographical error. Accordingly, Applicant requests withdrawal of the objection to claim 8. It is respectfully submitted that the claims are patentable over the prior art made of record and reconsideration of this application in light of the following remarks is respectfully requested.

The claimed invention relates to an exchange spring perpendicular magnetic recording media for ultrahigh density magnetic recording. The magnetic recording media comprises an essentially non-magnetic substrate, an underlayer formed on the substrate, and a multi-layer structure formed on the underlayer. The multi-layer structure comprises a hard magnetic layer formed on the underlayer and a nucleation host formed on the hard magnetic layer. The nucleation host is exchange coupled to the hard magnetic storage layer and has anisotropy increasing towards the non-magnetic substrate. Claim 1 further recites that the coercivity of the nucleation host is less than the coercivity of the hard magnetic storage layer.

By depositing the softer nucleation host on the hard magnetic storage layer, the nucleation host is closer to the write head so that, during the process of writing, magnetic domains are first generated within the softer nucleation host and move down to the interface connecting the nucleation host with the magnetic storage layer. Due to the varying anisotropy of the nucleation host, the magnetic domain does not remain pinned at this interface, which would normally be the case, but can move relatively easily into the hard magnetic storage layer in order to switch the respective grain. One advantage of this multi-layer structure is that writing of information into the hard magnetic storage layer can be done precisely and smaller writing fields can be applied as compared to prior art recording media.

Claim 1 has been rejected under 35 U.S.C. §103(a) as being obvious over Honda (U.S. 5,851,643) in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular

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Recording Media," April 2005 (Suess). Applicant respectfully submits that the combination of Honda and Suess fails to disclose or teach all of the limitations recited in claim 1 as amended. As explained in more detail below, the combination of Honda and Suess fails to disclose a magnetic multi-layer structure formed on a substrate and having a hard magnetic layer and a nucleation host where: (1) the nucleation host is formed on the hard magnetic layer such that the hard magnetic layer is disposed between the nucleation host and the substrate; (2) the nucleation host has a coercivity less than the coercivity of the hard magnetic storage layer; and (3) the nucleation host has an anisotropy increasing towards the non-magnetic substrate.

The principal reference relied upon by the examiner is Honda. Honda discloses a perpendicular magnetic recording media comprising two magnetic stacked films separated by a non-magnetic intermediate layer. For convenience, Figure 1a of Honda as shown in the Office Action dated August 28, 2014 is reproduced.

From Honda:

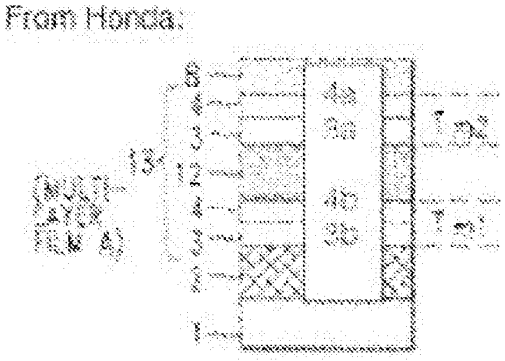


FIG. 1a

As shown in Figure 1a, the recording media includes two independent magnetic recording layers that are separated by an intermediate layer 12. The lower recording layer is formed on a structure control underlayer, which in turn is formed on a non-magnetic substrate. The upper recording layer is formed on the non-magnetic intermediate layer 12 that separates that upper and lower recording layers. Each recording layer includes two magnetic thin films

denoted by reference numerals 3 and 4. In both layers, the magnetic thin film 4 has a higher coercivity than the magnetic thin film 3. The stacked films in each layer are exchange coupled to one another. However, the intermediate layer 12 prevents exchange coupling between the thin films in different recording layers. This allows different data to be independently written and stored in each recording layer.

There is simply no way to read the multi-layer film structure described in Honda on claim 1 without ignoring limitations in the claim. The stacked films in the same recording layer of Honda do not read on claim 1 because the upper magnetic thin film 4 has higher coercivity than the lower magnetic thin film 3. For example, if the lower magnetic thin film 3 in Honda is considered to be the hard magnetic storage layer, and the upper magnetic thin film 4 is considered to be the nucleation host, the limitation that the coercivity of the nucleation host (magnetic film 4 in this example) be lower than the coercivity of the hard magnetic storage layer (magnetic film 3 in this example) is not met. On the other hand, if the upper magnetic thin film 4 is considered to be the hard magnetic layer and the lower magnetic thin film is considered to be the nucleation host, the limitation that the nucleation host be "formed on the hard magnetic storage layer" is not met.

Similarly, the magnetic thin films in different recording layers of Honda do not read on claim 1 because the magnetic thin films in different recording layers of Honda are not exchange coupled to one another. Claim 1 recites that the nucleation host is exchange coupled to the hard magnetic storage layer. The non-magnetic intermediate layer 12 in Honda prevents exchange coupling between magnetic thin films in different layers so that the recording layers are independent of one another.

In the Office Action dated August 25, 2014, the Examiner argues that the claims do not preclude intervening layers between the hard magnetic storage layer and the nucleation host. Therefore, according to the Examiner, the magnetic thin film 3a in the upper recording layer may

be considered the nucleation host. This argument, however, ignores the limitation that the nucleation host is "exchange coupled to the hard magnetic storage layer". In embodiments where a coupling layer is disposed between the hard magnetic storage layer and the nucleation host, the coupling layer increases the exchange coupling between the layers. In contrast, the intermediate layer 12 in Honda is a non-magnetic layer that prevents exchange coupling between the magnetic thin films in different recording layers. As noted above, if one considers the magnetic film 3 in the upper recording layer to be the nucleation host, then the requirement that the nucleation host be exchange coupled to the hard magnetic storage layer is not met.

As another point of distinction, claim 1 requires that the nucleation host have "an anisotropy increasing towards the non-magnetic substrate". There is no suggestion whatsoever that either the magnetic film 3 or magnetic film 4 in Honda have a varying anisotropy. Honda does disclose that the anisotropy may vary between layers. However, in this case, Honda discloses that the anisotropy of the upper layer should be higher than the anisotropy of the lower layer, which is exactly opposite of what is claimed. Therefore, claim 1 is distinguishable from Honda for this additional reason.

Suess is cited for disclosing a multi-layer structure wherein the nucleation host has a varying anisotropy. However, Suess does not cure the deficiencies of Honda discussed above.

In summary, the structure disclosed by Honda fails to disclose each of the limitations recited in claim 1. In particular, claim 1 recites that the nucleation host is formed on the hard magnetic storage layer, that the hard magnetic storage layer has higher coercivity than the nucleation host, and that the nucleation host includes an anisotropy "increasing towards the non-magnetic substrate". These limitations are not disclosed by the prior art made of record.

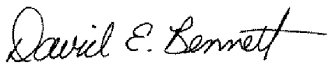
Claim 26 recites a magnetic recording medium similar to the recording medium in claim 1. Claim 26 includes the limitations from claim 1 discussed above and further recites that the

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 245 of 519

nucleation host comprises multiple layers. Accordingly, it is submitted that claim 26 is allowable for the same reasons as claim 1.

For the foregoing reasons, it is respectfully submitted that the present application is in condition for allowance.

Respectfully submitted,
COATS & BENNETT, P.L.L.C.



Dated: 10 August 2016

David E. Bennett
Registration No.: 32,194
Telephone: (919) 854-1844

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 246 of 519

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☐ SMALL ☒ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	08/10/2016	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $20 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X $105 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
ADRIENE SELLMAN

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	12619849
Filing Date	2009-11-17
First Named Inventor	Dieter Suess
Title	Multilayer Exchange Spring Recording Media
Art Unit	1785
Examiner Name	Lisa N. Chau
Attorney Docket Number	7304-002

SIGNATURE of Applicant or Patent Practitioner

Signature	/David E. Bennett, Reg. No. 32,194/	Date (Optional)	
Name	David E. Bennett	Registration Number	32194
Title (if Applicant is a juristic entity)	Attorney		
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
12619849	2009-11-17

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 24112

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Dieter Suess

☑ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/D.S./	Date (Optional)	28.7.2016
Name	Dieter Suess		
Title			

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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POWER OF ATTORNEY BY APPLICANT

No more than ten (10) patent practitioners total may be appointed as set forth below by name and registration number. This page need not be submitted if appointing the Patent Practitioner(s) associated with a Customer Number (see form PTO/AIA/82B):

Name	Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: MES GIB
Document Description: Certification of Micro Entity Status (Gross Income Basis)

PTO/SB/15A (07-14)

CERTIFICATION OF MICRO ENTITY STATUS
(GROSS INCOME BASIS)

Application Number or Control Number (if applicable):	Patent Number (if applicable):
12619849	
First Named Inventor:	**Title of Invention:**
Dieter Suess	Multilayer Exchange Spring Recording Media

The applicant hereby certifies the following—

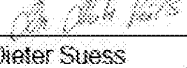
(1) **SMALL ENTITY REQUIREMENT –** The applicant qualifies as a small entity as defined in 37 CFR 1.27.

(2) **APPLICATION FILING LIMIT –** Neither the applicant nor the inventor nor a joint inventor has been named as the inventor or a joint inventor on more than four previously filed U.S. patent applications, excluding provisional applications and international applications under the Patent Cooperation Treaty (PCT) for which the basic national fee under 37 CFR 1.492(a) was not paid, and also excluding patent applications for which the applicant has assigned all ownership rights, or is obligated to assign all ownership rights, as a result of the applicant's previous employment.

(3) **GROSS INCOME LIMIT ON APPLICANTS AND INVENTORS –** Neither the applicant nor the inventor nor a joint inventor, in the calendar year preceding the calendar year in which the applicable fee is being paid, had a gross income, as defined in section 61(a) of the Internal Revenue Code of 1986 (26 U.S.C. 61(a)), exceeding the "Maximum Qualifying Gross Income" reported on the USPTO Web site at http://www.uspto.gov/patents/law/micro_entity.jsp which is equal to three times the median household income for that preceding calendar year, as most recently reported by the Bureau of the Census.

(4) **GROSS INCOME LIMIT ON PARTIES WITH AN "OWNERSHIP INTEREST" –** Neither the applicant nor the inventor nor a joint inventor has assigned, granted, or conveyed, nor is under an obligation by contract or law to assign, grant, or convey, a license or other ownership interest in the application concerned to an entity that, in the calendar year preceding the calendar year in which the applicable fee is being paid, had a gross income, as defined in section 61(a) of the Internal Revenue Code of 1986, exceeding the "Maximum Qualifying Gross Income" reported on the USPTO Web site at http://www.uspto.gov/patents/law/micro_entity.jsp which is equal to three times the median household income for that preceding calendar year, as most recently reported by the Bureau of the Census.

SIGNATURE by an authorized party set forth in 37 CFR 1.33(b)

Signature					
Name	Dieter Suess				
Date	8/2/2016	Telephone	+436508333999	Registration No.	

☐ There is more than one inventor and I am one of the inventors who are jointly identified as the applicant. The required additional certification form(s) signed by the other joint inventor(s) are included with this form.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt	
EFS ID:	26529664
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Correspondence Address:	DR. DIETER SUESS - Mattiellistrasse 3/30 - Wien - 1040 AT 436508333999 dietersuess@gmail.com or dietersuess@suessco.com
Filer:	David E. Bennett/Karen Nelson
Filer Authorized By:	David E. Bennett
Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	03-AUG-2016
Filing Date:	17-NOV-2009
Time Stamp:	09:41:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA.pdf	241944 a3c9f91c1a84155acd539efff1d980c3fc3bdc8f	no	4
Warnings:					
Information:					
2	Certification of Micro Entity (Gross Income Basis)	Confirmation_Micro_Entity_Status.pdf	794131 50f141d0d6f907de252a083005b2b07c71cfb607	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1036075		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF

CONFIRMATION NO. 9414

POWER OF ATTORNEY NOTICE

26530
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

OC000000083454385

Date Mailed: 06/07/2016

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/06/2016.

- The withdrawal as attorney in this application has been accepted. Future correspondence will be mailed to the new address of record. 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/eefswuser/

Doc Code: PET.AUTO Document Description: Petition automatically granted by EFS-Web	PTO/SB/83 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**REQUEST FOR WITHDRAWAL AS ATTORNEY OR AGENT AND CHANGE OF CORRESPONDENCE ADDRESS**
Application Number	12619849
Filing Date	17-Nov-2009
First Named Inventor	Dieter SUESS
Art Unit	1785
Examiner Name	LISA CHAU
Attorney Docket Number	CU-7887 ZBF
Title	MULTILAYER EXCHANGE SPRING RECORDING MEDIA

◉ Please withdraw me as attorney or agent for the above identified patent application and the practitioners of record associated with Customer Number: 26530

The reason(s) for this request are those described in 37 CFR:

11.116(a)(3)

11.116(b)(1)

Certifications

☒ I/We have given reasonable notice to the client, prior to the expiration of the response period, that the practitioner(s) intend to withdraw from employment

☒ I/We have delivered to the client or a duly authorized representative of the client all papers and property (including funds) to which the client is entitled

☒ I/We have notified the client of any responses that may be due and the time frame within which the client must respond

Change the correspondence address and direct all future correspondence to the first named inventor or assignee that has properly made itself of record pursuant to 37 CFR 3.71(for applications filed before September 16, 2012) or the applicant (for applications filed on or after September 16, 2012):

Name	DR. DIETER SUESS
Address	Mattiellistrasse 3/30
City	Wien
State	
Postal Code	1040

Country	AT
I am authorized to sign on behalf of myself and all withdrawing practitioners.	
Signature	/Loren K. Thompson/
Name	Loren K. Thompson
Registration Number	45918



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Decision Date : June 6, 2016

In re Application of :

Dieter SUESS

Application No : 12619849

Filed : 17-Nov-2009

Attorney Docket No : CU-7887 ZBF

DECISION ON REQUEST TO WITHDRAW AS ATTORNEY/AGENTOF RECORD

This is an electronic decision on the Request to Withdraw as attorney or agent of record under 37 CFR § 1.36(b), filed June 6, 2016

The request is **APPROVED.**

The request was signed by Loren K. Thompson (registration no. 45918) on behalf of all attorneys/agents associated with Customer Number 26530 . All attorneys/agents associated with Cusotmer Number 26530 have been withdrawn.

Since there are no remaining attorneys of record, all future communications from the Office will be directed to the first named inventor or assignee that has properly made itself of record pursuant to 37 CFR 3.71(for applications filed before September 16, 2012) or the applicant (for applications filed on or after September 16, 2012), with correspondence address:

Name	DR. DIETER SUESS
Name2	
Address 1	Mattiellistrasse 3/30
Address 2	
City	Wien
State	
Postal Code	1040
Country	AT

As a reminder, requester is required to inform the first named inventor or assignee that has properly made itself of record pursuant to 37 CFR 3.71 (for applications filed before September 16, 2012) or the applicant (for applications filed on or after September 16, 2012)of the electronically processed petition.

Telephone inquiries concerning this decision should be directed to the Patent Electronic Business Center (EBC) at 866-217-9197.

Office of Petitions

Electronic Acknowledgement Receipt

EFS ID:	25975467
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	26530
Filer:	Loren Keith Thompson/Debbie Szumowski
Filer Authorized By:	Loren Keith Thompson
Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	06-JUN-2016
Filing Date:	17-NOV-2009
Time Stamp:	14:38:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition automatically granted by EFS	petition-request.pdf	35253 e5ec9bc718c77855ab29029c03220577e7844f34	no	2

Warnings:	
Information:	

Total Files Size (in bytes):	35253

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 06/03/2016

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
06/03/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

In re Application of	:	
Dieter Suess	:	
Application No. 12/619,849	:	DECISION ON PETITION
Filed: November 17, 2009	:	TO WITHDRAW
Attorney Docket No. CU-7887 ZBF	:	FROM RECORD
	:	

This is a decision on the Request to Withdraw as attorney or agent of record under C.F.R. § 1.36(b) or 37 CFR § 11.116, filed December 15, 2015.

The request is **NOT APPROVED**.

A grantable request to withdraw as attorney/agent of record must be signed by every attorney/agent seeking to withdraw or contain a clear indication that one attorney is signing on behalf of another/others.

The Office strongly encourages practitioner(s) requesting withdrawal from representation as practitioner of record in an application to review the record to determine whether he or she is, in fact, of record and how he or she was made of record. The practitioner(s) should determine whether he or she was appointed by naming each practitioner individually or through the use of a Customer Number. If the practitioner(s) were appointed by a specific designation, then the request should ask that each specified practitioner be withdrawn and should list each practitioner(s) in the Request. Similarly, if practitioner(s) was appointed by a Customer Number, the practitioner(s) should ensure that the correct number is provided in the Request Additionally, as set forth in MPEP 403(I), the addition or deletion of a practitioner from the list of persons associated with a Customer Number should be done by way of a Request for Customer umber Data Change (PTO/SB/124) and not a Request for Withdrawal as Attorney or Agent and Change of Correspondence Address (PTO/SB/83).

The request cannot be approved because practitioners were appointed by customer number. Practitioners must withdraw in the same manner by which they were appointed.

All future communications from the Office will continue to be directed to the above-listed address until otherwise notified by applicant.

There is an outstanding final Office action mailed March 10, 206 that requires a reply from applicant.

Telephone inquiries concerning this decision should be directed to undersigned at (571) 272-1642. All other inquiries concerning the status or examination of this application should be directed to the Technology Center at their customer service line (571) 272-1700.

/April M. Wise/
April M. Wise
Petitions Paralegal Specialist
Office of Petitions

cc: DIETER SUESS
RATHAUSPLATZ 18, 3130
HERZOGENBURG
AUSTRIA

Transmittal Communication on Petition	Application No. 12/619,849	Applicant/Patent Under Reexamination SUESS, DIETER	
	Deciding Official APRIL M. WISE	Office of Petitions OPET	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(ADDITIONAL PARTY'S CORRESPONDENCE ADDRESS)

DIETER SUESS
RATHAUSPLATZ 18, 3130
HERZOGENBURG
AUSTRIA

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified Application/Patent.

Office of Petitions: Routing Sheet



Application No. 12/619,849

This application is being forwarded to your office for further processing. A decision has been rendered on a petition filed in this application, as indicated below. For details of this decision, please see the document PET.OP.DEC filed on the same date as this document.

- [X] **GRANTED (307)**
- [ ] **DISMISSED ()**
- [ ] **DENIED**

Office of Petitions: Decision Count Sheet

Mailing Month: 5

Application No.: 12619849

12619849

For US serial numbers: enter number only, no slashes or commas. Ex: 10123456
For PCT: enter "51+single digit of year of filing+last 5 numbers", Ex. for PCT/US05/12345, enter 51512345

Deciding Official: WISE, APRIL M.

Count (1) - Palm Credit 12/619,849

Decision: DISMISSED

FINANCE WORK NEEDED
☐ Select Check Box for YES

DISMISSED

Decision Type: 307 - WITHDRAWAL OF ATTORNEY (37 CFR 1.36)

307

Notes:

Count (2)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Count (3)

Decision: n/a

FINANCE WORK NEEDED
☐ Select Check Box for YES

Decision Type: NONE

Notes:

Initials of Approving Official (if required)

If more than 3 decisions, attach 2nd count sheet & mark this box ☐

Printed on: *5/29/2016*

Office of Petitions Internal Document - Ver. 5.0

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 03/10/2016

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
03/10/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

Office Action Summary	Application No. 12/619,849	Applicant(s) SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/1/15*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-26* is/are rejected.

8)☒ Claim(s) *8 and 15* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Pre-AIA Examination

1. The present application is being examined under the pre-AIA first to invent provisions.

Examiner's Note

2. The Examiner has cited particular columns and line numbers or figures in the references as applied to the claims below for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant, in preparing the responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.

Claim Objections

3. **Claim 8 is objected to because of the following informalities**:

The instant claim recites "coercive filed" (emphasis added). Filed should be field.

Applicant is advised that should Claim 17 be found allowable, Claim 15 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both

cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k). Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 2, 4-12, and 19-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.").

With regards to Claims 1, 4-7, 11, 25, and 26, Honda et al. teaches a perpendicular magnetic recording medium comprising an essentially non-magnetic substrate, a magnetic underlayer, an exchange coupled magnetic multilayer structure comprising a rare earth (Sm, Nd, and Dy) containing nucleation host with an anisotropy varying in the film normal direction and a CoCrPt hard magnetic storage layer (Figs. 1a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 25-27, 39-43, and 58-65).

Honda et al. further teaches that when forming its exchange coupled magnetic multilayer structure, the stacked magnetic film is preferably formed from magnetic thin-

film (magnetic layers) of different compositions, and that the coercivity of the upper layer is set higher than that of the lower layer (Col. 5, Lines 64-67 and Col. 6, Lines 12-24). In Fig. 1a, Honda et al. teaches a multilayer film (13) formed of *two stacked films* containing magnetic films 3 and 4. Thus, with the teaching that the coercivity of the upper layer is set higher than the lower layer within a stacked film, magnetic film 4 has a higher coercivity than magnetic film 3. Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation host is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the *upper stacked film* and the hard magnetic storage layer is magnetic film 4 in the *lower stacked film* in Fig. 1a) (Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Considering that the nucleation host has an anisotropy varying in the film normal direction in Honda et al., it is inherent that the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host (Fig. 7b and Col. 6, Lines 58-65). It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

Honda et al. teaches its nucleation host and hard magnetic storage layers comprises ferromagnetic layers with increasing anisotropy from layer to layer, which also reads on Honda et al.'s nucleation host having a ferromagnetic layer with a

continuous change of anisotropy in the film normal direction (in terms of magnitude) (Fig. 7b, Col. 6, Lines 34-37, and Col. 7, Lines 14-23).

Honda et al. does not specifically teach the anisotropy in the nucleation host comprising more than one layer and the anisotropy increases from one layer to the next layer (graded anisotropy).

Suess et al. teaches a magnetic recording medium comprising an exchange coupled magnetic multilayer structure, wherein a nucleation host is softer than the hard magnetic storage layer, and the anisotropy in the nucleation host gradually increases (Slide 15 - each layer having a different anisotropy as depicted in the soft magnetic portion). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to have Honda et al.'s nucleation host conform to the teaching of Suess et al. in order to yield desirable magnetic properties (Slide 15). It would also have been obvious to one of ordinary skill in the art to have the anisotropy increasing towards the non-magnetic substrate because it is well within the purview of choice in the art to try from these very limited alternatives (i.e. either increasing or decreasing from the substrate).

With regards to Claim 8, Honda et al. teaches the coercive field of the nucleation host is less than the coercive field of the hard magnetic storage layer as set forth/argued above (Col. 5, Lines 64-67; Col. 6, Lines 12-24; Col. 7, Lines 58-67; and Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Honda et al. does not teach the coercive field of the nucleation host is less than 1/2 of a coercive field of the hard magnetic storage layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize the coercive field of Honda et al. to have its nucleation host less than half of the coercive field of the hard magnetic storage layer in order to set a desirable saturation magnetization value and to obtain a ultra high-density recording with an overall coercivity of 2000 Oe or more (Col. 4, Lines 55-58; Col. 6, Lines 21-24; Col. 7, Lines 58 bridging to Col. 8, Line 1).

With regards to Claims 12 and 24, Honda et al. teaches its nucleation host with a thickness smaller than 30 nm (Col. 5, Lines 60-63). Therefore, it is inherent that the thickness of Honda et al.'s nucleation host has a value such that the in plane component of a magnetization remanent state is less than 20% of a total magnetization due to Honda et al. meeting the claimed thickness of its nucleation host.

With regards to Claims 2, 9, 10, and 19-23, Honda et al.'s magnetic recording medium inherently has the claimed magnetic properties. The properties set forth in these claims are material properties. The prior art use the same materials as claimed and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or

inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

6. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20040191576 ("Shimizu et al.").

Honda et al. disclose a perpendicular magnetic recording medium as set forth above.

Honda et al. does not teach its nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm and the height of grains is greater than the diameter of the grains.

However, Shimizu et al. teaches a perpendicular magnetic recording medium wherein the height of the grains is 5 to 50 nm and the average diameter is 4 to 12 nm ([0077] and [0097]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize Honda et al.'s nucleation host to have an average diameter greater than 2 nm and less than 10 nm, wherein the height is greater than the diameter in order to obtain a sufficient magnetic flux and to prevent degradation of reproduction output ([0012] and [0097]).

7. Claims 3 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20050058855 ("Girt et al.").

Honda et al. teaches numerous configurations for its perpendicular magnetic recording medium, including its nucleation host either in direct contact with its hard magnetic storage layer or separated from a strong exchange coupling layer having a thickness less than 5 nm (Figs. 1a and 1d; Col. 6, Lines 34-38; Col. 7, Lines 6-7).

Honda et al. does not teach its nucleation host is antiferromagnetic coupled to the hard magnetic layer.

However, Girt et al. teaches anti-ferromagnetically coupled perpendicular magnetic recording media wherein the ferromagnetic layers are anti-ferromagnetically coupled by a non-magnetic spacer layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Honda et al.'s magnetic layers be antiferromagnetically coupled in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

Response to Arguments

8. Applicant's arguments filed 12/1/15 have been fully considered but they are not persuasive.

Applicant argues that Honda et al. clearly states that layer 12 is a non-magnetic layer. The instant claims require a hard magnetic storage layer is strongly exchanged coupled to a nucleation layer. In Honda et al., the layer 3a (according to examiner nucleation host) is not exchange coupled at all to 4b (according to examiner storage layer) due to the non-magnetic layer 12.

Examiner notes that instant Claim 1 is open to unrecited layers, such as an intervening or non-magnetic layer. In addition, dependent Claim 15 requires an intervening layer between the nucleation host and hard magnetic storage layer. Honda teaches many different configurations for its magnetic recording stack. The Examiner has cited particular columns and line numbers or figures in the references as applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant, in preparing the responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. For example in Col. 6: lines 64-37, the stacked magnetic films can be joined at a common interface thereof or can be stacked in multiple layers via a non-magnetic intermediate layer. In this case, the intermediate layer 12 can be absent in Fig. 1a of Honda and/or nucleation host comprising of ferromagnetic layers.

Furthermore, Applicant recognizes that exchange coupled magnetic layers can be done by directly in contact or by an intervening layer (for example, a nonmagnetic

layer). In para [0008], the Specification states, "[t]he exchange coupling can be direct or via a thin coupling layer in order to achieve strong coupling." Furthermore, Honda discloses that the thickness of its non-magnetic layer is optimized to control the strength of the magnetic exchange interaction of the magnetic layers (i.e. the magnetic layers are strongly exchange coupled) (Col. 7: Lines 6-9).

Conclusion

9. THIS **ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/MARK RUTHKOSKY/
Supervisory Patent Examiner, Art Unit 1785

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011	07/12/2011	11/01/2013	08/22/2014	06/24/2015	02/23/2016			
	1	✓	✓	✓	✓	✓	✓			
	2	✓	✓	✓	✓	✓	✓			
	3	✓	✓	✓	✓	✓	✓			
	4	✓	✓	✓	✓	✓	✓			
	5	✓	✓	✓	✓	✓	✓			
	6	✓	✓	✓	✓	✓	✓			
	7	✓	✓	✓	✓	✓	✓			
	8	✓	✓	✓	✓	✓	✓			
	9	✓	✓	✓	✓	✓	✓			
	10	✓	✓	✓	✓	✓	✓			
	11	✓	✓	✓	✓	✓	✓			
	12	✓	✓	✓	✓	✓	✓			
	13	✓	✓	✓	✓	✓	✓			
	14	✓	✓	✓	✓	✓	✓			
	15	✓	✓	✓	✓	✓	✓			
	16	✓	✓	✓	✓	✓	✓			
	17	✓	✓	✓	✓	✓	✓			
	18	✓	✓	✓	✓	✓	✓			
	19	✓	✓	✓	✓	✓	✓			
	20	✓	✓	✓	✓	✓	✓			
	21	✓	✓	✓	✓	✓	✓			
	22	✓	✓	✓	✓	✓	✓			
	23	✓	✓	✓	✓	✓	✓			
	24	✓	✓	✓	✓	✓	✓			
	25	✓	✓	✓	✓	✓	✓			
	26				✓	✓	✓			

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13 8/22/14 6/24/15 2/23/16	LC

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52

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S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08

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S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR;	ADJ	ON	2011/01/12 16:38

			FPRS; EPO; JPO; DERWENT			
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43
S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-	ADJ	OFF	2013/11/01

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			PGPUB; USPAT; USOCR; EPO; JPO; DERWENT			17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57
S48	47	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/08/22 14:55
S49	1117	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S50	1027	S49 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S51	26	S50 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/12/28 15:58
S52	32	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2015/06/24 17:23
S53	2	Jp "03254421"	US-	ADJ	ON	2016/02/23

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			PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT			16:46
S54	33	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2016/02/23 18:20

EAST Search History (Interference)

< This search history is empty>

2/ 23/ 2016 6:22:08 PM
C:\ Users\ lchau5\ Documents\ EAST\ Workspaces\ 12619849\ 12619849.wsp

Doc Code: PET.POA.WDRW
Document Description: Petition to withdraw attorney or agent (SB83)

PTO/SB/83 (04-13)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REQUEST FOR WITHDRAWAL AS ATTORNEY OR AGENT AND CHANGE OF CORRESPONDENCE ADDRESS

Application Number	12/619,849
Filing Date	November 17, 2009
First Named Inventor	Dieter Suess
Art Unit	1785
Examiner Name	Lisa N Chau
Practitioner Docket Number	CU-7887

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Please withdraw me as attorney or agent for the above-identified patent application, and

- ☐ all the practitioners of record;
- ☑ the practitioners (with registration numbers) of record listed on the attached paper(s); or
- ☐ the practitioners of record associated with Customer Number: _____

NOTE: The immediately preceding box should only be marked when the practitioners were appointed using the listed Customer Number.

The reason(s) for this request are those described in 37 CFR:

☐ 11.116(a)(1)	☐ 11.116(a)(2)	☐ 11.116(a)(3)
☐ 11.116(b)(1)	☐ 11.116(b)(2)	☐ 11.116(b)(3)
☐ 11.116(b)(4)	☐ 11.116(b)(5)	☐ 11.116(b)(6)

☑ 11. 116(b)(7) Please explain below:

Client's request to withdraw

Certifications

Check each box below that is factually correct. WARNING: If a box is left unchecked, the request will likely not be approved.

1. ☒ I/We have given reasonable notice to the client, prior to the expiration of the response period, that the practitioner(s) intend to withdraw from employment.
2. ☒ I/We have delivered to the client or a duly authorized representative of the client all papers and property (including funds) to which the client is entitled.
3. ☒ I/We have notified the client of any responses that may be due and the time frame within which the client must respond.

Please provide an explanation, if necessary:

This collection of information is required by 37 CFR 1.36. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/83 (04-13)
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REQUEST FOR WITHDRAWAL AS ATTORNEY OR AGENT AND CHANGE OF CORRESPONDENCE ADDRESS

Complete the following section only when the correspondence address will change. *Changes of address will only be accepted to the first named inventor or an assignee that has properly made itself of record pursuant to 37 CFR 3.71.*

Change the correspondence address and direct all future correspondence to:

A. ☐ The address of the first named inventor or assignee associated with Customer Number: .....

OR

B. ☑ First Named Inventor or Assignee Name

Address Rathausplatz 18, 3130

City	State	Zip	Country
Herzogenburg			Austria

Telephone 43-650-833-399 Email dietersuess@gmail.com

I am authorized to sign on behalf of myself and all withdrawing practitioners.

Signature

Name Loren K. Thompson Registration No. 45,918

Address 224 South Michigan Avenue, Suite 1600

City	State	Zip	Country
Chicago	IL	60604	USA

Date Telephone No. 312-427-1300

NOTE: Withdrawal is effective when approved rather than when received.

This collection of information is required by 37 CFR 1.36. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	24368637
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	26530
Filer:	Loren Keith Thompson
Filer Authorized By:	
Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	15-DEC-2015
Filing Date:	17-NOV-2009
Time Stamp:	15:54:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Petition to withdraw attorney or agent (SB83)	2015-12-15_12619849_CU7887_Request_for_Withdrawal_As_Attorney.pdf	235762 f38f6f07d2359eb6faf1a198bc009a325ce12698	no	3

Warnings:	
Information:	

Total Files Size (in bytes):	235762

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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DEC 0 1 2015

Application Serial No. 12/619,849 PATENT
Reply to office action of 07/06/2015

Certification under 37 CFR § 1.8(a)
The USPTO Central Fax No: 571 273-8300
Date of Fax Transmittal: Nov 28, 2014
I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted to the United States Patent and Trademark Office to the fax number and on the date indicated above.

Dieter Suess, Ph.D

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application: Dieter SUESS	GRP ART UNIT: 1785
Serial No: 12/619,849	Ex.: Lisa N. CHAU
Filed: November 17, 2009	

For: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

AMENDMENT UNDER 37 CFR 1.111

MAIL STOP AF
The Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sirs and Madams:

In response to the office action dated 07/06/2015 the applicants submit the following responsive amendment in the above-identified application. This amendment is considered to place the application in better condition for allowance.

There are no amendments to the claims.

Remarks/Arguments begin on page 6 of this paper.

Listing of the Claims

The listing of claims presented below will replace all prior versions, and listings,

PAGE 2/12 * RCVD AT 12/1/2015 12:33:08 PM [Eastern Standard Time] * SVR:W-PTOFAX-001/36 * DNIS:2738300 * CSID:+43 1 58801 13899 * DURATION (mm-ss):04-51

of claims in the application.

Listing of claims:

1. (original) A magnetic recording medium, comprising:
an essentially non-magnetic substrate;
an underlayer; and
an exchange coupled magnetic multilayer structure, comprising:
a hard magnetic storage layer, formed on the underlayer;
a nucleation host,
formed on the hard magnetic storage layer,
exchange coupled to the hard magnetic storage layer,
with an anisotropy increasing towards the non-magnetic substrate,
and the nucleation host is softer than the hard magnetic storage layer.

2. (original) The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$,
wherein: $k = \frac{dM}{dH}\frac{H_c}{M_z}$, M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, $\frac{dM}{dH}$ being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

PAGE 3/12 * RCVD AT 12/1/2015 12:33:08 PM [Eastern Standard Time] * SVR:W-PTOFAX-001/36 * DNIS:2738300 * CSID:+43 1 58801 13899 * DURATION (mm-ss):04-51

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4. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

7. (original) The magnetic recording of medium of claim 1, wherein the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (original) The magnetic recording medium of claim 1, wherein a coercive filed of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

9. (original) The magnetic structure of claim 1 wherein a $H_c(\alpha=20°) < H_c(\alpha=45°)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

10. (original) The magnetic structure of claim 1 wherein a $H_m(\alpha=20°) < H_m(\alpha=45°)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (original) The magnetic recording medium of claim 1, wherein the nucleation host has thickness smaller than 30 nm.

13. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (original) The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. (original) The magnetic recording medium of claim 1, wherein a coupling layer is between the nucleation host and the hard magnetic storage layer.

16. (original) The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

18. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (previously presented) The magnetic recording medium of claim 1, where parameters of the medium comprise:

an anisotropy constant in the nucleation host K^{n}_{1} as a function of the layer depth a hard magnetic storage layer anisotropy constant K^{n}_{1};

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic layer.

20. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (original) The magnetic recording medium of claim 19, wherein the energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage on the non-magnetic substrate; removing the nucleation host from a multiplayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (original) The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (original) The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

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RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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26. (original) A magnetic recording medium, comprising:

a non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn; and

a hard magnetic storage layer;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer,

wherein the nucleation host comprises a plurality of layers in which anisotropy increases from one layer of the nucleation host to the next layer of the nucleation host.

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REMARKS/ARGUMENTS

The office action mailed on July 6th, 2015, has been reviewed and carefully considered. Reconsideration is respectfully requested.

Claim Rejections - 35 U.S.C. §112

In the office action (page 4) Claims 1-25 stand rejected as failing to comply with 35 U.S.C 112(b) or 35 U.S.C 112 (pre-AIA).
The examiner argues: "...support for the anisotropy of the nucleation hast to increase towards the non-magnetic substrate claimed in Claim 1. While Applicants cited paragraphs [0008] and [0022] to provide support, the instant disclosure merely discloses that the last layer comprises more than one layer, wherein the anisotropy increases from one layer to the next layer."

In the specification it is clearly stated that the anisotropy can continuously increase, as written in paragraph [0029] *"In embodiments where the anisotropy of nucleation host 21 is continuously increased, hard magnetic storage layer 24 is optional. "*

In paragraph [0008] it is written *"In embodiments, where the host layer comprises more than one layer the anisotropy increases from one layer to the next layer."*

Hence, the anisotropy either continuously increases as written in [0029] or increases from layer to layer [0008]. Hence the anisotropy has to increase as written in claim 1 by "the anisotropy increases", since there is no other option for an increasing property to either increase layer per layer or continuously.

In paragraph [0050] it is written that the anisotropy may e.g. increase or decrease as it is written:

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"The variation of K(z) can take many different form. The rise can be linear, or follow any polynomial or other rising function. It can have plateaus or steps, connected by rising segments. It can also have decreasing segments. In some embodiments, the functional form of K(z) is chosen to optimize the switching properties of the recording media, e.g. by increasing the thermal energy barrier while keeping the writing field, or coercive field, essentially unchanged, or even decreasing it."

The z-direction is according to paragraph [0034] "In the following the plane of nucleation host 21 will be identified as the x-y plane. For example, in a magnetic storage disk, the plane of the disk is essentially parallel to the x-y plane of nucleation host 21. The z coordinate then parametrizes the direction of the thickness of nucleation host 21."

Hence, it is clearly described in the specification that the anisotropy may increase or decrease in the z-direction. In claim 1 we restrict the direction to only one direction by writing it "increasing towards the non-magnetic substrate". The only other option would be "it decreases towards the non-magnetic substrate" which we do not cover with claim 1.

Claim Rejections - 35 U.S.C. §103

In the office action (page 7), claims 1, 2, 4-12, and 19-26 stand rejected as being unpatentable over Honda et al. (US Patent No. 5851643) in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint pages (hereinafter referred to as D. Suess et al.).

Remarks regarding rejections:

The examiner states "Honda et al. teaches a .... containing nucleation host with an anisotropy varying in the film normal direction ... (Figs. 1 a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 25-27, 39-43, and 58-65)." and the nucleation host is "the nucleation host

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is magnetic film 3 in the upper stacked film "

The examiner argues "Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation hast is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the upper stacked film and the hard magnetic storage layer is magnetic film 4 in the lower stacked film in Fig. 1 a)".

From Honda et al:

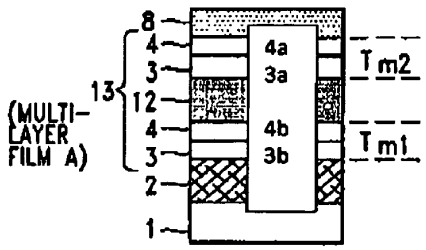


FIG. 1a

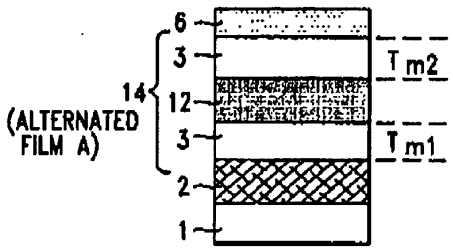


FIG. 1b

The argument of the examiner "Honda et al. teaches the nucleation host is deposited on the hard magnetic storage" is clearly not correct by looking at Fig. 1a and also in Col. 14, Lines Honda 61-66) . The nucleation host (magnetic film 3 in the upper stack) is deposit on layer 12 (which is a non-magnetic layer) and not on the hard magnetic storage layer which is magnetic film 4 in the lower stack, as written by the examiner.

Honda explicitly writes that (Col. 14, Lines Honda 61-66) "Under the same vacuum, first magnetic film 3 and second magnetic film 4 were formed in that order on the underlayer thus forming a lower stacked film. **Next, non-magnetic layer 12 was formed on top of the stacked film, with thereafter, another (here, upper) stacked film, again formed of first magnetic film 3** followed by second magnetic film 4, fabricated on top of layer 12."

It clearly states that layer 12 is a non-magnetic layer. Furthermore it clearly states "the non-magnetic layer 12 was formed on top of the stacked film, and the top of the stacked film is according to the examiner the storage layer. On top of the layer 12 the magnetic film 3 in the upper stack (the nucleation host) is deposit on layer 12.

Of course the functional behavior of the nucleation host and the storage layer is completely different if these two layers are in direct contact which leads to a strong exchange coupling of this layers or not-coupled due a the non-magnetic layer such as layer 12 in Honda. The effect of the exchange coupling between nucleation host and storage layer is shown in Fig. 4 of the application. As it can be seen with decreasing coupling the switching field of the storage layer increases which is unsuitable for magnetic recording, since the hard magnetic layer cannot be reversed by the limited head field.
In the application the hard magnetic storage layer 24, is strongly exchange coupled to a nucleation layer 21. See para [0022] of the application "a hard magnetic storage layer 24, strongly exchange coupled to a nucleation layer 21". In Honda et al. the layer 3a (according to examiner nucleation host) is not exchange coupled at all to 4b (according to examiner storage layer) due to the non-magnetic layer 12.

For the reasons set forth above, the applicants respectfully submit the pending application, which is in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.
This amendment is considered to be responsive to all points raised in the office action.

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Exhibit 1002
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Application Serial No. 12/619,849 PATENT
Reply to office action of 07/06/2015

Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

Dated: **Dec. 1st 2015**

Dieter Suess, Ph.D.
Rathausplatz 18
3130 Herzogenburg
Austria / Europe
(+43) 650 8333 999

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Pages (incl cover): **12**

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	12/01/2015	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/PAUL STANBACK/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

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☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
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☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	11/06/2015	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

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*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
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LIE
/TERRY MALLOY/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

Paper No.

Application No.:	**12/619,849**	**Date Mailed:**	**2015-11-17** **ELECTRONIC**
First Named Inventor:	Dieter SUESS	Examiner:	CHAU, LISA N
Attorney Docket No.:	CU-7887 ZBF	Art Unit:	1785
Confirmation No.:	9414	Filing Date:	11/17/2009

Please find attached an Office communication concerning this application or proceeding.

Commissioner for Patents

PTO-90c (Rev.08-06)

Notice of Non-Compliant Amendment (37 CFR 1.121)	Application No. 12/619,849	Applicant(s) SUESS, DIETER
		Art Unit OPES

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

The amendment document filed on *06 November, 2015* is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121 or 1.4. In order for the amendment document to be compliant, correction of the following item(s) is required.

THE FOLLOWING MARKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- ☐ 1. Amendments to the specification:
  - ☐ A. Amended paragraph(s) do not include markings.
  - ☐ B. New paragraph(s) should not be underlined.
  - ☐ C. Other _____.
- ☐ 2. Abstract:
  - ☐ A. Not presented on a separate sheet. 37 CFR 1.72.
  - ☐ B. Other _____.
- ☐ 3. Amendments to the drawings:
  - ☐ A. The drawings are not properly identified in the top margin as "Replacement Sheet," "New Sheet," or "Annotated Sheet" as required by 37 CFR 1.121(d).
  - ☐ B. The practice of submitting proposed drawing correction has been eliminated. Replacement drawings showing amended figures, without markings, in compliance with 37 CFR 1.84 are required.
  - ☐ C. Other _____.
- ☒ 4. Amendments to the claims:
  - ☐ A. A complete listing of all of the claims is not present.
  - ☐ B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
  - ☐ C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following status identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn) and (Withdrawn-currently amended).
  - ☐ D. The claims of this amendment paper have not been presented in ascending numerical order.
  - ☒ E. Other: *Claims 26 should be on a separate sheet of paper*.
- ☐ 5. Other (e.g., the amendment is unsigned or not signed in accordance with 37 CFR 1.4): For further explanation of the amendment format required by 37 CFR 1.121, see MPEP § 714.

TIME PERIODS FOR FILING A REPLY TO THIS NOTICE:

1. Applicant is given **no new time period if the non-compliant amendment is an** after-final amendment or an amendment filed after allowance, or a drawing submission (only) If applicant wishes to resubmit the non-compliant after-final amendment with corrections, the **entire corrected amendment** must be resubmitted.

2. Applicant is given **two months** from the mail date of this notice to supply the correction, if the non-compliant amendment is one of the following: a preliminary amendment, a non-final amendment (including a submission for a request for continued examination (RCE) under 37 CFR 1.114), a supplemental amendment filed within a suspension period under 37 CFR 1.103(a) or (c), and an amendment filed in response to a Quayle action. If any of above boxes 1 to 4 are checked, the correction required is only the corrected section of the non-compliant amendment in compliance with 37 CFR 1.121.

Extensions of time are available under 37 CFR 1.136(a) only if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action.

Failure to timely respond to this notice will result in:

Abandonment of the application if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action; or

Non-entry of the amendment if the non-compliant amendment is a preliminary amendment or supplemental amendment.

Legal Instruments Examiner (LIE), if applicable /TERRY MALLOY/ Telephone No: (571)272-1028

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Application Serial No. 12/619,849 PATENT
Reply to office action of 07/06/2015

Certification under 37 CFR § 1.8(a)
The USPTO Central Fax No: 571 273-8300
Date of Fax Transmittal: Nov 28, 2014
I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted to the United States Patent and Trademark Office to the fax number and on the date indicated above.

Dieter Suess, Ph.D

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application: Dieter SUESS] GRP ART UNIT: 1785
]
Serial No: 12/619,849] Ex.: Lisa N. CHAU
]
Filed: November 17, 2009]

For: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

AMENDMENT UNDER 37 CFR 1.111

MAIL STOP AF
The Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sirs and Madams:

In response to the office action dated 07/06/2015 the applicants submit the following responsive amendment in the above-identified application. This amendment is considered to place the application in better condition for allowance.

There are no amendments to the claims.

Remarks/Arguments begin on page 6 of this paper.

Listing of the Claims

The listing of claims presented below will replace all prior versions, and listings,

of claims in the application.

Listing of claims:

1. (original) A magnetic recording medium, comprising:
an essentially non-magnetic substrate;
an underlayer; and
an exchange coupled magnetic multilayer structure, comprising:
a hard magnetic storage layer, formed on the underlayer;
a nucleation host,
formed on the hard magnetic storage layer,
exchange coupled to the hard magnetic storage layer,
with an anisotropy increasing towards the non-magnetic substrate,
and the nucleation host is softer than the hard magnetic storage layer.

2. (original) The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$,
wherein: $k = \frac{dM}{dH}\frac{H_c}{M_s}$, M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, $\frac{dM}{dH}$ being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

4. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

7. (original) The magnetic recording of medium of claim 1, wherein the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (original) The magnetic recording medium of claim 1, wherein a coercive filed of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

9. (original) The magnetic structure of claim 1 wherein a $H_c(\alpha=20°) < H_c(\alpha=45°)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

10. (original) The magnetic structure of claim 1 wherein a $H_m(\alpha=20°) < H_m(\alpha=45°)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (original) The magnetic recording medium of claim 1, wherein the nucleation host has thickness smaller than 30 nm.

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13. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (original) The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. (original) The magnetic recording medium of claim 1, wherein a coupling layer is between the nucleation host and the hard magnetic storage layer.

16. (original) The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

18. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (previously presented) The magnetic recording medium of claim 1, where parameters of the medium comprise:

an anisotropy constant in the nucleation host K^n_1 as a function of the layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

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an exchange constant between the nucleation host and the hard magnetic layer.

20. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (original) The magnetic recording medium of claim 19, wherein the energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage on the non-magnetic substrate; removing the nucleation host from a multiplayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (original) The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (original) The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

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26. (original) A magnetic recording medium, comprising:

a non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn; and

a hard magnetic storage layer;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer,

wherein the nucleation host comprises a plurality of layers in which anisotropy increases from one layer of the nucleation host to the next layer of the nucleation host.

REMARKS/ARGUMENTS

The office action mailed on July 6th, 2015, has been reviewed and carefully considered. Reconsideration is respectfully requested.

Claim Rejections - 35 U.S.C. §112

In the office action (page 4) Claims 1-25 stand rejected as failing to comply with 35 U.S.C 112(b) or 35 U.S.C 112 (pre-AIA).

The examiner argues: "...support for the anisotropy of the nucleation hast to increase towards the non-magnetic substrate claimed in Claim 1. While Applicants cited paragraphs [0008] and [0022] to provide support, the instant disclosure merely discloses that the last layer comprises more than one layer, wherein the anisotropy

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increases from one layer to the next layer."

In the specification it is clearly stated that the anisotropy can continuously increase, as written in paragraph [0029] *"In embodiments where the anisotropy of nucleation host 21 is continuously increased, hard magnetic storage layer 24 is optional. "*

In paragraph [0008] it is written *"In embodiments, where the host layer comprises more than one layer the anisotropy increases from one layer to the next layer."*

Hence, the anisotropy either continuously increases as written in [0029] or increases from layer to layer [0008]. Hence the anisotropy has to increase as written in claim 1 by "the anisotropy increases", since there is no other option for an increasing property to either increase layer per layer or continuously.

In paragraph [0050] it is written that the anisotropy may e.g. increase or decrease as it is written:

"The variation of K(z) can take many different form. The rise can be linear, or follow any polynomial or other rising function. It can have plateaus or steps, connected by rising segments. It can also have decreasing segments. In some embodiments, the functional form of K(z) is chosen to optimize the switching properties of the recording media, e.g. by increasing the thermal energy barrier while keeping the writing field, or coercive field, essentially unchanged, or even decreasing it."

The z-direction is according to paragraph [0034] "In the following the plane of nucleation host 21 will be identified as the x-y plane. For example, in a magnetic storage disk, the plane of the disk is essentially parallel to the x-y plane of nucleation host 21. The z coordinate then parametrizes the direction of the thickness of nucleation host 21."

Hence, it is clearly described in the specification that the anisotropy may increase or

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Exhibit 1002
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decrease in the z-direction. In claim 1 we restrict the direction to only one direction by writing it "increasing towards the non-magnetic substrate". The only other option would be "it decreases towards the non-magnetic substrate" which we do not cover with claim 1.

Claim Rejections - 35 U.S.C. §103

In the office action (page 7), claims 1, 2, 4-12, and 19-26 stand rejected as being unpatentable over Honda et al. (US Patent No. 5851643) in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint pages (hereinafter referred to as D. Suess et al.).

Remarks regarding rejections:

The examiner states "Honda et al. teaches a .... containing nucleation host with an anisotropy varying in the film normal direction ... (Figs. 1 a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 25-27, 39-43, and 58-65)." and the nucleation host is "the nucleation host is magnetic film 3 in the upper stacked film "

The examiner argues "Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation hast is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the upper stacked film and the hard magnetic storage layer is magnetic film 4 in the lower stacked film in Fig. 1 a)".

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Application Serial No. 12/619,849 PATENT
Reply to office action of 07/06/2015

From Honda et al:

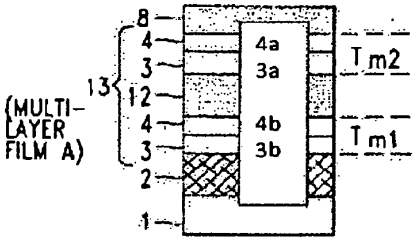


FIG. 1a

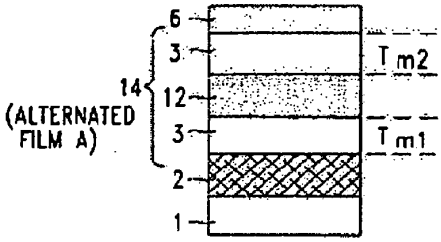


FIG. 1b

The argument of the examiner "Honda et al. teaches the nucleation host is deposited on the hard magnetic storage" is clearly not correct by looking at Fig. 1a and also in Col. 14, Lines Honda 61-66) . The nucleation host (magnetic film 3 in the upper stack) is deposit on layer 12 (which is a non-magnetic layer) and not on the hard magnetic storage layer which is magnetic film 4 in the lower stack, as written by the examiner.

Honda explicitly writes that (Col. 14, Lines Honda 61-66) "Under the same vacuum, first magnetic film 3 and second magnetic film 4 were formed in that order on the underlayer thus forming a lower stacked film. **Next, non-magnetic layer 12 was formed on top of the stacked film, with thereafter, another (here, upper) stacked film, again formed of first magnetic film 3** followed by second magnetic film 4, fabricated on top of layer 12."

It clearly states that layer 12 is a non-magnetic layer. Furthermore it clearly states "the non-magnetic layer 12 was formed on top of the stacked film, and the top of the stacked film is according to the examiner the storage layer. On top of the layer 12 the magnetic film 3 in the upper stack (the nucleation host) is deposit on layer 12.

Of course the functional behavior of the nucleation host and the storage layer is

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completely different if these two layers are in direct contact which leads to a strong exchange coupling of this layers or not-coupled due a the non-magnetic layer such as layer 12 in Honda. The effect of the exchange coupling between nucleation host and storage layer is shown in Fig. 4 of the application. As it can be seen with decreasing coupling the switching field of the storage layer increases which is unsuitable for magnetic recording, since the hard magnetic layer cannot be reversed by the limited head field.

In the application the hard magnetic storage layer 24, is strongly exchange coupled to a nucleation layer 21. See para [0022] of the application "a hard magnetic storage layer 24, strongly exchange coupled to a nucleation layer 21". In Honda et al. the layer 3a (according to examiner nucleation host) is not exchange coupled at all to 4b (according to examiner storage layer) due to the non-magnetic layer 12.

For the reasons set forth above, the applicants respectfully submit the pending application, which is in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.

This amendment is considered to be responsive to all points raised in the office action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

Dated: **Nov. 6th 2015**

Dieter Suess, Ph.D.
Rathausplatz 18
3130 Herzogenburg
Austria / Europe
(+43) 650 8333 999

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PTO/SB/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional)
Application Number 12/619,849	Filed 11/17/2009
For SUESS, DIETER	
Art Unit 1785	Examiner Lisa Chau

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☑ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 100
☐ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☐ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

☐ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☑ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☐ attorney or agent of record. Registration number _____.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

Dr. Dieter Suess — 29.9.2015
Signature — Date

Dr. Dieter Suess — +436508333999
Typed or printed name — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☒ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional)

Application Number 12/619,849	Filed 11/17/2009
For SUESS, DIETER	
Art Unit 1785	Examiner Lisa Chau

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The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☑ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 100
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☐ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

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☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

☐ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☑ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☐ attorney or agent of record. Registration number _____.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

Dr. Dieter Suess — 29.9.2015
Signature — Date

Dr. Dieter Suess — +436508333999
Typed or printed name — Telephone Number

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☒ * Total of 1 forms are submitted.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 07/06/2015

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
07/06/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

Office Action Summary	Application No. 12/619,849	Applicant(s) SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/28/14*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-26* is/are rejected.

8)☒ Claim(s) *8 and 15* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/28/14 has been entered.

Response to Amendment

3. Examiner acknowledges amended Claim 1 in the response filed on 11/28/14.

Response to Arguments

4. Applicant's arguments filed 11/28/14 have been fully considered but they are not persuasive.

Applicant argues that the claimed embodiment, the storage layer is formed on the underlayer. In contrast, Honda's storage layer 4 is formed on the nucleation host.

However, the Examiner respectfully disagrees. The instant claim is open to unrecited layers. That is, intervening layers can be present between the claimed hard magnetic storage layer and underlayer. In the instant case, Honda et al. teaches its hard magnetic storage layer formed on the underlayer (Please see Fig. 1a).

Applicant argues that the claimed embodiment, the nucleation host is formed on the storage layer. In contrast, Honda's storage layer 4b is formed on the nucleation layer 3b. Applicant further argues that the Office Action misidentifies the claimed layers in Honda. Honda has a three dimensional storage structure. In Honda's structure the storage layer-nucleation host structure 3a-4a are functionally completely independent from the 3b-4b structure. They each are formed to store a bit of information, separate from each other. Therefore, the layers the Office Action points to, 3a and 4b, are completely independent. This is expressed by observing that the layers 3a and 4b are not magnetically coupled.

However, the Examiner respectfully disagrees. The *claimed* magnetic recording structure meets the structure disclosed in Honda's magnetic recording medium, in placement, etc. Furthermore, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Examiner notes that instant Claim 1 is open to unrecited layers, such as an intervening or non-magnetic layer. In addition, dependent Claim 15 requires an intervening layer between the nucleation host and hard magnetic storage layer. Honda teaches many different configurations for its magnetic recording stack. The Examiner has cited particular columns and line numbers or figures in the references as applied to the claims below for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations

within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant, in preparing the responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. For example in Col. 6: lines 64-37, the stacked magnetic films can be joined at a common interface thereof or can be stacked in multiple layers via a non-magnetic intermediate layer. In this case, the intermediate layer 12 can be absent in Fig. 1a of Honda and/or nucleation host comprising of ferromagnetic layers.

Examiner's Note

5. The Examiner has cited particular columns and line numbers or figures in the references as applied to the claims below for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the applicant, in preparing the responses, to fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.

Claim Objections

6. Claim 8 is objected to because of the following informalities: The instant claim recites "coercive filed" (emphasis added). Filed should be field.

Applicant is advised that should Claim 17 be found allowable, Claim 15 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two

claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1-25 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

As discussed during the interview on 12/2/14, the Examiner was unable to find support for the anisotropy of the nucleation host to increase *towards* the non-magnetic

substrate claimed in Claim 1. While Applicants cited paragraphs [0008] and [0022] to provide support, the instant disclosure merely discloses that the host layer comprises more than one layer, wherein the anisotropy increases from one layer to the next layer.

Claims 2-25 are rejected as being dependent on Claim 1.

Appropriate clarification and/or correction are required in the next response.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 2, 4-12, and 19-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) in view of D. Suess et al., “Optimization of Exchange Spring Perpendicular Recording Media” Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.").

With regards to Claims 1, 4-7, 11, 25, and 26, Honda et al. teaches a perpendicular magnetic recording medium comprising an essentially non-magnetic substrate, a magnetic underlayer, an exchange coupled magnetic multilayer structure comprising a rare earth (Sm, Nd, and Dy) containing nucleation host with an anisotropy varying in the film normal direction and a CoCrPt hard magnetic storage layer (Figs. 1a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 25-27, 39-43, and 58-65).

Honda et al. further teaches that when forming its exchange coupled magnetic multilayer structure, the stacked magnetic film is preferably formed from magnetic thin-film (magnetic layers) of different compositions, and that the coercivity of the upper layer is set higher than that of the lower layer (Col. 5, Lines 64-67 and Col. 6, Lines 12-24). In Fig. 1a, Honda et al. teaches a multilayer film (13) formed of *two stacked films* containing magnetic films 3 and 4. Thus, with the teaching that the coercivity of the upper layer is set higher than the lower layer within a stacked film, magnetic film 4 has a higher coercivity than magnetic film 3. Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation host is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the *upper stacked film* and the hard magnetic storage layer is magnetic film 4 in the *lower stacked film* in Fig. 1a) (Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Considering that the nucleation host has an anisotropy varying in the film normal direction in Honda et al., it is intrinsic that the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host (Fig. 7b and Col. 6, Lines 58-65).

It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

Honda et al. teaches its nucleation host and hard magnetic storage layers comprises ferromagnetic layers with increasing anisotropy from layer to layer, which also reads on Honda et al.'s nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction (in terms of magnitude) (Fig. 7b, Col. 6, Lines 34-37, and Col. 7, Lines 14-23).

Honda et al. does not specifically teach the anisotropy in the nucleation host comprising more than one layer and the anisotropy increases from one layer to the next layer (graded anisotropy).

Suess et al. teaches a magnetic recording medium comprising an exchange coupled magnetic multilayer structure, wherein a nucleation host is softer than the hard magnetic storage layer, and the anisotropy in the nucleation host gradually increases (Slide 15 - each layer having a different anisotropy as depicted in the soft magnetic portion). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to have Honda et al.'s nucleation host conform to the teaching of Suess et al. in order to yield desirable magnetic properties (Slide 15). It would also have been obvious to one of ordinary skill in the art to have the anisotropy increasing towards the non-magnetic substrate because it is well within the purview of choice in the art to try from these very limited alternatives (i.e. either increasing or decreasing from the substrate).

With regards to Claim 8, Honda et al. teaches the coercive field of the nucleation host is less than the coercive field of the hard magnetic storage layer as set

forth/argued above (Col. 5, Lines 64-67; Col. 6, Lines 12-24; Col. 7, Lines 58-67; and Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Honda et al. does not teach the coercive field of the nucleation host is less than 1/2 of a coercive field of the hard magnetic storage layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize the coercive field of Honda et al. to have its nucleation host less than half of the coercive field of the hard magnetic storage layer in order to set a desirable saturation magnetization value and to obtain a ultra high-density recording with an overall coercivity of 2000 Oe or more (Col. 4, Lines 55-58; Col. 6, Lines 21-24; Col. 7, Lines 58 bridging to Col. 8, Line 1).

With regards to Claims 12 and 24, Honda et al. teaches its nucleation host with a thickness smaller than 30 nm (Col. 5, Lines 60-63). Therefore, it is inherent that the thickness of Honda et al.'s nucleation host has a value such that the in plane component of a magnetization remanent state is less than 20% of a total magnetization due to Honda et al. meeting the claimed thickness of its nucleation host.

With regards to Claims 2, 9, 10, and 19-23, it is inherent that Honda et al.'s magnetic recording medium has those magnetic properties as well. The properties set forth in these claims are material properties. The prior art use the same materials as claimed and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or

inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

11. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) in view of D. Suess et al., “Optimization of Exchange Spring Perpendicular Recording Media” Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20040191576 (“Shimizu et al.”).

Honda et al. disclose a perpendicular magnetic recording medium as set forth above.

Honda et al. does not teach its nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm and the height of grains is greater than the diameter of the grains.

However, Shimizu et al. teaches a perpendicular magnetic recording medium wherein the height of the grains is 5 to 50 nm and the average diameter is 4 to 12 nm ([0077] and [0097]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize Honda et al.'s nucleation host to have an average diameter greater than 2 nm and less than 10 nm, wherein the height is greater than the diameter in order to obtain a sufficient magnetic flux and to prevent degradation of reproduction output ([0012] and [0097]).

12. Claims 3 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) in view of D. Suess et al., “Optimization of Exchange Spring Perpendicular Recording Media” Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20050058855 ("Girt et al.”).

Honda et al. teaches numerous configurations for its perpendicular magnetic recording medium, including its nucleation host either in direct contact with its hard magnetic storage layer or separated from a strong exchange coupling layer having a thickness less than 5 nm (Figs. 1a and 1d; Col. 6, Lines 34-38; Col. 7, Lines 6-7).

Honda et al. does not teach its nucleation host is antiferromagnetic coupled to the hard magnetic layer.

However, Girt et al. teaches anti-ferromagnetically coupled perpendicular magnetic recording media wherein the ferromagnetic layers are anti-ferromagnetically coupled by a non-magnetic spacer layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Honda et al.'s magnetic layers be antiferromagnetically coupled in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13 8/22/14 6/24/15	LC

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52

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S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08

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S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR;	ADJ	ON	2011/01/12 16:38

			FPRS; EPO; JPO; DERWENT			
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43
S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-	ADJ	OFF	2013/11/01

			PGPUB; USPAT; USOCR; EPO; JPO; DERWENT			17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57
S48	47	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/08/22 14:55
S49	1117	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S50	1027	S49 AND ((G11B5/66 OR G11B5/65 OR G11B5/7325 OR G11B5/667 OR G11B5/82 OR G11B5/855 OR G11B5/84 OR G11B5/746 OR G11B5/656 OR G11B5/732 OR G11B5/8404 OR G11B5/72 OR G11B5/64 OR G11B5/653 OR G11B5/851 OR G11B5/1278 OR G11B5/738 OR G11B5/743 OR G11B2005/0021 OR G11B2005/0024 OR G11B2005/0029 OR G11B5/3906 OR G11B5/3909 OR G11B2020/1281 OR G11B20/10 OR G11B20/1217 OR G11B2220/235 OR G11B2220/2516 OR G11B5/1276 OR G11B5/235 OR G11B5/3113 OR G11B5/314 OR G11B5/3146 OR G11B5/3153 OR G11B5/3163 OR G11B5/3929 OR G11B5/3983 OR G11B5/6088 OR G11B5/645 OR G11B5/647 OR G11B5/70605 OR G11B5/70626 OR G11B5/708 OR G11B5/716 OR G11B5/7315 OR G11B5/735 OR G11B5/85 OR G11B5/865).CPC.)	US-PGPUB; USPAT; USOCR	ADJ	ON	2014/12/28 15:58
S51	26	S50 and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/12/28 15:58
S52	32	(428/827,828,828.1,829).ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR	ADJ	ON	2015/06/24 17:23

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EAST Search History (Interference)

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6/ 24/ 2015 5:24:38 PM
C:\ Users\ lchau5\ Documents\ EAST\ Workspaces\ 12619849\ 12619849.wsp

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011	07/12/2011	11/01/2013	08/22/2014	06/24/2015				
	1	✓	✓	✓	✓	✓				
	2	✓	✓	✓	✓	✓				
	3	✓	✓	✓	✓	✓				
	4	✓	✓	✓	✓	✓				
	5	✓	✓	✓	✓	✓				
	6	✓	✓	✓	✓	✓				
	7	✓	✓	✓	✓	✓				
	8	✓	✓	✓	✓	✓				
	9	✓	✓	✓	✓	✓				
	10	✓	✓	✓	✓	✓				
	11	✓	✓	✓	✓	✓				
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	14	✓	✓	✓	✓	✓				
	15	✓	✓	✓	✓	✓				
	16	✓	✓	✓	✓	✓				
	17	✓	✓	✓	✓	✓				
	18	✓	✓	✓	✓	✓				
	19	✓	✓	✓	✓	✓				
	20	✓	✓	✓	✓	✓				
	21	✓	✓	✓	✓	✓				
	22	✓	✓	✓	✓	✓				
	23	✓	✓	✓	✓	✓				
	24	✓	✓	✓	✓	✓				
	25	✓	✓	✓	✓	✓				
	26				✓	✓				

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 343 of 519

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 12/09/2014

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	

ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
12/09/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	12/619,849	SUESS, DIETER	
	Examiner	Art Unit	
	LISA CHAU	1785	

All participants (applicant, applicant's representative, PTO personnel):

(1) *LISA CHAU*. (3)_____.

(2) *Loren Thompson*. (4)_____.

Date of Interview: *02 December 2014*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *all pending*.

Identification of prior art discussed: *prior art of record*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Discussed the proposed amendment requiring the nucleation host's anisotropy is increasing towards the non-magnetic substrate. The Examiner was not able to find support for the anisotropy of the nucleation host to increase TOWARDS the non-magnetic substrate. In addition, Claim 4 requires the host to comprise ferromagnetic layers. Is Applicant stating that each layer has its own anisotropy value and together, the anisotropy of the ferromagnetic layers increases towards the substrate? Or does the nucleation host comprise one layer that has a has a graded anisotropy and further comprises additional ferromagnetic layers?

Applicant argues that in Honda's layers 3a and 4b do not meet the limitation of "a nucleation host … exchange coupled ot the hard magnetic storage layer" due to an intermediate layer disposed therebetween. However, the Examiner respectfully disagrees. As argued by the Examiner in the final office action dated 8/28/14, the claims are open to unrecited layers. Examiner further notes that dependent claim 15 requires an intervening layer between the nucleation host and hard magnetic storage layer, and that Honda et al.'s invention have many different configuration for its magnetic recording stack .

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/LC/ Lisa Chau	

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 345 of 519

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

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Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	12/619,849
Filing Date	November 17, 2009
First Named Inventor	Dieter Suess
Art Unit	1785
Examiner Name	Chau Lisa N
Attorney Docket Number	

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☑ Enclosed

      i. ☑ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
   The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to

   a. ☐ Deposit Account No. _____.

      i. ☐ RCE fee required under 37 CFR 1.17(e)

      ii. ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii. ☐ Other _____

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☑ Payment by credit card (Form PTO-2038 enclosed)

11/28/2014 APEREZAM 00000023 12619849
01 FC:2820 850.00 OP

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature		Date	11/28/2014
Name (Print/Type)	Dieter Suess	Registration No.	

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature			
Name (Print/Type)	Dieter Suess	Date	11/28/2014

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE; Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/30 (07-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Instruction Sheet for RCEs

(not to be submitted to the USPTO)

NOTES:

An RCE is not a new application, and filing an RCE will not result in an application being accorded a new filing date.

Filing Qualifications:
The application must be a utility or plant application filed on or after June 8, 1995. The application cannot be a provisional application, a utility or plant application filed before June 8, 1995, a design application, or a patent under reexamination. See 37 CFR 1.114(e).

Filing Requirements:
Prosecution in the application must be closed. Prosecution is closed if the applicat ion is under appeal, or the last Office action is a final action, a notice of allowance, or an action that otherwise closes prosecution in the application (e.g., an Office action under *Ex parte Quayle*). See 37 CFR 1.114(b).

A submission and a fee are required at the time the RCE is filed. If reply to an Office action under 35 U.S.C. 132 is outstanding (e.g., the application is under final rejection), the submission must meet the reply requirements of 37 CFR 1.111. If there is no outstanding Office action, the submission can be an information disclosure statement, an amendment, new arguments, or new evidence. See 37 CFR 1.114(c). The submission may be a previously filed amendment (e.g., an amendment after final rejection).

WARNINGS:

Request for Suspension of Action:
All RCE filing requirements must be met before suspension of action is granted. A request for a suspension of action under 37 C FR 1.103(c) does not satisfy the submission requirement and does not permit the filing of the required submission to be suspended.

Improper RCE will NOT toll Any Time Period:

Before Appeal - If the RCE is improper (e.g., prosecution in the application is not closed or the submission or fee has not been filed) and the application is not under appeal, the time period set forth in the last Office action will continue to run and the application will be abandoned after the statutory time period has expired if a reply to the Office action is not timely filed. No additional time will be given to correct the improper RCE.

Under Appeal - If the RCE is improper (e.g., the submission or the fee has not been filed) and the application is under appeal, the improper RCE is effective to withdraw the appeal. Withdrawal of the appeal results in the allowance or abandonment of the application depending on the status of the claims. If there are no allowed claims, the application is abandoned. If there is at least one allowed claim, the application will be passed to issue on the allowed claim(s). See MPEP 1215.01.

See MPEP 706.07(h) for further information on the RCE practice.

PAGE 3/19 * RCVD AT 11/28/2014 7:48:44 AM [Eastern Standard Time] * SVR:W-PTOFAX-001/8 * DNIS:2738300 * CSID:+43 1 58801 13899 * DURATION (mm-ss):08-15

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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Doc Code: WFEE
Document Description: Fee Worksheet (PTO-875)

PTO/SB/06 (10-07)
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PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number: 12/619,849

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X =		OR	X =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X =			X =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			N/A			N/A	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT A		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X =	0	OR	X =	
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X =	0	OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT B		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X =		OR	X =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X =		OR	X =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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NOV 28 2014

Application Serial No. 12/619,849 PATENT
Reply to office action of August 28, 2013

Certification under 37 CFR § 1.8(a)
The USPTO Central Fax No: 571 273-8300
Date of Fax Transmittal: Nov 28, 2014
I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted to the United States Patent and Trademark Office to the fax number and on the date indicated above.

Dieter Suess, Ph.D

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application: Dieter SUESS] GRP ART UNIT: 1785
]
Serial No: 12/619,849] Ex.: Lisa N. CHAU
]
Filed: November 17, 2009]

For: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

AMENDMENT AFTER FINAL UNDER 37 CFR 1.116
EXPEDITED PROCEDURE- TC-1785

MAIL STOP AF
The Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sirs and Madams:

In response to the final office action dated August 28, 2014, setting a 3-month shortened statutory period for a reply ending on November 28, 2014, the applicants submit the following responsive amendment in the above-identified application. This amendment is considered to place the application in better condition for allowance.
Also enclosed is the **Request for Continued Examination (RCE)** accompanied by the authorization to charge the fee of $ 850 (small entity) to Credit Card (Form PTO-2038 enclosed).
No other fee is believed to be required, but, if this is not the case, please charge any additional fee or credit any overpayment to the Credit Card indicated above.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 12 of this paper.

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Amendments To The Claims

The listing of claims presented below will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1. **(currently amended)** A magnetic recording medium, comprising:
an essentially non-magnetic substrate;
an underlayer; and
an exchange coupled magnetic multilayer structure, comprising:
a hard magnetic storage layer, formed on the underlayer;
a nucleation host,
formed on the hard magnetic storage layer,
exchange coupled to the hard magnetic storage layer,
with an anisotropy increasing towards the non-magnetic substrate,
~~varying in the film normal direction~~;
~~and a hard magnetic storage layer~~;

~~wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,~~

~~where the nucleation host layer comprises layer and the anisotropy increases from one layer to the next layer,~~
~~wherein the nucleation hast is deposited on the hard magnetic storage layer~~, and
the nucleation host is softer than the hard magnetic storage layer. ~~,~~

2. (original) The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong

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and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_Z/M_s < 0.7$, wherein: $k = \frac{dM}{dH}\frac{H_c}{M_s}$, M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, $\frac{dM}{dH}$ being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

4. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

7. (original) The magnetic recording of medium of claim 1, wherein the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (original) The magnetic recording medium of claim 1, wherein a coercive filed of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

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9. (original) The magnetic structure of claim 1 wherein a $H_c(\alpha=20°) < H_c(\alpha=45°)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

10. (original) The magnetic structure of claim 1 wherein a $H_m(\alpha=20°) < H_m(\alpha=45°)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn.

12. (original) The magnetic recording medium of claim 1, wherein the nucleation host has thickness smaller than 30 nm.

13. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (original) The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. (original) The magnetic recording medium of claim 1, wherein a coupling layer is between the nucleation host and the hard magnetic storage layer.

16. (original) The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

18. (original) The magnetic recording medium of claim 1, wherein the nucleation host is

coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (previously presented) The magnetic recording medium of claim 1, where parameters of the medium comprise:

an anisotropy constant in the nucleation host K^{n}_{1} as a function of the layer depth a hard magnetic storage layer anisotropy constant K^{n}_{1};

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic layer.

20. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (original) The magnetic recording medium of claim 19, wherein the energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage on the non-magnetic substrate; removing the nucleation host from a multiplayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

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23. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (original) The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (original) The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

26. (original) A magnetic recording medium, comprising:

a non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn; and

a hard magnetic storage layer;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer,

wherein the nucleation host comprises a plurality of layers in which anisotropy increases from one layer of the nucleation host to the next layer of the nucleation host.

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REMARKS/ARGUMENTS

The office action mailed on August 28, 2014, has been reviewed and carefully considered. Reconsideration is respectfully requested.

Amendments to the Claims

Claims 1-26 were pending in the present application prior to this amendment. Claims 1 has been amended.

Support in claim 1 for the requirement that -- a hard magnetic storage layer, formed on the underlayer; -- can be found in FIG. 1 para[0022] element 11b.

Support in claim 1 for the requirement that -- a nucleation host, formed on the hard magnetic storage layer -- can be found in para [0022]

Support in claim 1 for the requirement that -- increasing towards the non-magnetic substrate -- can be found in para [0022] and in para [0008].

Therefore, no new matter has been added. Accordingly, the applicant respectfully requests that this amendment be considered and entered.

Claim Rejections - 35 U.S.C. §112

In the office action (page 4) Claims 1-25 stand rejected as failing to comply with 35 U.S.C 112(b) or 35 U.S.C 112 (pre-AIA).

Since the claims have been amended and cancelled to remove all of the bases for these 35 U.S.C. §112 rejections, then the applicant respectfully request that the examiner withdraw all of these 35 U.S.C. §112 rejections.

Claim Rejections - 35 U.S.C. §103

In the office action (page 5), claims 1, 2, 4-12, and 19-25 stand rejected as being unpatentable over Honda et al. (US Patent No. 5851643) in view of D. Suess et al.,

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"Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint pages (hereinafter referred to as D. Suess et al.).

Remarks regarding rejections

1. In the claimed embodiment, the storage layer is formed on the underlayer. In contrast, Honda's storage layer 4 is formed on the nucleation host.

   Applicant has already presented this argument in the previous response. Unfortunately, the present Office Action completely ignored Applicant's argument. Applicant respectfully requests the Office to address this argument.

2. In the claimed embodiment, the nucleation host is formed on the storage layer. In contrast, Honda's storage layer 4b is formed on his nucleation layer 3b.

   The Office action incorrectly asserted that "Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer ... (the nucleation host is magnetic film 3 in the upper stacked film and the hard magnetic storage layer is magnetic film 4 in the lower stacked film in Fig. 1 a)"

   However, the Office Action misidentifies the claimed layers in Honda. Honda has a three dimensional storage structure. In Honda's structure the storage-layer-nucleation host structure 3a-4a are functionally completely independent from the 3b-4b structure. They each are formed to store a bit of information, separate from each other. Therefore, the layers the Office Action points to, 3a and 4b, are completely independent. This is best expressed by observing that the layers 3a and 4b are not magnetically coupled.

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In contrast, the claimed storage layer and nucleation host are functionally coupled as together they are intended to store a bit. This is well captured by the newly added limitation of

"a nucleation host,
formed on the hard magnetic storage layer,
exchange coupled to the hard magnetic storage layer"

Visibly, Honda's layers 3a and 4b do not meet this limitation, as they are well separated by non-magnetic layer 12.

3. Claim 3: Honda does not have his storage layer and nucleation host in direct contact.

   The Office Action rejected claim 3 in an inherently self-contradicting manner. First, the Office Action pointed to layers 3a and 4b as the alleged nucleation host and storage layer to reject claim 1. However, for rejecting claim 3, the Office Action pointed to layers 3b and 4b being in direct contact. This identification of the layers contradicts the identification of layers in claim 1, making the rejection impermissible. Therefore, Applicant respectfully submits that claim 3 stands patentable.

4. Claim 4: Honda does not have a nucleation host comprising of ferromagnetic layers. In Honda et al, the nucleation host (see Fig 1a and Fig 1b) consists of one magnetic material. This is in contrast to the varying magnetic property according to claim 4 and claim 1.

5. Claim 26: The applicant kindly points out that the arguments listed as 1. and 2. in this response also apply to claim 26.

For the reasons set forth above, the applicants respectfully submit that claims 1,

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now pending in this application, are in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter. This amendment is considered to be responsive to all points raised in the office action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,



Dated: **Nov. 28. 2014**

Dieter Suess, Ph.D.
Rathausplatz 18
3130 Herzogenburg
Austria / Europe
(+43) 650 8333 999

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To: United States Patent and Trademark Office

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Fax No: (001) 571 273-8300

Pages (incl cover): 19

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	11/28/2014	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/DIANE FLOYD/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 08/28/2014

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
08/28/2014	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

Office Action Summary	Application No. 12/619,849	Applicant(s) SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5/15/14*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-26* is/are rejected.

8)☒ Claim(s) *1-25* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Examiner acknowledges amended Claims 1, 11, and 15 and new Claim 26 in the response filed on 5/15/14.

Response to Arguments

2. Applicant's arguments with respect to Claims 1-26 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Applicant argues:

From Honda:

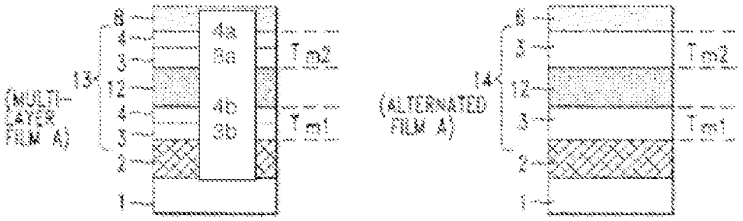


FIG. 1a FIG. 1b

The applicant ask the question to the examiner and argues that layer host layer is magnetic film 3 (in the upper stacked film) [so 3a] and storage layer is film 4 (in the lower stacked film).

However than film 3 is also a nucleation host layer in the lower stacked film (3b). In this case ,4b (storage layer) is deposit on 3b (nucleation host).

However, the applicant notes that this state is opposite to that in claim 1. Another argument is that the storage layer (4b) is deposit on the nucleation host (3b) in Honda. However, in the submitted application the storage layer is deposit on the underlayer (2).

However, Applicants' arguments are unpersuasive. Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation host is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the *upper stacked film* and the hard magnetic storage layer is magnetic film 4 in the *lower stacked film* in Fig. 1a) (Col. 14, Lines 60 bridging over to Col. 15, Lines 3). That is, from Applicant's recreated/annotated drawing of Honda et al.'s Fig. 1a, the claimed nucleation host corresponds to Honda et al.'s element 3a and the claimed hard magnetic storage layer corresponds to Honda et al.'s element 4b. The instant claims are open to unrecited layers, which can include layers that are disposed between the hard magnetic storage layer and the nucleation host and/or above or below the hard magnetic storage layer and the nucleation host.

Claim Objections

3. Claims 1-25 are objected to because of the following informalities: Instant Claim 1 recites "theanisotropy". Please provide a space between "the" and "anisotropy". Claims 2-25 are objected as being dependent on Claim 1.

Claim 8 is objected to because of the following informalities: The instant claim recites "coercive filed" (emphasis added). Filed should be field.

Applicant is advised that should Claim 17 be found allowable, Claim 15 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing

one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-25 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 1 recites the limitation "the magnetic underlayer." There is insufficient antecedent basis for this limitation in the claim.

With regards to Claim 4, Claim 4 is not further limiting Claim 1. Claim 1 requires the nucleation host to comprise multiple layers with an anisotropy relationship, which is substantially the same in Claim 4. Do applicants want *additional* ferromagnetic layers on top of the already plurality layered nucleation host?

Claims 2, 3, and 5-25 are rejected as being dependent on Claim 1.

Appropriate clarification and/or correction are required in the next response.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1, 2, 4-12, and 19-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.").

With regards to Claims 1, 7, 11, 25, and 26, Honda et al. teaches a perpendicular magnetic recording medium comprising an essentially non-magnetic substrate, a magnetic underlayer, an exchange coupled magnetic multilayer structure comprising a rare earth (Sm, Nd, and Dy) containing nucleation host with an anisotropy varying in the film normal direction and a CoCrPt hard magnetic storage layer (Figs. 1a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 25-27, 39-43, and 58-65).

Honda et al. further teaches that when forming its exchange coupled magnetic multilayer structure, the stacked magnetic film is preferably formed from magnetic thin-film (magnetic layers) of different compositions, and that the coercivity of the upper layer is set higher than that of the lower layer (Col. 5, Lines 64-67 and Col. 6, Lines 12-24). In Fig. 1a, Honda et al. teaches a multilayer film (13) formed of *two stacked films* containing magnetic films 3 and 4. Thus, with the teaching that the coercivity of the

upper layer is set higher than the lower layer within a stacked film, magnetic film 4 has a higher coercivity than magnetic film 3. Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation host is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the *upper stacked film* and the hard magnetic storage layer is magnetic film 4 in the *lower stacked film* in Fig. 1a) (Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Considering that the nucleation host has an anisotropy varying in the film normal direction in Honda et al., it is intrinsic that the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host (Fig. 7b and Col. 6, Lines 58-65).

It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

With regards to Claims 4-6, Honda et al. teaches its nucleation host and hard magnetic storage layers comprises ferromagnetic layers with increasing anisotropy from layer to layer, which also reads on Honda et al.'s nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction (in terms of magnitude) (Fig. 7b, Col. 6, Lines 34-37, and Col. 7, Lines 14-23).

Honda et al. does not specifically teach the anisotropy in the nucleation host comprising more than one layer and the anisotropy increases from one layer to the next layer (graded anisotropy).

Suess et al. teaches a magnetic recording medium comprising an exchange coupled magnetic multilayer structure, wherein a nucleation host is softer than the hard magnetic storage layer, and the anisotropy in the nucleation host gradually increases (Slide 15 - each layer having a different anisotropy as depicted in the soft magnetic portion). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to have Honda et al.'s nucleation host conform to the teaching of Suess et al. in order to yield desirable magnetic properties (Slide 15).

With regards to Claim 8, Honda et al. teaches the coercive field of the nucleation host is less than the coercive field of the hard magnetic storage layer as set forth/argued above (Col. 5, Lines 64-67; Col. 6, Lines 12-24; Col. 7, Lines 58-67; and Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Honda et al. does not teach the coercive field of the nucleation host is less than 1/2 of a coercive field of the hard magnetic storage layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize the coercive field of Honda et al. to have its nucleation host less than half of the coercive field of the hard magnetic storage layer in order to set a desirable saturation magnetization value and to obtain a ultra high-density recording with an overall coercivity of 2000 Oe or more (Col. 4, Lines 55-58; Col. 6, Lines 21-24; Col. 7, Lines 58 bridging to Col. 8, Line 1).

With regards to Claims 12 and 24, Honda et al. teaches its nucleation host with a thickness smaller than 30 nm (Col. 5, Lines 60-63). Therefore, it is inherent that the thickness of Honda et al.'s nucleation host has a value such that the in plane component of a magnetization remanent state is less than 20% of a total magnetization due to Honda et al. meeting the claimed thickness of its nucleation host.

With regards to Claims 2, 9, 10, and 19-23, it is inherent that Honda et al.'s magnetic recording medium has those magnetic properties as well. The properties set forth in these claims are material properties. The prior art use the same materials as claimed and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

8. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20040191576 ("Shimizu et al.").

Honda et al. disclose a perpendicular magnetic recording medium as set forth above.

Honda et al. does not teach its nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm and the height of grains is greater than the diameter of the grains.

However, Shimizu et al. teaches a perpendicular magnetic recording medium wherein the height of the grains is 5 to 50 nm and the average diameter is 4 to 12 nm ([0077] and [0097]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize Honda et al.'s nucleation host to have an average diameter greater than 2 nm and less than 10 nm, wherein the height is greater than the diameter in order to obtain a sufficient magnetic flux and to prevent degradation of reproduction output ([0012] and [0097]).

9. Claims 3 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) in view of D. Suess et al., “Optimization of Exchange Spring Perpendicular Recording Media” Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20050058855 ("Girt et al.”).

Honda et al. teaches numerous configurations for its perpendicular magnetic recording medium, including its nucleation host either in direct contact with its hard magnetic storage layer or separated from a strong exchange coupling layer having a thickness less than 5 nm (Figs. 1a and 1d; Col. 6, Lines 34-38; Col. 7, Lines 6-7).

Honda et al. does not teach its nucleation host is antiferromagnetic coupled to the hard magnetic layer.

However, Girt et al. teaches anti-ferromagnetically coupled perpendicular magnetic recording media wherein the ferromagnetic layers are anti-ferromagnetically coupled by a non-magnetic spacer layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Honda et al.'s magnetic layers be antiferromagnetically coupled in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011	07/12/2011	11/01/2013	08/22/2014					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	✓					
	4	✓	✓	✓	✓					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	✓	✓					
	9	✓	✓	✓	✓					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					
	15	✓	✓	✓	✓					
	16	✓	✓	✓	✓					
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	18	✓	✓	✓	✓					
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	20	✓	✓	✓	✓					
	21	✓	✓	✓	✓					
	22	✓	✓	✓	✓					
	23	✓	✓	✓	✓					
	24	✓	✓	✓	✓					
	25	✓	✓	✓	✓					
	26				✓					

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13 8/22/14	LC

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	ON	2011/01/12 11:19

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			DERWENT			
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43

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S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57
S48	47	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2014/08/22 14:55

EAST Search History (Interference)

<This search history is empty>

8/22/2014 2:56:03 PM
C:\Users\lchau5\Documents\EAST\Workspaces\12619849\12619849.wsp

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	Dieter SUESS	] GRP ART UNIT: 1785
Serial No:	12/619,849	] Ex.: Lisa N. CHAU
Filed:	November 17, 2009	]

For: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

AMENDMENT UNDER 37 CFR 1.111

The Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sir:

In response to the office action dated November 18, 2013, setting a 3-month shortened statutory period for a reply ending on February 18, 2014, the applicant submits the following responsive amendment in the above-identified application. This amendment is considered to place the application in better condition for allowance.

Also enclosed is the **Request for Three-Month Extension of Time**, thereby extending the end date of the current term to **MONDAY May 19, 2014**, accompanied by the authorization to charge the fee of **$700.00 (small entity)** to Deposit Account No. 12-0400.

The Commissioner is also authorized to charge the fee of $40.00 (small entity) to Deposit Account No. 12-0400 for the addition of one claim in excess to twenty.

No other fee is believed to be required, but, if this is not the case, please charge any additional fee or credit any overpayment to Deposit Account No. 12-0400.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 7 of this paper.

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Amendments To The Claims

The listing of claims presented below will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1. **(currently amended)** A magnetic recording medium, comprising:

an essentially non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction; and

a hard magnetic storage layer;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host, ~~**and the anisotropy in the nucleation host essentially monotonic increases towards the hard magnetic storage layer,**~~

where the host layer comprises more than one layer and theanisotropy increases from one layer to the next layer,

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer, **wherein the storage layer is deposit on the magnetic underlayer**.

2. (original) The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$,

wherein: $k = \frac{dM}{dH}\frac{H_c}{M_s}$, M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H

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being an external magnetic field parallel to a normal of the layers, $\frac{dM}{dH}$ being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

4. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

7. (original) The magnetic recording of medium of claim 1, wherein the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (original) The magnetic recording medium of claim 1, wherein a coercive filed of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

9. (original) The magnetic structure of claim 1 wherein a $H_c(\alpha=20^\circ) < H_c(\alpha=45^\circ)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

10. (original) The magnetic structure of claim 1 wherein a $H_m(\alpha=20^\circ) < H_m(\alpha=45^\circ)$,

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wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. **(currently amended)** The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of ~~**Fe, Ni, Al, Si, B, Co, Cr, Pt, Ta, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn, Ni and O**~~ **Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn**.

12. (original) The magnetic recording medium of claim 1, wherein the nucleation host has thickness smaller than 30 nm.

13. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (original) The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. **(currently amended)** The magnetic recording medium of claim 1, wherein **a coupling layer is between** the nucleation host ~~**is not in direct contact with**~~ **and** the hard magnetic storage layer.

16. (original) The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

18. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (previously presented) The magnetic recording medium of claim 1, where

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parameters of the medium comprise:

an anisotropy constant in the nucleation host K^n_1 as a function of the layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

an exchange constant between the nucleation host and the hard magnetic layer.

20. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (original) The magnetic recording medium of claim 19, wherein the energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage on the non-magnetic substrate; removing the nucleation host from a multiplayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer

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increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (original) The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (original) The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

26. (new) A magnetic recording medium, comprising:

a non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction, wherein the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn; and

a hard magnetic storage layer;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer,

wherein the nucleation host comprises a plurality of layers in which anisotropy increases from one layer of the nucleation host to the next layer of the nucleation host.

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REMARKS/ARGUMENTS

The office action mailed on November 18, 2013, has been reviewed and carefully considered. Reconsideration is respectfully requested.

Amendments to the Claims

Claims 1-25 were pending in the present application prior to this amendment. Claims 1-26 are now pending in the present application; among them, claims 1 and 26 are independent claims. Claims 1, 11, and 15 have been amended.

Support in claim 15 for the requirement that -- *a coupling layer is between the nucleation host and the hard magnetic storage layer* -- can be found in FIG. 1 and page 7 para[0033] element 22, i.e., the optional coupling layer 22.

Support in new claim 26 for the requirements that -- *the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn* -- can be found, inter alia, in original claim 11.

Support in new claim 26 for the requirements that -- *the nucleation host comprises a plurality of layers in which anisotropy increases from one layer of the nucleation host to the next layer of the nucleation host* -- can be found, inter alia, in para[0008].

Therefore, no new matter has been added. Accordingly, the applicant respectfully requests that this amendment be considered and entered.

Claim Rejections - 35 U.S.C. §112

In the office action (page 3) Claims 1-25 stand rejected as failing to comply with the written description requirement. Also in the office action (page 4), claims 1-25 stand rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter.

Since the claims have been amended to remove all of the bases for these 35 U.S.C. §112 rejections, then the applicant respectfully request that the examiner withdraw all of these 35 U.S.C. §112 rejections.

Claim Rejections - 35 U.S.C. §102 and §103

In the office action (page 5), claims 1, 2, 4-12, and 19-25 stand rejected as being unpatentable over Honda et al. (US Patent No. 5851643) in view of D. Suess

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et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint pages (hereinafter referred to as D. Suess et al.). Also in the office action (page 8), claims 13 and 14 stand rejected as being unpatentable over Honda et al. (US Patent No. 5851643) in view of D. Suess et al. and further in view of Shimizu et al. (US Pub. No. 20040191576). Also in the office action (page 9), claims 3 and 15-18 stand rejected as being unpatentable over Honda et al. (US Patent No. 5851643) in view of D. Suess et al., and further in view of Girt et al. (US Pub. No. 20050058855).

The applicant respectfully traverses all of these rejections

With regards to Claims 1, 7, 11, and 25, Honda et al. teaches a perpendicular magnetic recording medium comprising an essentially non-magnetic substrate, an exchange coupled magnetic multilayer structure comprising a Co nucleation host with an anisotropy varying in the film normal direction and a CoCrPt hard magnetic storage layer (Figs. 1 a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 39-43, 58-65).

Honda et al. further teaches that when forming its exchange coupled magnetic multilayer structure, the stacked magnetic film is preferably formed from magnetic thin film(magnetic layers) of different compositions, and that the coercivity of the upper layer is set higher than that of the lower layer (Col. 5, Lines 64-67 and Col. 6, Lines 12-24).

In Fig. 1 a, Honda et al. teaches a multilayer film (13) formed of two stacked films containing magnetic films 3 and 4. Thus, with the teaching that the coercivity of the upper layer is set higher than the lower layer within a stacked film, magnetic film 4 has a higher coercivity than magnetic film 3. Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation host is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the upper stacked film and the hard magnetic storage layer is magnetic film 4 in the lower stacked film in Fig. 1 a) (Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Considering that the nucleation host has an anisotropy varying in the film normal direction in Honda et al., it is intrinsic that the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host (Fig. 7b and Col. 6, Lines 58-65)."

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From Honda:

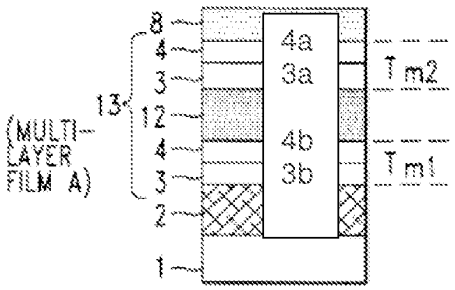


FIG. 1a

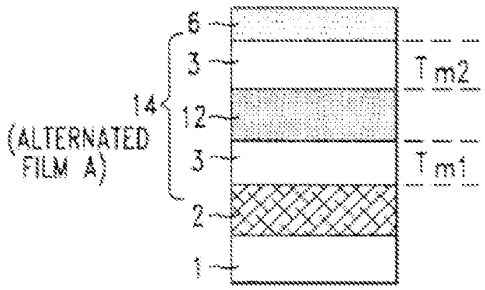


FIG. 1b

The applicant ask the question to the examiner and argues that layer host layer is magnetic film 3 (in the upper stacked film) [so 3a] and storage layer is film 4 (in the lower stacked film).

However than film 3 is also a nucleation host layer in the lower stacked film (3b). In this case ,4b (storage layer) is deposit on 3b (nucleation host).

However, the applicant notes that this state is opposite to that in claim 1. Another argument is that the storage layer (4b) is deposit on the nucleation host (3b) in Honda. However, in the submitted application the storage layer is deposit on the underlayer (2).

In Honda et al. (Col. 14, lines 52-55)

“Next, substrate 1 was heated to 2000 c., and underlayer 2 of thickness 50 nm, which acts to control magnetic film structure, was formed. ”So we could add to claim 1: “The storage layer is deposit on the magnetic underlayer” in which this is supported by **[0022]** FIG. 1 illustrates the cross sectional view of the layer structure of an existing disk of recording medium. The disk includes a substrate 5, a soft magnetic underlayer 7, an interlayer 9, an optional seed layer 11a and underlayer 11b, a hard magnetic storage layer 24, strongly exchange coupled to a nucleation layer 21, an optional coupling layer 22, a protective.”

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Regarding new claim 26, the applicant submit that new claim 26 is also in condition for allowance since new claim requires limitations not taught or suggested by any combination of the cited references, then the applicant respectfully submits that the claims are in condition for allowance.

For instance, since the claims now require that -- the nucleation host comprises at least one of Fe, Al, Cu, Ag, Ge, Pd, Sm, Nd, Dy, and Mn -- and since none of the cited references hint at these requirements then the examiner is respectfully requested to withdraw all of these obviousness rejections.

For the reasons set forth above, the applicants respectfully submit that claims 1-26, now pending in this application, are in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.

This amendment is considered to be responsive to all points raised in the office action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

Dated: **May 15, 2014**

/ **Loren K. Thompson** /

Loren K. Thompson, Ph.D., Reg. No. 45,918
Ladas & Parry LLP
224 South Michigan Avenue
Chicago, Illinois 60604
(312) 427-1300

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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Page 390 of 519

Electronic Patent Application Fee Transmittal

Application Number:	12619849
Filing Date:	17-Nov-2009
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	Loren Keith Thompson
Attorney Docket Number:	CU-7887 ZBF

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in excess of 20	2202	1	40	40
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
		Total in USD ($)		**740**

Electronic Acknowledgement Receipt

EFS ID:	19040975
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	26530
Filer:	Loren Keith Thompson
Filer Authorized By:	
Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	15-MAY-2014
Filing Date:	17-NOV-2009
Time Stamp:	15:18:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$740
RAM confirmation Number	1722
Deposit Account	120400
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Extension of Time	2014-05-15_12619849_CU7887_sb0022.pdf	187068 589ed66bed972648de369f7b662fe55f490a107f	no	2
Warnings:					
Information:					
2	Amendment/Req. Reconsideration-After Non-Final Reject	2014-05-15_12619849_CU7887_OAResponse.pdf	115054 9183e6f86fdb977eb64e768bb79769d64a2b5cbd	no	10
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32317 6b01994d7e8c31e92463f8dea6ede8b4db738d35	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	334439		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) CU-7887
Application Number 12/619,849	Filed November 17, 2009
For MULTILAYER EXCHANGE SPRING RECORDING MEDIA	
Art Unit 1785	Examiner Lisa N. CHAU

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☑	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$ 700
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☐ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number _____.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration number 45918.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Loren K. Thompson/	May 15, 2014
Signature	Date
Loren K. Thompson	312-427-1300
Typed or printed name	Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The **Privacy Act of 1974** (**P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849	Filing Date 11/17/2009	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	05/15/2014	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 25	= 1	X $40 =	40
	Independent (37 CFR 1.16(h))	* 2	Minus	***3	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	40

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/LINDA HUMES/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 11/18/2013

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	

NOTIFICATION DATE	DELIVERY MODE
11/18/2013	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ChicagoUSPTO@ladas.net

Office Action Summary	Application No. 12/619,849	Applicant(s) SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/15/11*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-25* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-25* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

1. The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

2. Receipt is acknowledged of a request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e) and a submission, filed on 11/15/2011.

Response to Amendment

3. Examiner acknowledges amended Claims 1, 15, and 19 in the response filed on 11/15/2011.

Response to Arguments

4. Applicant's arguments with respect to Claims 1-25 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Claim Rejections - 35 USC § 112

5. The following is a quotation of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), first paragraph:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1-25 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

With regards to Claim 1, as noted in the Advisory Action dated 11/2/11, while Applicant cited certain parts of the Specification to provide support for the limitation, "the anisotropy in the nucleation host essentially monotonic increases towards the hard magnetic storage layer," the Examiner does not see it being disclosed. Specifically, the anisotropy *essentially monotonic* increases *towards* the hard magnetic layer (emphasis added).

With regards to Claim 15, Applicant does not have support for the negative limitation, "the nucleation host is **not** in direct contact with the hard magnetic storage layer." Negative limitation(s) in the claim(s) must have explicit support in the specification to satisfy the description requirement of 35 USC 112, In re Grasselli, 231 USPQ 393. Also please see MPEP 2173.05(i) which states, "The mere absence of a positive recitation is not basis for an exclusion." Examiner notes that Claims 16 and 17 discloses a separation layer (coupling layer). However, Claim 15 does not have the broad support of other separation layer besides the disclosed coupling layer.

Claims 2-14 and 16-25 are rejected as being dependent on Claim 1.

Appropriate clarification and/or correction are required in the next response.

7. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

> The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-25 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

With regards to Claim 1, it is unclear to the Examiner how the anisotropy in the nucleation host essentially monotonic increases towards the hard magnetic storage layer. What exactly does "essentially monotonic increases" mean?

From the Merriam-Webster dictionary, monotonic is defined as having the property either of never increasing or of never decreasing as the values of the independent variable or the subscripts of the terms increase. Therefore, it is confusing to the Examiner combining the term monotonic with the term increasing. Is Applicant referring to monolayers? Is the limitation associated with Claims 4-6? Is the anisotropy monotonically increasing function (as in mathematics). That is, a function that either never decreases or never increases when the anisotropy increases (independent variable). What is the function that stays constant?

For the purpose of examining prior art, the Examiner is interpreting the limitation as a graded magnetic layer.

Claims 2-25 are rejected as being dependent on Claim 1.

Appropriate clarification and/or correction are required in the next response.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 2, 4-12, and 19-25 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) in view of D. Suess et al., “Optimization of Exchange Spring Perpendicular Recording Media” Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.").

With regards to Claims 1, 7, 11, and 25, Honda et al. teaches a perpendicular magnetic recording medium comprising an essentially non-magnetic substrate, an exchange coupled magnetic multilayer structure comprising a Co nucleation host with an anisotropy varying in the film normal direction and a CoCrPt hard magnetic storage layer (Figs. 1a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 39-43, 58-65).

Honda et al. further teaches that when forming its exchange coupled magnetic multilayer structure, the stacked magnetic film is preferably formed from magnetic thin-film (magnetic layers) of different compositions, and that the coercivity of the upper layer is set higher than that of the lower layer (Col. 5, Lines 64-67 and Col. 6, Lines 12-24). In Fig. 1a, Honda et al. teaches a multilayer film (13) formed of *two stacked films* containing magnetic films 3 and 4. Thus, with the teaching that the coercivity of the

upper layer is set higher than the lower layer within a stacked film, magnetic film 4 has a higher coercivity than magnetic film 3. Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation host is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the *upper stacked film* and the hard magnetic storage layer is magnetic film 4 in the *lower stacked film* in Fig. 1a) (Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Considering that the nucleation host has an anisotropy varying in the film normal direction in Honda et al., it is intrinsic that the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host (Fig. 7b and Col. 6, Lines 58-65).

It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

Honda et al. does not specifically teach the anisotropy in the nucleation host essentially monotonic increase towards the hard magnetic storage layer (magnetic layer with graded anisotropy).

However, Suess et al. teaches a magnetic recording medium comprising an exchange coupled magnetic multilayer structure, wherein a nucleation host is softer than the hard magnetic storage layer, and the anisotropy in the nucleation host

essentially monotonic increases towards the hard magnetic storage layer (Slide 15). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to have Honda et al.'s nucleation host conform to the teaching of Suess et al. in order to yield desirable magnetic properties (Slide 15).

With regards to Claims 4-6, Honda et al. teaches its nucleation host and hard magnetic storage layers comprises ferromagnetic layers with increasing anisotropy from layer to layer, which also reads on Honda et al.'s nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction (in terms of magnitude) (Fig. 7b, Col. 6, Lines 34-37, and Col. 7, Lines 14-23).

With regards to Claim 8, Honda et al. teaches the coercive field of the nucleation host is less than the coercive field of the hard magnetic storage layer as set forth/argued above (Col. 5, Lines 64-67; Col. 6, Lines 12-24; Col. 7, Lines 58-67; and Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Honda et al. does not teach the coercive field of the nucleation host is less than 1/2 of a coercive field of the hard magnetic storage layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize the coercive field of Honda et al. to have its nucleation host less than half of the coercive field of the hard magnetic storage layer in order to set a desirable saturation magnetization value and to obtain a ultra high-density recording with an overall coercivity of 2000 Oe or more (Col. 4, Lines 55-58; Col. 6, Lines 21-24; Col. 7, Lines 58 bridging to Col. 8, Line 1).

With regards to Claims 12 and 24, Honda et al. teaches its nucleation host with a thickness smaller than 30 nm (Col. 5, Lines 60-63). Therefore, it is inherent that the thickness of Honda et al.'s nucleation host has a value such that the in plane component of a magnetization remanent state is less than 20% of a total magnetization due to Honda et al. meeting the claimed thickness of its nucleation host.

With regards to Claims 2, 9, 10, and 19-23, it is inherent that Honda et al.'s magnetic recording medium has those magnetic properties as well. The properties set forth in these claims are material properties. The prior art use the same materials as claimed and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

11. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") in view of D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20040191576 ("Shimizu et al.").

Honda et al. disclose a perpendicular magnetic recording medium as set forth above.

Honda et al. does not teach its nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm and the height of grains is greater than the diameter of the grains.

However, Shimizu et al. teaches a perpendicular magnetic recording medium wherein the height of the grains is 5 to 50 nm and the average diameter is 4 to 12 nm ([0077] and [0097]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize Honda et al.'s nucleation host to have an average diameter greater than 2 nm and less than 10 nm, wherein the height is greater than the diameter in order to obtain a sufficient magnetic flux and to prevent degradation of reproduction output ([0012] and [0097]).

12. Claims 3 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) in view of D. Suess et al., “Optimization of Exchange Spring Perpendicular Recording Media” Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages ("Suess et al.") as applied to Claim 1 above, and further in view of US Pub. No. 20050058855 ("Girt et al.”).

Honda et al. teaches numerous configurations for its perpendicular magnetic recording medium, including its nucleation host either in direct contact with its hard magnetic storage layer or separated from a strong exchange coupling layer having a thickness less than 5 nm (Figs. 1a and 1d; Col. 6, Lines 34-38; Col. 7, Lines 6-7).

Honda et al. does not teach its nucleation host is antiferromagnetic coupled to the hard magnetic layer.

However, Girt et al. teaches anti-ferromagnetically coupled perpendicular magnetic recording media wherein the ferromagnetic layers are anti-ferromagnetically coupled by a non-magnetic spacer layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Honda et al.'s magnetic layers be antiferromagnetically coupled in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

Notice of References Cited	Application/Control No. 12/619,849	Applicant(s)/Patent Under Reexamination SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,851,643	12-1998	Honda et al.	428/212
*	B	US-2004/0191576	09-2004	Shimizu et al.	428/694.0TM
*	C	US-2005/0058855	03-2005	Girt, Erol	428/694.0TS
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	D. Suess et al., "Optimization of Exchange Spring Perpendicular Recording Media" Intermag Nagoya, April 2005, magnet.aip.tuwien.ac.at, Vienna University of Technology, Austria 18 powerpoint printout pages.
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668").URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44
S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	ADJ	ON	2011/01/12 11:19

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			DERWENT			
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S25	37	"18" and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30
S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43

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S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S40	42	428/8$.ccls. and (grad$5 near2 anisotrop$5)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:29
S41	3	"20060222901"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 14:32
S42	34	lisa near3 chau	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:19
S43	5	"20040057156" or "20040053078"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:34
S44	2	"20040013910"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:47
S45	8	"6759149"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S46	3	"20060177704"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:50
S47	14	"20040086753" or "20040013910" or "6610424"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	ADJ	OFF	2013/11/01 17:57

EAST Search History (Interference)

<This search history is empty>

11/1/2013 7:42:35 PM
C:\Users\lchau5\Documents\EAST\Workspaces\12619849\12619849.wsp

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11 11/1/13	LC

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011	07/12/2011	11/01/2013						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	✓						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
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	24	✓	✓	✓						
	25	✓	✓	✓						

PTO/SB/30 (10-08)
Approved for use through 11/30/2008. OMB 0651-0031
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Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	12/619,849
Filing Date	November 17, 2009
First Named Inventor	Dieter Suess
Art Unit	1785
Examiner Name	Chau, Lisa N
Attorney Docket Number	7887

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. [✓] Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. [ ] Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. [✓] Other Amendment After Final filed October 17, 2011

   b. [ ] Enclosed

      i. [ ] Amendment/Reply

      ii. [ ] Affidavit(s)/ Declaration(s)

      iii. [ ] Information Disclosure Statement (IDS)

      iv. [ ] Other _____

2. Miscellaneous

   a. [ ] Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. [ ] Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

   a. [✓] The Director is hereby authorized to charge the following fees, any underpayment of fees, or credit any overpayments, to Deposit Account No. 12-0400.

      i. [✓] RCE fee required under 37 CFR 1.17(e)

      ii. [✓] Extension of time fee (37 CFR 1.136 and 1.17)

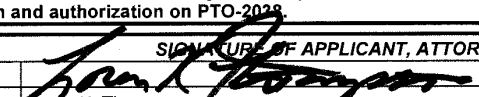
      iii. [ ] Other _____

   b. [ ] Check in the amount of $ _____ enclosed

   c. [ ] Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature		Date	11-15-2011
Name (Print/Type)	Loren K. Thompson	Registration No.	45,918

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature			
Name (Print/Type)		Date	

This collection of information is required by 37 CFR 1.114. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Patent Application Fee Transmittal

Application Number:	12619849
Filing Date:	17-Nov-2009
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	Loren Keith Thompson
Attorney Docket Number:	CU-7887 ZBF

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 1 month with $0 paid	2251	1	75	75

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	2801	1	465	465
		Total in USD ($)		**540**

Electronic Acknowledgement Receipt	
EFS ID:	11414044
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	26530
Filer:	Loren Keith Thompson
Filer Authorized By:	
Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	15-NOV-2011
Filing Date:	17-NOV-2009
Time Stamp:	17:36:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$540
RAM confirmation Number	4479
Deposit Account	120400
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	2011-11-15_12619849_CU7887_RCE_w_1MoExt.pdf	182157 ef2e2f4df4d6842 39ec8ba0e48ec81a35e31e080	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32287 8a760ad862f514545104e9f0a3baf2a32adc8b7c	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	214444		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Address: COMMISSIONER FOR PATENTS
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 11/02/2011

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	
MAIL DATE	DELIVERY MODE
11/02/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 12/619,849	**Applicant(s)** SUESS, DIETER	
	Examiner LISA CHAU	**Art Unit** 1785	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 17 October 2011 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires *3* months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☒ They raise the issue of new matter (see NOTE below);
   (c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): a) ☒ will not be entered, or b) ☐ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: _____.
   Claim(s) objected to: *15*.
   Claim(s) rejected: *1-25*.
   Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.
12. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
13. ☐ Other: _____.

/Holly Rickman/
Primary Examiner, Art Unit 1785

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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Continuation of 3. NOTE: amendment filed on 10/17/11 raises new issues that would require further consideration and/or search. While Applicant cited certain parts of the Specification to provide support for the limitation, "the anisotropy in the nucleation host essentially monotonic increases towards the hard magnetic storage layer," the Examiner does not see it being disclosed. Especially, the anisotropy continuously increases towards the hard magnetic storage layer.

Continuation of 11. does NOT place the application in condition for allowance because: Applicant's arguments are directed to non-entered claim amendments.

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Exhibit 1002
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	Dieter SUESS	] GRP ART UNIT: 1785
Serial No:	12/619,849	] Ex.: Lisa N. CHAU
Filed:	November 17, 2009	]

For: MULTILAYER EXCHANGE SPRING RECORDING MEDIA

AMENDMENT UNDER 37 CFR 1.111

Mail Stop Amendment
The Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sir:

In response to the office action dated July 19, 2011, setting a 3-month shortened statutory period for a reply ending on October 19, 2011, the applicants submit the following responsive amendment in the above-identified application. This amendment is considered to place the application in better condition for allowance.

No fee is believed to be required with this amendment, but, if this is not the case, please charge the requisite fee (or credit any overpayment) to Deposit Account No. 12-0400.

Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 424 of 519

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application:	Dieter SUESS	] GRP ART UNIT: 1785
Serial No:	12/619,849	] Ex.: Lisa N. CHAU
Filed:	November 17, 2009	]

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AMENDMENT UNDER 37 CFR 1.111

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The Commissioner for Patents
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Amendments to the Claims are reflected in the listing of claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
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Amendments To The Claims

The listing of claims presented below will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1. **(currently amended)** A magnetic recording medium, comprising:

an essentially non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction; and

a hard magnetic storage layer;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host, **and the anisotropy in the nucleation host essentially monotonic increases towards the hard magnetic storage layer,**

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer.

2. (original) The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$, wherein: $k = \frac{dM}{dH}\frac{H_c}{M_s}$, M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, $\frac{dM}{dH}$ being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

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4. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

7. (original) The magnetic recording of medium of claim 1, wherein the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (original) The magnetic recording medium of claim 1, wherein a coercive filed of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

9. (original) The magnetic structure of claim 1 wherein a $H_c(\alpha=20^o) < H_c(\alpha =45^o)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

10. (original) The magnetic structure of claim 1 wherein a $H_m(\alpha=20^o) < H_m(\alpha =45^o)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of Fe, Ni, Al, Si, B, Co, Cr, Pt, Ta, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn, Ni and O.

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12. (original) The magnetic recording medium of claim 1, wherein the nucleation host has thickness smaller than 30 nm.

13. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (original) The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. **(currently amended)** The magnetic recording medium of claim 1, wherein the nucleation host is **not** in direct contact with the hard magnetic storage layer.

16. (original) The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.
17. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.
18. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. **(currently amended)** The magnetic recording medium of claim 1, where parameters of the medium comprise:

[[a]] an anisotropy constant in the nucleation host K^n_1 as a function of the layer depth a hard magnetic storage layer anisotropy constant K^n_1;

a nucleation host grain diameter;

a hard magnetic storage layer grain diameter;

an exchange constant between grains in the nucleation host; an exchange constant between grains of the hard magnetic storage layer;

a saturation polarization in the nucleation host as a function of the layer depth;

a saturation polarization of the hard magnetic storage layer;

a layer thickness of the nucleation host;

a layer thickness of the magnetic storage layer; and

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an exchange constant between the nucleation host and the hard magnetic layer.

20. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (original) The magnetic recording medium of claim 19, wherein the energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage on the non-magnetic substrate; removing the nucleation host from a multiplayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (original) The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (original) The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

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REMARKS/ARGUMENTS

The office action mailed on July 19, 2011, has been reviewed and carefully considered. Reconsideration is respectfully requested.

Amendments to the Claims

Claims 1-25 were pending in the present application prior to this amendment. Claims 1-25 are now pending in the present application; among them, claim 1 is an independent claims. Claims 1, 15, and 19 have been amended. No new matter has been added.

Claim Objections

In the office action (page 2) claim 15 stands objected to under 37 CRF 1.75 as being substantially duplicative to claim 3.

The applicant has subsequently amended claim 15 so that it is no longer duplicative to claim 3 and therefore removed the basis for this objection. Accordingly, the examiner is respectfully requested to withdraw this objection.

Claim Rejections - 35 U.S.C. §102 and §103

In the office action (page 2) claims 1, 2, 4-7, 9-12, and 19-25 stand rejected as being anticipated by Honda et al. (U.S. 5,851,643). Also in the office action (page 5), claim 8 stands rejected as being obvious over Honda. Also in the office action (page 6), claims 3 and 15-18 stand rejected over Honda et al. in view of Girt et al. (U.S. 2005/0058855).

The claims have been amended to require limitations not taught or even suggested by any of the cited references. In particular, the claims now require that the anisotropy in the nucleation host essentially monotonic increases towards the hard magnetic storage layer. Support can be found at page 4, paragraphs [0011-0012] and page 11-12 paragraphs [0049-0050] and at page 13, paragraph [0054].

Honda discloses a perpendicular magnetic recording media with a magnetic film made from at least two layers stacked via a non-magnetic intermediate layer, wherein the magnetic film is formed on a structure control underlayer situated on a non-magnetic substrate. The stacked magnetic film is formed of magnetic thin-films of at least two or more different compositions connected with each other at an interface. The thin-films

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are epitaxially grown.

Further, Honda teaches with respect to the stacked magnetic film used as a recording media that an upper magnetic layer has a higher anisotropy than a lower magnetic layer. See Col 7, Line 10-22, which says "[t]o provide proper performance, a standard magnetic thin-film must obey the relationship, set forth in equations (relationships) (1) and (2) below, wherein a_1 and a_2 are axis lengths, i.e., lengths of a bottom side of a hexagon of a corresponding hcp structure crystal, of magnetic thin-film a located nearest the substrate and of magnetic thin-film b located farthest from the substrate, respectively, and Ku_a and Ku_b are corresponding magnetic anisotropy constants for thin-films a and b:

$$a_2 \geq a_1$$

$$Ku_b \geq Ku_a"$$

Hence, the invention Honda does not teach a nucleation host which is deposited on a hard magnetic storage layer and the nucleation host is magnetically softer than the hard magnetic storage layer and the anisotropy in the nucleation host essentially monotonic increases towards the hard magnetic storage layer.

The applicants also note that in another patent application (11/676299) assigned by Hitachi the USPTO examiner accepted this argument by recognizing that Honda teaches a magnetic recording media in which an upper magnetic layer has a higher coercivity than a lower magnetic layer. Thus, Honda actually teaches away from the currently claimed invention.

Girt is not used by the examiner to cure the above noted deficiencies of Honda in replicating the present invention. Thus, Honda and Girt, in whole or in combination, do not teach or suggest all of the limitations required in the claims, then Honda and Grit cannot support either an anticipation or an obviousness rejection to the claims. Therefore, the examiner is respectfully requested to withdraw all of these anticipation and obviousness rejections.

For the reasons set forth above, the applicants respectfully submit that claims 1-25, now pending in this application, are in condition for allowance over the cited

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references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.

This amendment is considered to be responsive to all points raised in the office action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

Dated: **October 17, 2011**

Loren K. Thompson, Ph.D., Reg. No. 45,918
Ladas & Parry LLP
224 South Michigan Avenue
Chicago, Illinois 60604
(312) 427-1300

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
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Electronic Acknowledgement Receipt

EFS ID:	11199989
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	26530
Filer:	Loren Keith Thompson
Filer Authorized By:	
Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	17-OCT-2011
Filing Date:	17-NOV-2009
Time Stamp:	14:58:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	2011-10-17_12619849_CU7887_OAResponse.pdf	349434 4941fffb487dfc2c6cf8ba99106c42ed4d0a38da	no	8

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/619,849	11/17/2009	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY ☒ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 10/17/2011

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 25	Minus	** 25	= 0	X $30 =	0	OR	X $ =	
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $125 =	0	OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/BRENDA HINES/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 07/19/2011

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	
MAIL DATE	DELIVERY MODE
07/19/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/619,849	SUESS, DIETER	
	Examiner	Art Unit	
	LISA CHAU	1785	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 April 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☒ Claim(s) *15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Examiner acknowledges amended Claims 1 and 19 in the response filed on 4/25/11.

Response to Arguments

2. Applicant's arguments with respect to Claims 1-25 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

3. Applicant is advised that should Claim 3 be found allowable, Claim 15 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 2, 4-7, 9-12, and 19-25 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent No. 5851643 (“Honda et al.”).

With regards to Claims 1, 7, 11, and 25, Honda et al. teaches a perpendicular magnetic recording medium comprising an essentially non-magnetic substrate, an exchange coupled magnetic multilayer structure comprising a Co nucleation host with an anisotropy varying in the film normal direction and a CoCrPt hard magnetic storage layer (Figs. 1a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 39-43, 58-65).

Honda et al. further teaches that when forming its exchange coupled magnetic multilayer structure, the stacked magnetic film is preferably formed from magnetic thin-film (magnetic layers) of different compositions, and that the coercivity of the upper layer is set higher than that of the lower layer (Col. 5, Lines 64-67 and Col. 6, Lines 12-24). In Fig. 1a, Honda et al. teaches a multilayer film (13) formed of *two stacked films* containing magnetic films 3 and 4. Thus, with the teaching that the coercivity of the upper layer is set higher than the lower layer within a stacked film, magnetic film 4 has a higher coercivity than magnetic film 3. Therefore, Honda et al. teaches the nucleation host is deposited on the hard magnetic storage layer and the nucleation host is softer than the hard magnetic storage layer (the nucleation host is magnetic film 3 in the *upper stacked film* and the hard magnetic storage layer is magnetic film 4 in the *lower stacked film* in Fig. 1a) (Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Considering that the nucleation host has an anisotropy varying in the film normal direction in Honda et al., it is inherent that the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host (Fig. 7b and Col. 6, Lines 58-65).

It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes,

the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

With regards to Claims 4-6, Honda et al. teaches its nucleation host and hard magnetic storage layers comprises ferromagnetic layers with increasing anisotropy from layer to layer, which also reads on Honda et al.'s nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction (in terms of magnitude) (Fig. 7b, Col. 6, Lines 34-37, and Col. 7, Lines 14-23).

With regards to Claims 12 and 24, Honda et al. teaches its nucleation host with a thickness smaller than 30 nm (Col. 5, Lines 60-63). Therefore, it is inherent that the thickness of Honda et al.'s nucleation host has a value such that the in plane component of a magnetization remanent state is less than 20% of a total magnetization due to Honda et al. meeting the claimed thickness of its nucleation host.

With regards to Claims 2, 9, 10, and 19-23, it is inherent that Honda et al.'s magnetic recording medium has those magnetic properties as well. The properties set forth in these claims are material properties. The prior art use the same materials as claimed and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or

inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") as applied to Claim 1 above.

With regards to Claim 8, Honda et al. teaches the coercive field of the nucleation host is less than the coercive field of the hard magnetic storage layer as set forth/argued above (Col. 5, Lines 64-67; Col. 6, Lines 12-24; Col. 7, Lines 58-67; and Col. 14, Lines 60 bridging over to Col. 15, Lines 3).

Honda et al. does not teach the coercive field of the nucleation host is less than 1/2 of a coercive field of the hard magnetic storage layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize the coercive field of Honda et al. to have its nucleation host less than half of the coercive field of the hard magnetic storage layer in order to set a desirable saturation magnetization value and to obtain a ultra high-density recording with an overall coercivity of 2000 Oe or more (Col. 4, Lines 55-58; Col. 6, Lines 21-24; Col. 7, Lines 58 bridging to Col. 8, Line 1).

8. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) as applied to Claim 1 above, and further in view of US Pub. No. 20040191576 (“Shimizu et al.”).

Honda et al. disclose a perpendicular magnetic recording medium as set forth above.

Honda et al. does not teach its nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm and the height of grains is greater than the diameter of the grains.

However, Shimizu et al. teaches a perpendicular magnetic recording medium wherein the height of the grains is 5 to 50 nm and the average diameter is 4 to 12 nm ([0077] and [0097]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize Honda et al.'s nucleation host to have an average diameter greater than 2 nm and less than 10 nm, wherein the height is greater than the diameter in order to obtain a sufficient magnetic flux and to prevent degradation of reproduction output ([0012] and [0097]).

9. Claims 3 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) as applied to Claim 1 above, and further in view of US Pub. No. 20050058855 ("Girt et al.”).

Honda et al. teaches numerous configurations for its perpendicular magnetic recording medium, including its nucleation host either in direct contact with its hard magnetic storage layer or separated from a strong exchange coupling layer having a thickness less than 5 nm (Figs. 1a and 1d; Col. 6, Lines 34-38; Col. 7, Lines 6-7).

Honda et al. does not teach its nucleation host is antiferromagnetic coupled to the hard magnetic layer.

However, Girt et al. teaches anti-ferromagnetically coupled perpendicular magnetic recording media wherein the ferromagnetic layers are anti-ferromagnetically coupled by a non-magnetic spacer layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Honda et al.'s magnetic layers be antiferromagnetically coupled in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LISA CHAU whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

Notice of References Cited	Application/Control No. 12/619,849	Applicant(s)/Patent Under Reexamination SUESS, DIETER	
	Examiner LISA CHAU	Art Unit 1785	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,851,643	12-1998	Honda et al.	428/212
*	B	US-2004/0191576	09-2004	Shimizu et al.	428/694.0TM
*	C	US-2005/0058855	03-2005	Girt, Erol	428/694.0TS
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668"). URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
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S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S25	37	"18" and (diameter same grain same height) and (perpendicular. ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
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S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43
S37	1851	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S38	859	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38
S39	20	S37 and S38	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/07/12 13:38

EAST Search History (Interference)

< This search history is empty>

7/12/2011 1:41:19 PM
C:\Documents and Settings\lchau5\My Documents\EAST\Workspaces\12619849\12619849.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011	07/12/2011							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	✓	✓							
	21	✓	✓							
	22	✓	✓							
	23	✓	✓							
	24	✓	✓							
	25	✓	✓							

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC
Update	7/12/11	LC

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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APR 25 2011

Certification under 37 C.F.R. §1.8(a)

The USPTO Central Fax No. (571) 273-8300

Date of Fax Transmittal: 4-25-2011

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being transmitted to the United States Patent and Trademark Office to the fax number and on the date indicated above.

Zareefa Burki Flener Reg. No. 52,896

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR:	**Dieter Suess**	) EXAMINER: **Chau, Lisa N.**
SERIAL NO:	**12/619,849**	) GROUP ART UNIT: **1785**
FILED:	**11/17/2009**	)

TITLE: **Multilayer Exchange Spring Recording Media**
ATTORNEY DOCKET NO. **CU-7887**

Mail Stop Amendment
THE COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

This paper is responsive to the office action mailed January 25, 2011, having a term for response of April 25, 2011. The Applicant respectfully requests reconsideration of the above-identified application in view of the following amendments and remarks.

Please note that the Application is filed under SMALL ENTITY status and any fees or credits should be charged to our deposit acct. no. 120400 accordingly. Your assistance in this matter is greatly appreciated.

Amendment to the Claims are reflected in the **Listing of Claims** beginning on page 2 of this paper.

Remarks begin on page 7 of this paper.

PAGE 1/10 * RCVD AT 4/25/2011 5:58:25 PM [Eastern Daylight Time] * SVR:W-PTOFAX-001/44 * DNIS:2738300 * CSID:312 427 6663 * DURATION (mm-ss):01-51

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AMENDMENT

Amendments to the Claims

The listing of claims presented below replaces all prior versions, and listings, of claims in the application.

Applicant wishes to make the following amendments to the claims of the above patent application:

Listing of Claims

1. (currently amended) A magnetic recording medium, comprising:

an essentially non-magnetic substrate; and

an exchange coupled magnetic multilayer structure, comprising:

a nucleation host with an anisotropy varying in the film normal direction; and

a hard magnetic storage layer;

wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host,

wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer.

2. (original) The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$, wherein:

$$k = \frac{dM\ H_c}{dH\ M_s},$$

M being a magnetization of the recording medium,

M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the

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APR 25 2011

layers, *dM/dH* being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

4. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. (original) The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. (original) The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing anisotropy values.

7. (original) The magnetic recording of medium of claim 1, wherein the hard magnetic storage layer comprises of at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. (original) The magnetic recording medium of claim 1, wherein a coercive filed of the nucleation host is less than ½ of a coercive field of the hard magnetic storage layer.

9. (original) The magnetic structure of claim 1 wherein a $H_c(\alpha=20°) < H_c(\alpha=45°)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

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10. (original) The magnetic structure of claim 1 wherein a $H_m(\alpha=20^o) < H_m(\alpha=45^o)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of Fe, Ni, Al, Si, B, Co, Cr, Pt, Ta, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn, Ni and O.

12. (original) The magnetic recording medium of claim 1, wherein the nucleation host has thickness smaller than 30 nm.

13. (original) The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. (original) The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. (original) The magnetic recording medium of claim 1, wherein the nucleation host is in direct contact with the hard magnetic storage layer.

16. (original) The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

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18. (original) The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. (currently amended) The magnetic recording medium of claim 1, where parameters of the media structure comprise:
a anisotropy constant in the nucleation host K^n_1 as a function of the layer depth;
a hard magnetic storage layer anisotropy constant K^n_1;
a nucleation host grain diameter;
a hard magnetic storage layer grain diameter;
an exchange constant between grains in the nucleation host;
an exchange constant between grains of the hard magnetic storage layer;
a saturation polarization in the nucleation host as a function of the layer depth;
a saturation polarization of the hard magnetic storage layer;
a layer thickness of the nucleation host;
a layer thickness of the magnetic storage layer; and
an exchange constant between the nucleation host and the hard magnetic layer.

20. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than ½ of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

22. (original) The magnetic recording medium of claim 19, wherein the energy barrier of the hard magnetic storage layer is determined by at least one of: depositing only the hard magnetic storage on the non-magnetic substrate;

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removing the nucleation host from a multiplayer structure; and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. (original) The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. (original) The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. (original) The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

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REMARKS

This is responsive to the office action January 25, 2011. In the office action, claims 1-25 are rejected. The Applicant submits that the rejection of the claims is overcome by amendment or is traversed by arguments below.

In the Claims, please amend claim 1 and claim 19. Claim 19 is amended for clarity. Support for claim 1 can be found in the originally filed disclosure for example in paragraph 30 providing "The recording media includes hard magnetic storage layer 24 and softer nucleation host 21" and also paragraph 32 providing "In some embodiments nucleation host 21 can be formed on hard magnetic storage layer 24." Therefore, no new matter has been added. The amendments to the claims can be viewed in the amendments section in the Listing of claims beginning on page 2 of this paper.

Claims 1, 2, 4-7, 9-12, and 19-25 are rejected under 35 U.S.C 102(b) as being anticipated by Honda et al. (U.S. 5,851,643).

The Applicant respectfully disagrees and submits that the claims are novel and not anticipated thereby.

Independent amended claim 1 recites "...wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer...". This amendment is fully supported by the original disclosure.

Honda et al. discloses a perpendicular magnetic recording media with a magnetic film made from at least two layer stacked via a non-magnetic intermediate layer, wherein the magnetic film is formed on a structure control underlayer situated on a non-magnetic substrate. The stacked magnetic film is

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formed of magnetic thin-films of at least two or more different compositions connected with each other at an interface. The thin-films are epitaxially grown.

Furthermore, Honda et al. teaches with respect to the stacked magnetic film used as a recording media that an upper magnetic layer has a higher anisotropy than a lower magnetic layer. See col. 7, ll. 10-22, which provides "To provide proper performance, a standard magnetic thin-film must obey the relationship, set forth in equations (relationships) (1) and (2) below, wherein a_1 and a_2 are axis lengths, i.e., lengths of a bottom side of a hexagon of a corresponding hcp structure crystal, of magnetic thin-film a located nearest the substrate and of magnetic thin-film b located farthest from the substrate, respectively, and Ku_a and Ku_b are corresponding magnetic anisotropy constants for thin-films a and b:

$$a_2 \geq a_1 \qquad (1)$$

$$Ku_b \geq Ku_a \qquad (2)$$

The stacked.... ".

Hence, contrary to the claimed invention, Honda et al. does not teach a nucleation host which is deposited on a hard magnetic storage layer.

In order to clearly illustrate the difference between claim 1 and Honda et al., the following recitation has been added to claim 1, "...wherein the nucleation host is deposited on the hard magnetic storage layer, and the nucleation host is softer than the hard magnetic storage layer...".

One feature of the invention is that a hard magnetic storage layer is combined with a magnetic nucleation host with an anisotropy varying in the film normal direction wherein the nucleation host is softer than the hard magnetic storage layer.

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By depositing the softer nucleation host on the hard magnetic storage layer, the nucleation host is closer to the write head so that during the process of writing magnetic domains are first generated within the upper softer nucleation host and move down to the interface connecting the nucleation host with the lower storage layer. Due to the varying anisotropy of the nucleation host the magnetic domain does not remain pinned at this interface which would normally be in the case but can move relatively easily into the hard magnetic storage layer in order to switch the respective grain.

Due to this multilayer architecture the writing of information into the hard magnetic storage layer can be done precisely and smaller writing fields can be applied as compared to recording medias described in the state of the art.

At least for these reasons, claim 1 and the claims dependent thereon are not anticipated by Honda et al. The Applicant submits that the claims are novel and respectfully requests that the Examiner withdraw this rejection of the claims.

Claim 8 was rejected under 35 U.S.C. 103(a) as being obvious and unpatentable over Honda et al. Claims 13and 14 are also rejected as being obvious and unpatentable over Honda et al. in view of Shimizu et al. (U.S. 2004/0191576). Claims 3 and 15-18 are likewise rejected as being obvious and unpatentable over Honda et al. but in view of Girt et al. (U.S. 2005/0058855).

The Applicant respectfully disagrees and submits that at least because all of the elements of the independent claim 1 are not taught, disclosed or suggested by Honda et al., and none of the other references cure this deficit found in Honda et al., in whole or in combination, independent claim 1 is non-obvious and allowable, and so are the claims depending therefrom. The Applicant respectfully requests that the Examiner withdraw this ground of rejection.

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CONCLUSIONS

Applicant respectfully contends that all conditions of patentability are met in the pending claims as amended and requests that the amendments to the claims be entered into the record. Applicant respectfully submits that this application should be in condition for allowance. Furthermore, Applicant respectfully requests favorable consideration.

Respectfully submitted,



Zareefa B. Flener, Pat. Reg. No. 52,896
Attorney for Applicant

Ladas & Parry, LLP
224 South Michigan Ave.
Suite 1600
Chicago, IL 60604

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PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
12/619,849	11/17/2009	

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY ☒		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 04/25/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 25	Minus	** 25	= 0	X $26 =	0	OR	X $ =	
Independent (37 CFR 1.16(h))	* 1	Minus	***3	= 0	X $110 =	0	OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/DIANIECE JACOBS/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF	9414

26530 7590 01/25/2011

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
CHAU, LISA N	
ART UNIT	PAPER NUMBER
1785	
MAIL DATE	DELIVERY MODE
01/25/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	12/619,849	SUESS, DIETER	
	Examiner	Art Unit	
	Lisa Chau	1785	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 November 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☒ Claim(s) *3 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 November 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Applicant is advised that should Claim 3 be found allowable, Claim 15 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 4-7, 9-12, and 19-25 are rejected under 35 U.S.C. 102(b) as being anticipated by US Patent No. 5851643 ("Honda et al.").

With regards to Claims 1, 7, 11, and 25, Honda et al. teaches a perpendicular magnetic recording medium comprising an essentially non-magnetic substrate, an exchange coupled magnetic multilayer structure comprising a Co nucleation host with an anisotropy varying in the film normal direction and a CoCrPt hard magnetic storage layer (Figs. 1a and 7b; Col. 4, Lines 35-45; Col. 6, Lines 39-43, 58-65).

Considering that the nucleation host has an anisotropy varying in the film normal direction in Honda et al., it is inherent that the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host (Fig. 7b and Col. 6, Lines 58-65).

It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

With regards to Claims 4-6, Honda et al. teaches its nucleation host and hard magnetic storage layers comprises ferromagnetic layers with increasing anisotropy from layer to layer, which also reads on Honda et al.'s nucleation host having a ferromagnetic layer with a continuous change of anisotropy in the film normal direction (in terms of magnitude) (Fig. 7b, Col. 6, Lines 34-37, and Col. 7, Lines 14-23).

With regards to Claims 12 and 24, Honda et al. teaches its nucleation host with a thickness smaller than 30 nm (Col. 5, Lines 60-63). Therefore, it is inherent that the thickness of Honda et al.'s nucleation host has a value such that the in plane component of a magnetization remanent state is less than 20% of a total magnetization due to Honda et al. meeting the claimed thickness of its nucleation host.

With regards to Claims 2, 9, 10, and 19-23, it is inherent that Honda et al.'s magnetic recording medium has those magnetic properties as well. The properties set

forth in these claims are material properties. The prior art use the same materials as claimed and therefore, would be expected to exhibit the same properties as claimed. It has been held that where claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to applicant to show that prior art products do not necessarily or inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC §102 or on prima facie obviousness under 35 USC §103, jointly or alternatively. In re Best, Bolton, and Shaw, 195 USPQ 430. (CCPA 1977).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 ("Honda et al.") as applied to Claim 1 above.

With regards to Claim 8, Honda et al. teaches the coercive field of the nucleation host is less than the coercive field of the hard magnetic storage layer (Col. 7, Lines 58-67). Honda et al. does not teach the coercive field of the nucleation host is less than 1/2 of a coercive field of the hard magnetic storage layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize the coercive field of Honda et al. to have its nucleation host less than half of the coercive field of the hard magnetic storage layer in order to set a desirable

saturation magnetization value and to obtain a ultra high-density recording with an overall coercivity of 2000 Oe or more (Col. 4, Lines 55-58; Col. 6, Lines 21-24; Col. 7, Lines 58 bridging to Col. 8, Line 1).

6. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) as applied to Claim 1 above, and further in view of US Pub. No. 20040191576 (“Shimizu et al.”).

Honda et al. disclose a perpendicular magnetic recording medium as set forth above.

Honda et al. does not teach its nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm and the height of grains is greater than the diameter of the grains.

However, Shimizu et al. teaches a perpendicular magnetic recording medium wherein the height of the grains is 5 to 50 nm and the average diameter is 4 to 12 nm ([0077] and [0097]). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to optimize Honda et al.'s nucleation host to have an average diameter greater than 2 nm and less than 10 nm, wherein the height is greater than the diameter in order to obtain a sufficient magnetic flux and to prevent degradation of reproduction output ([0012] and [0097]).

7. Claims 3 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 5851643 (“Honda et al.”) as applied to Claim 1 above, and further in view of US Pub. No. 20050058855 ("Girt et al.”).

Honda et al. teaches numerous configurations for its perpendicular magnetic recording medium, including its nucleation host either in direct contact with its hard magnetic storage layer or separated from a strong exchange coupling layer having a thickness less than 5 nm (Figs. 1a and 1d; Col. 6, Lines 34-38; Col. 7, Lines 6-7).

Honda et al. does not teach its nucleation host is antiferromagnetic coupled to the hard magnetic layer.

However, Girt et al. teaches anti-ferromagnetically coupled perpendicular magnetic recording media wherein the ferromagnetic layers are anti-ferromagnetically coupled by a non-magnetic spacer layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have Honda et al.'s magnetic layers be antiferromagnetically coupled in order to improve signal-to-medium noise ratio and thermal stability (Abstract).

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lisa Chau whose telephone number is (571)270-5496. The examiner can normally be reached on Monday-Friday 8:30 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on (571) 272 - 1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/LC/
Lisa Chau

/Holly Rickman/
Primary Examiner, Art Unit 1785

Notice of References Cited	Application/Control No. 12/619,849	Applicant(s)/Patent Under Reexamination SUESS, DIETER	
	Examiner Lisa Chau	Art Unit 1785	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,851,643	12-1998	Honda et al.	428/212
*	B	US-2004/0191576	09-2004	Shimizu et al.	428/694.0TM
*	C	US-2005/0058855	03-2005	Girt, Erol	428/694.0TS
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	**Art Unit**
	Lisa Chau	1785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2011								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
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	22	✓								
	23	✓								
	24	✓								
	25	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12619849	SUESS, DIETER
	Examiner	Art Unit
	Lisa Chau	1785

SEARCHED			
Class	Subclass	Date	Examiner
428	827, 828, 828.1, and 829	1/12/10	LC

SEARCH NOTES		
Search Notes	Date	Examiner
Inventors	1/12/10	LC
Talked with Kevin Bernatz	1/12/10	LC

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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BIB DATA SHEET

CONFIRMATION NO. 9414

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/619,849	11/17/2009	428	1785	CU-7887 ZBF

APPLICANTS
Dieter SUESS, Herzogenburg, AUSTRIA;

**** CONTINUING DATA ***************************
This application is a DIV of 11/424,859 06/17/2006 /LC/

**** FOREIGN APPLICATIONS *************************** None /LC/

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
11/30/2009

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /LISA N CHAU/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		AUSTRIA	6	25	1

ADDRESS

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604
UNITED STATES

TITLE

MULTILAYER EXCHANGE SPRING RECORDING MEDIA

FILING FEE RECEIVED		
592	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	2	((DIETER) near2 (SUESS)).INV.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 10:22
S2	1	((DIETER) near2 (SUESS)).INV.	EPO; JPO; DERWENT	ADJ	ON	2011/01/07 10:23
S3	10	(("5583727") or ("6280813") or ("6383668") or ("6468670") or ("20070292720")).PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2011/01/07 10:24
S4	25	("5569533" | "5815342" | "6294490").PN. OR ("6383668"). URPN.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:18
S5	826	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S6	604	S5 and anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:31
S7	12	S5 and anisotropy and host	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:32
S8	1	"20100165508"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:37
S9	46	vary$6 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S10	2	S9 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:40
S11	4988	(varies$5 or vary$6) same anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S12	483	S11 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:52
S13	1651	(varies$5 or vary$6) near12 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S14	1752	(varies$5 or vary$6) near15 anisotropy	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S15	167	S14 and "428"/	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:53
S16	115	S14 and recording.ab.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/07 11:54
S17	4	"20030180577" or "20060228586" or "20060222901"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/11 14:20
S18	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 09:44

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
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S19	3	"20060177700"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:17
S20	3	"20060177704"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 11:19
S21	2	"20050058855"	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:06
S22	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:07
S23	12	"18" and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:07
S24	3445	"18" and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S25	37	"18" and (diameter same grain same height) and (perpendicular. ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:08
S26	828	(428/827,828,828.1,829).ccls.	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:10
S27	5	S26 and (diameter same grain same height) and (perpendicular.ab.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:10
S28	2	S26 and (anti$1ferro$1magnet$5 coupl$5) and (diameter same grain same height)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:12
S29	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR	ADJ	ON	2011/01/12 16:13
S30	29	S26 and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:13
S31	67	(perpendicular near3 recording).ab. and (height same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:30

RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
Exhibit 1002
Page 475 of 519

S32	119	(perpendicular near3 recording).ab. and (thickness same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:35
S33	15	(perpendicular near3 recording).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S34	74	(magnetic recording medium).ab. and (height same (granular or grain) same diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:38
S35	5	(magnetic recording medium).ab. and (height same (granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:42
S36	116	(magnetic recording medium).ab. and ((granular or grain) same average diameter)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	ADJ	ON	2011/01/12 16:43

EAST Search History (Interference)

< This search history is empty>

1/12/2011 5:38:59 PM
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF

CONFIRMATION NO. 9414

26530
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

PUBLICATION NOTICE

OC000000040545542

Title:MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Publication No.US-2010-0062286-A1
Publication Date:03/11/2010

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
12/619,849	11/17/2009	Dieter SUESS	CU-7887 ZBF

CONFIRMATION NO. 9414

26530
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

POA ACCEPTANCE LETTER

OC000000039021212

Date Mailed: 12/02/2009

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/17/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/byemane-brehan/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
12/619,849	11/17/2009	1794	592	CU-7887 ZBF	25	1

CONFIRMATION NO. 9414

26530
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

FILING RECEIPT

OC000000039021043

Date Mailed: 12/02/2009

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Dieter SUESS, Herzogenburg, AUSTRIA;

Power of Attorney: The patent practitioners associated with Customer Number 26530

Domestic Priority data as claimed by applicant

This application is a DIV of 11/424,859 06/17/2006

Foreign Applications

If Required, Foreign Filing License Granted: 11/30/2009

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 12/619,849**

Projected Publication Date: 03/11/2010

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****

Title

MULTILAYER EXCHANGE SPRING RECORDING MEDIA

Preliminary Class

428

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DOCKET: CU-7886

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

APPLICANT:	Dieter SUESS	)
SERIAL NO:	11/424,859	) Group Art Unit: 1794
FILING DATE:	June 17, 2006	) Examiner: Chau, Lisa N.
TITLE:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA	)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

POWER OF ATTORNEY

We hereby appoint the attorneys associated with **Customer Number 26530** to prosecute the application identified above, and to transact all business in the U.S. Patent and Trademark Office connected therewith.

Please address all correspondence for the above-identification application to:

Customer Number 26530

Richard J. Streit
Ladas & Parry LLP
224 South Michigan Avenue
Chicago, Illinois 60604
(312) 427-1300

I am the:

☒ Applicant/Inventor

☐ Assignee of record of the entire interest
Statement under 37 CFR 3.73(b) is enclosed

3 Nov. 2009
Date

Dieter SUESS

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/424,859	06/17/2006	Dieter Suess	CU-7886 ZBF

CONFIRMATION NO. 8267

POA ACCEPTANCE LETTER

26530
LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

OC000000038741902

Date Mailed: 11/17/2009

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This is in response to the Power of Attorney filed 11/06/2009.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

/snguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CU-7887 ZBF
	Application Number	
Title of Invention	MULTILAYER EXCHANGE SPRING RECORDING MEDIA	

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Prefix	Given Name	Middle Name	Family Name	Suffix
	Dieter		SUESS	

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City	Herzogenburg	Country Of Residence[i]	AT
Citizenship under 37 CFR 1.41(b) [i]	AT		

Mailing Address of Applicant:

Address 1	Rathausplatz 18		
Address 2			
City	Herzogenburg	State/Province	
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Application Information:

Title of the Invention	MULTILAYER EXCHANGE SPRING RECORDING MEDIA		
Attorney Docket Number	CU-7887 ZBF	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CU-7887 ZBF
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Title of Invention	MULTILAYER EXCHANGE SPRING RECORDING MEDIA	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CU-7887 ZBF
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Title of Invention	MULTILAYER EXCHANGE SPRING RECORDING MEDIA	

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Signature	/Brian W. Hameder/			Date (YYYY-MM-DD)	2009-11-17
First Name	Brian W.	Last Name	Hameder	Registration Number	45613

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Application Number:	
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Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Filer:	Brian WIlliam Hameder/Debbie Szumowski
Attorney Docket Number:	CU-7887 ZBF

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Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
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EFS ID:	6467174
Application Number:	12619849
International Application Number:	
Confirmation Number:	9414
Title of Invention:	MULTILAYER EXCHANGE SPRING RECORDING MEDIA
First Named Inventor/Applicant Name:	Dieter SUESS
Customer Number:	26530
Filer:	Brian WIlliam Hameder/Debbie Szumowski
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Attorney Docket Number:	CU-7887 ZBF
Receipt Date:	17-NOV-2009
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Application Type:	Utility under 35 USC 111(a)

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Specification	1	14
Claims	15	18
Abstract	19	19
Drawings-only black and white line drawings	20	25

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Multilayer Exchange Spring Recording Media

Dieter Suess

BACKGROUND

Field of Invention

[0001] This invention relates generally to magnetic recording media, and more particularly to thermally stable high density media.

Description of Related Art

[0002] Modern magnetic recording media reaches ever higher recording densities. Further increase of the areal density is believed to be limited by the superparamagnetic limit. This limit represents that as the size of the magnetic grains in the media decrease, at some grain size the thermal fluctuations at room temperature $k_B T_{300}$ become capable of overcoming the energy barrier $\Delta E=KV$, which separates the two magnetization directions of an isolated grain with a volume V and an uniaxial anisotropy constant K. This superparamagnetic limit, or thermal instability, can be overcome by increasing the anisotropy K, according to the Stoner–Wohlfarth theory. However, such an increase also results in an unfavourable increase of the coercivity H_c. As a consequence, these grains are thermally stable but can not be written with existing recording heads.

[0003] Various improvements have been proposed to counter this thermal instability recently, also known as the writeability problem. In US patent No.: 6,468,670 a continuous ferromagnetic overlayer was introduced to increase the Signal to Noise Ratio (SNR). US patent No.: 6,280,813 and US patent No.: 6,383,668 addressed the thermal instability problem by replacing the conventional single magnetic recording layer with two ferromagnetic films that are antiferromagnetically coupled together across a nonferromagnetic spacer film, and a ferromagnetic layer that is coupled to a synthetic antiferromagnet, respectively. This idea reduces the demagnetizing field of the bits in the case of longitudinal magnetic recording. U.S. Pat. No. 5,583,727 proposed to overcome the problem by employing thermally assisted recording. In the paper "FeRh/FePt exchange spring films for thermally assisted magnetic

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recording media" Applied Physics Letters, Vol. 82, Issue 17, April 2003, pp. 2859-2861, Thiele *et al.* suggested to lower the coercive field by the use of FePt/FeRh bilayer system. The proposed architecture included a hard layer, exchange coupled to an antiferromagnetic layer. After heating the antiferromagnetic layer across a transition temperature, it became ferromagnetic with a large magnetic moment and low magnetocrystalline anisotropy. Thus, upon crossing the transition temperature the antiferromagnetic layer acted as a magnetic soft layer that helped to reverse the hard layer.

[0004] In the paper "Composite Media for Perpendicular Magnetic Recording", IEEE Transcations on Magnetics, Vol. 41, No. 2, February 2005, pp. 537-542, R. H. Victora and X. Shen proposed magnetic multilayer structures composed of magnetically hard and magnetically soft layers. In the model of Victora and Shen, the magnetization of the soft and the hard part of each grain remained uniform. In order to decrease the coercive field, the exchange coupling between these layers had to be reduced with a decoupling layer. Motivated by the theoretical work, Wang et al. performed an experimental work on two layer composite media. The results were reported in "Composite media (dynamic tilted) media for magnetic recording", Applied Physics Letters, Vol. 86, April 2005, pp. 142504. Wang et al. concluded that a coupling layer was required in composite media to decrease the exchange coupling between the soft and hard layer, in accordance with the theory. This was in contrast to the paper "Exchange spring media for perpendicular recording," Applied Physics Letters, Vol. 87, July 2005, pp. 12504-12507 by Suess et al., incorporated herein by reference in its entirety, where states with inhomogeneous magnetization were formed.

[0005] The paper "Preliminary Study on (CoPtCr/NiFe)-SiO2 Hard/Soft-Stacked Perpendicular Recording Media", IEEE Transactions on Magnetics, Vol. 41, No. 10, October 2005, pp. 3136, Y. Inaba et al. considered a sufficiently thin soft magnet coupled to a sufficiently thin hard magnet in order to keep the magnetization uniform and parallel in both layers during reversal. The paper "Exchange spring recording media for areal densities up to 10 Tbit/in^2", Journal of Magnetism and Magnetic Materials, Vol. 290–291, 2005, pp. 551–554 (available online 18 December 2004) by Suess et al., incorporated herein by reference in its entirety, proposed a tri-layer structure which was composed of a hard layer at bottom, a soft layer in the middle and a hard layer on top.

[0006] The paper "Exchange spring media for perpendicular recording," Applied Physics Letters, vol. 87, 30. June 2005, pp. 012504, by Suess et al., incorporated herein by reference

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in its entirety, domain wall assisted recording on bilayers was presented. Subsequent work by A. Dobin and H. J. Richter (presented at the Intermag conference 2006, talk DB-10, San Diego, CA, May 2006; preprint available at http://arxiv.org "Domain Wall Assisted Magnetic Recording" by Dobin and Richter) followed the same approach.

[0007] In previous works it was not shown that a finite value of the anisotropy in the soft magnetic layer does not reduce the thermal stability of the structure. This question needs to be investigated, as larger anisotropies in the softer layer reduce the energy that is required to push a domain wall from the soft layer to the hard layer. Further, typical multilayer exchange spring media do not even contain a soft magnetic layer. Instead, it contains a nucleation layer which can be magnetically hard. The softest layer in the nucleation layer can have a coercive field similar to typical fields of recording heads.

For all these reasons, the choice of layer architectures and their anisotropies to overcome the superparamagnetic limit in optimal fashion remain a topic of intense investigations.

SUMMARY

[0008] Briefly and generally, embodiments according to the invention include a magnetic recording media wherein the magnetic recording layer consists of a multilayer structure, with a special multilayer host layer (nucleation host) and a hard magnetic storage layer ($H_c > 2$ T). The anisotropy of the softest layer in the nucleation host is significantly smaller than in the hard layer. In some embodiments the ratio of anisotropies can reach a factor of 2. During writing a domain wall is formed in the nucleation host that propagates through the whole grain structure and finally reverses the hard magnetic storage layer. The nucleation host significantly decreases the coercive field of each grain of the proposed media but has only little influence on the thermal stability. In some embodiments the host layer comprises of just one layer, the media is a bilayer structure with one hard magnetic nucleation host and an even harder storage layer. In embodiments, where the host layer comprises more than one layer the anisotropy increases from one layer to the next layer. The layers can be strongly exchange coupled. The exchange coupling can be direct or via a thin coupling layer in order to achieve strong coupling. If the layers are strongly coupled a domain wall is formed across the hard/soft interface during reversal.

[0009] In embodiments with a nucleation host having the same magnetization as the hard

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magnetic storage layer and consisting only of one layer, the coercive field can be reduced by a factor of up to five compared to the coercive field of the hard magnetic storage layer without the nucleation host at the same thermal stability.

[0010] In embodiments, where the nucleation host has an exchange constant and magnetic polarization in the nucleation host larger than in the hard magnetic storage layer, the reduction of the coercive field can be even larger than a factor of five.

[0011] The coercive field can also be increased by increasing the number of layers in the nucleation host. In embodiments with two or three layers in the nucleation host, the coercive field is reduced by a factor of up to 9 and 13, compared to the coercive field of the hard magnetic storage layer without the nucleation host.

[0012] In other embodiments further increase of the coercive field is reached by increasing the anisotropy continuously. For a 25 nm thick layer with quadratically increasing anisotropy and a maximum value of $K_1 = 2\text{MJ/m}^3$ in the nucleation host the coercive field is smaller by a factor of 10 compared to a layer consisting of a material with $K_1 = 2\text{MJ/m}^3$, while, remarkably, the thermal stability of these two architectures is substantially the same.

[0013] Embodiments also show a characteristic dependence of the coercive field on the angle between the external field and the easy axis of the hard layer. In contrast to single phase recording media that shows a Stoner-Wohlfarth like switching field dependence as a function of the external field angle, exchange spring media behave more like "pinning magnets". In pinning permanent magnets a high coercive field can be achieved by the introduction of pinning centres, such as soft magnetic inclusions or non magnetic inclusions that trap a domain wall and hence hinder the domain wall from propagating through the whole magnet. Therefore, the reversal of the magnetization due to domain wall motion is stopped by the pinning centres. Typically, in pinning magnets the dependence of the coercive field as a function of the angle α between the external field and the easy axis can be described by, $H_c = 1 / \cos(\alpha)$. That implies that for small angles between the external field and the easy axis the switching field is less sensitive to the easy axis distribution. This makes exchange spring media also a potential candidate for patterned media since the switching field distribution due to an easy axis distribution is reduced.

[0014] Generally, the above embodiments provide marked improvement against the superparamagnetic limit as the coercive field is reduced by the spatially varying anisotropy in

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the nucleation host, while the thermal stability is determined only by the domain wall energy in the hardest magnetic storage layer, which is not influenced by the variations of the anisotropy of the nucleation host.

[0015] This is achieved because the new architecture removes the proportionality of the energy barrier to the coercive field. In some cases the coercive field can be inversely proportional to the layer thickness while the energy barrier remains independent of it. Therefore, with these new architectures embodiments overcome the writeability problem of extremely hard magnetic storage layers with high thermal stability.

BRIEF DESCRIPTION OF DRAWINGS

[0016] FIG. 1 is a schematic sectional view of a magnetic recording disk with a multilayer exchange spring recording media.

[0017] FIG. 2 shows a hysteresis loop in some embodiments. For comparison, the hysteresis loop of a conventional single phase grain is shown.

[0018] FIG. 3 shows the coercive field as a function of the angle between the easy axis and external field for bilayers with different values of the anistropy in the softest layer in the nucleation host.

[0019] FIG. 4 shows the hysteresis loop of different exchange spring films comprising of 14 x 14 grains.

[0020] FIG. 5 illustrates the reduction of the coercive field for a nucleation host with a continuously increasing anisotropy.

[0021] FIG. 6 shows the energy barrier as a function of the hard layer thickness.

DETAILED DESCRIPTION

[0022] FIG. 1 illustrates the cross sectional view of the layer structure of an existing disk of recording medium. The disk includes a substrate 5, a soft magnetic underlayer 7, an interlayer 9, an optional seed layer 11a and underlayer 11b, a hard magnetic storage layer 24, strongly exchange coupled to a nucleation layer 21, an optional coupling layer 22, a protective

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layer 28a, and a lubricant layer 28b. Although the hard magnetic storage layer is shown on top of the nucleation layer, the order of the layers can also be reversed..

[0023] Substrate 5 may be made of any suitable material such as ceramic glass, amorphous glass, or NiP plated AlMg or an AlMg alloy base with a NiP surface coating.

[0024] Soft magnetic underlayer 7 is deposited on substrate 5. soft magnetic underlayer 7 may be made of any suitable material such as NiFe, CoNbB, FeAlSi, CoFeB, FeTaN, FeTaC, FeCoB, FeSiO, FeAlSi, FeTaN, FeN, CoFe, CoZr , CoFeB ,CoZrNb, NiFeNb or equivalents. Soft magnetic underlayer 7 may have a thickness in the range of about 50 nm to about 500 nm.

[0025] Interlayer 9 maybe important for the grain structure of the hard magnetic recording media. Interlayer 9 maybe any suitable material such as Pt, Ge, Si, CoCr, SiO_2, Au, Al, CoZr, Ta, Ti, TiCr, Ru, RuCrCo, TiZr, or equivalents.

[0026] Optional seed layer 11a maybe used in order to improve the growth of underlayer 11b. Optional seed layer 11a may be formed of a suitable material of hcp, fcc, bcc or even amorphous structure. It provides a smooth wetted surface for the subsequent growth of underlayer 11b.

[0027] Underlayer 11b is deposited onto optional seed layer 11a, if present, or otherwise directly onto substrate 5. Underlayer 11b may be formed of a suitable hcp material with a lattice parameter close to the alloys of the first layer in the magnetic layer. These alloys may be, for example, Ru-based alloys, Re-based alloys or Pd based alloys. Underlayer 11b may have a thickness in the range of about 1 nm to about 20 nm. Other thicknesses can also be used.

[0028] The recording media includes hard magnetic storage layer 24 and softer nucleation host 21. Hard magnetic storage layer 24 can be a ferromagnet, ferrimagnet, antiferromagnet, or any other synthetic antiferromagnetic structure. The coupling between the nucleation host and the hard magnetic storage layer may be ferromagnetic or antiferromagnetic. Hard magnetic storage layer 24 maybe formed from any material that has large perpendicular anisotropy. These materials include tetragonal $L1_0$-ordered phase materials, CoPt and FePt based alloys, CoPtCr alloys, including CoPtCrB, CoPtCrTa, and CoCr based granular media. Other high anisotropy materials suitable for the recording layer 16 include pseudo-binary

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alloys based on the FePt and CoPt $L1_0$ phase, i.e., FePt--X and CoPt--X, where the element X may be Ni, Au, Cu, Pd or Ag, as well as granular composite materials such as FePt--C, FePt--ZrO, FePt--MgO, FePt—B_2O_3, materials containing at least one of B, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Pd, Sm, Nd, Dy, Hf, Mn, Ni and other similar composites.

[0029] In some embodiments the thickness of hard magnetic storage layer 24 is between 3 nm and 30 nm. In other architectures it can be outside these ranges. In embodiments where the anisotropy of nucleation host 21 is continuously increased, hard magnetic storage layer 24 is optional.

[0030] In some embodiments nucleation host 21 can be formed on hard magnetic storage layer 24. In other embodiments the order is changed so that hard magnetic storage layer 24 is deposited on nucleation host 24. Nucleation host can be formed as a granular or a continuous film. The exchange coupling between hard magnetic storage layer 24 and nucleation host 21 can be sufficiently strong to enable the formation of a domain wall across the interface of these layers during reversal.

[0031] Any of the materials, listed for hard magnetic storage layer 24 can be also used for forming nucleation host 21. In some embodiments a magnetic material is referred to as "hard" if its coercive field Hc > 0.5 T, and "soft" is its coercive field is Hc < 0.5 T. In some embodiments these terms are defined in a relative sense: the coercive field of (soft) nucleation host 21 can be half of the coercive field of hard magnetic storage layer 24. In other embodiments this ratio can be different. In some embodiments a layer is referred to as "hard", if $\Delta k_{max} / k_{min} < 0.5$. The definition of the terms in this inequality will be given below.

[0032] In some embodiments the grains of nucleation host 21 are aligned with the grains of hard magnetic storage layer 24, as shown in FIG. 1. In some embodiments this alignment is only approximate. These embodiments are sometimes called columnar media.

[0033] In some embodiments nucleation host 21 and hard magnetic storage layer 24 are in direct contact. In other embodiments, they are separated by optional coupling layer 22. Optional coupling layer 22, disposed between hard magnetic storage layer 24 and nucleation host 21, can provide a strong "exchange coupling". Optional coupling layer 22 may enhance the granular growth between hard magnetic storage layer 24 and nucleation host 21. Optional coupling layer 22 may have a thickness between 0.1 nm and 3 nm. Optional coupling layer 22 may provide an exchange constant A in excess of $A = 10^{-14}$ J/m. In conventional

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perpendicular recording the exchange constant between grains is small. In exchange spring media both large and small values of the lateral exchange can be useful. For a large value of the lateral exchange in hard magnetic storage layer 24 the transitions of the bits are not necessarily located at the grain boundaries. Instead, domain walls are formed that separate the bits. A large value of the anisotropy of hard magnetic storage layer 24 decreases the domain wall width, so that the transition parameter of the bits may not be significantly larger than 2nm to 3 nm that can be equal to about the grain diameter. In the case of large lateral exchange the domain walls are not pinned at the grain boundary in the hard magnetic storage layer but the domain walls are pinned due to the granular laterally weakly exchange coupled nucleation host. A weak exchange in the hard magnetic storage layer may require a large exchange in the nucleation layer.

[0034] In the following the plane of nucleation host 21 will be identified as the x-y plane. For example, in a magnetic storage disk, the plane of the disk is essentially parallel to the x-y plane of nucleation host 21. The z coordinate then parametrizes the direction of the thickness of nucleation host 21.

[0035] In some embodiments nucleation host 21 contains more than one layer which have different anisotropy K. In other embodiments nucleation host 21 is characterized by a spatially varying anisotropy $K(z)$. In these embodiments, the anisotropy assumes more than one value in a substantial magnetic portion of nucleation host 21. In this sense the embodiments differ from single layer nucleation hosts, whose anisotropy assumes varying values only in an insubstantial portion. This may occur e.g. because of surface effects, in a very thin layer at the surface. Also, the variation is occurring in the magnetic nucleation host 21 itself. In this sense, embodiments differ from disks which have a single layer nucleation host 21 and a spacer layer.

[0036] In some embodiments, the softest, or smallest value of the anisotropy K is half of the anisotropy of hard magnetic storage layer 24. In other embodiments this ratio can be closer to one. This softest value of K is the anisotropy of the softest layer in multilayer embodiments, or the softest value in the spatially varying embodiments.

[0037] In some embodiments the lateral, or nearest neighbor, exchange between the grains of nucleation host 21 is small.

[0038] Protective layer 28a, sometimes called overcoat, is typically diamond-like amorphous

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carbon or nitrogenated carbon, but may be any conventional disk overcoat. Overcoat 28a is typically less than 15 nm thick.

[0039] All of the layers described above from seed layer 11 to overcoat 28a can be sputtered in a continuous process in either an in-line sputtering system or a single disk system, such as commercially available single disk systems with multiple sputtering target capacity. The sputter deposition of each of the layers can be accomplished using standard targets and techniques known to those in the field with the modifications described above.

[0040] In the following, some considerations will be provided, which may be relevant for understanding features of the embodiments. Some embodiments combine benefits of softer magnetic layer with that of harder magnetic layers.

[0041] In some embodiments nucleation host 21 includes only one layer. In these embodiments the recording media is referred to as a bilayer, which includes nucleation host 21 and hard magnetic storage layer 24. Under the assumption that both layers remain completely homogeneous, the bilayer structure does not provide any improvements for the writeability compared to a single layer system. This conclusion is different from that of Y. Inaba et al. in the paper "Preliminary Study on (CoPtCr/NiFe)-SiO2 Hard/Soft-Stacked Perpendicular Recording Media", IEEE Transactions on Magnetics, Vol. 41, No. 10, October 2005, pp. 3136.

[0042] A hard/soft layer structure where the magnetization in the hard and soft layer is parallel and uniform can be described with one average magnetization $M_{eff} = (M_{hard} \times l_{hard} + M_{soft} \times l_{soft})/(l_{soft}+l_{hard})$ and one average anisotropy constant $K_{eff} = (K_{hard} \times l_{hard} + K_{soft} \times l_{soft})/(l_{soft}+l_{hard})$. In a simple model the energy barrier can be estimated by $\Delta E = F \times K_{eff} \times (l_{soft}+l_{hard})$, where F is the area of the basal plane of one grain of the media. The coercive field is $H_c = 2 K_{eff} / M_{eff}$. The ratio of the energy barrier to the coercive field, the "ratio barrier" $\Delta E/ H_c$ only depends on the value of the average magnetization and the grain volume. Therefore, this bilayer structure leads to the same thermal stability as the single layer structure of the same thickness for the same value of the coercive field and for the same value of the average magnetization.

[0043] In embodiments of the invention, the design of the recording media is capable of supporting the formation of a domain wall during reversal. This magnetic domain wall becomes pinned at hard/soft interfaces. Compared to single phase media with the magnetic

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properties of the hard layer, the coercive field in a bilayer structure can be significantly reduced. In embodiment this reduction reaches a factor of four, as described by Loxley et al. in the paper: "Theory of Domain Wall Nucleation in a Two Section Magnetic Wire", IEEE Transactions on Magnetics, Vol. 37, July 2001, pp. 1998 – 2100). However, Loxley et al considered an idealized magnetic wire instead of a magnetic recording medium. A factor of five decrease was shown by Hagedorn in the paper: "Analysis of Exchange-Coupled Magnetic Thin Films," Journal of Applied Physics, Vol. 41, 1970, pp. 2491-2502, when a finite anistropy in the soft layer was assumed.

[0044] A feature of embodiments of the invention is that the coercive field and the thermal energy barrier can be separately adjusted. In contrast, the above works considered these quantities closely connected and thus not adjustable separately. The thermal energy barrier is primarily determined by the material parameters of hard magnetic storage layer 24, substantially independently from the material parameters of nucleation host 21. Thus, in embodiments the ratio $r = \frac{\Delta E_{thermal}}{\Delta E_{hyst}}$ can be selected in the range of 0.5 to 10. In others the range can be even broader. Here the thermal energy barrier $\Delta E_{thermal}$ is the energy barrier separating the two magnetic states, which has to be overcome by the thermal fluctuations. The hysteretic energy loss $\Delta E_{hyst} = J_s H_c V$ is the product of grain volume V, the coercive field H_c and the average magnetization J_s which characterizes the energy to be overcome during a write process. For single domain particles these energy scales are closely connected with a fixed ratio r of 0.5.

[0045] The field, required to overcome the pinning field to push a domain wall from the softer layer to the hard layer depends on the difference between the anistropy constants of these layers as described by a formula by Hagedorn et al. If the number of layers is increased, this difference can be decreased leading to a reduction of the pinning and coercive field. For example, if the anisotropy of the m-th layer assumes the value $K^m=(m\text{-}1)K_{hard}/(N\text{-}1)$, the difference between the anisotropy constants of adjacent layers is $K_{hard}/(N\text{-}1)$. Such an architecture leads to a coercive field of the whole structure of $H_c=1/(4N\text{-}4) \times 2\ K_{hard}/J_s$. Here, K_{hard} is the anisotropy constant of the hardest layer (the hard magnetic storage layer), J_s the magnetic polarization of the structure and N is the number of layers. For sufficiently thick hard magnetic storage layer the thermal stability is given by the domain wall energy in the

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hard magnetic storage layer. Importantly, therefore, at zero field the nucleation host does not lower the thermal stability.

[0046] FIG. 2 illustrates the micromagnetic simulations, which were performed to demonstrate the benefit of multilayer exchange spring media. FIG. 2 compares the hysteresis loop of different multilayer exchange spring media with a conventional recording media. Only one grain of the media was modeled. The parameters are for illustrative purposes only and can widely vary in different embodiments. The external field is applied at an angle of 0.5°. Nucleation host 21 is assumed to have a granular structure. The thickness of the entire grain structure is 25 nm. The grain diameter is 5 nm. The magnetization is M_s=0.5 T / μ_0. The grains are formed from a magnetic hard material with K_1= 2 MJ/m³.

[0047] The trace "single phase" illustrates an embodiment in which the grains have a single anisotropy value. The trace "bilayer soft K_{soft}=0" illustrates an embodiment, where 7 nm of the grain are magnetically extremely hard with K_{hard} = 2 MJ/m³, the other 18 nm are perfectly soft K_{soft} = 0. The trace "bilayer soft K_{soft}=0.2 MJ/m³" illustrates an embodiment where again 7 nm of the grain is extremely hard K_{hard} = 2 MJ/m³. The softer region has still a relative high anisotropy of K_{soft} = 0.2 MJ/m³. The "trilayer" trace illustrates the embodiment where 7 nm again has $K^1 = K_{hard}$= 2 MJ/m³, 5.6 nm of the grain has K^2 = 1.11 MJ/m³ and 12.4 nm of the grain has K^3 = 0.22 MJ/m³.

[0048] Visibly, the coercive field of the bilayer structures is severely reduced from that of the single phase media by a factor of about 4-4.5. The trilayer structure has its coercive field further reduced, by about a factor of 7 compared to the single phase media. The discrepancy to the theoretical limit of 9 can be attributed to the finite layer thickness. The effect of reversible magnetization processes can be observed by the non – rectangular shape of the hysteresis loop.

[0049] Some embodiments have a gradually varying anisotropy $K(z)$ in nucleation host 21. Such embodiments will be referred to as "*G*-layer". In FIG. 2 the hysteresis loop of G-layers are shown. The trace "continuous strayfield" illustrates the embodiment in which the anistropy increases quadratically as a function of the z coordinate, the distance from the bottom of the grain: $K(z) \sim z^2$. The demagnetizing field of the grain is taken into account. The trace "continuous" illustrates the embodiment in which the demagnetizing field was omitted. FIG. 2 shows that the coercive field is just 1/10 of the coercive field of the single

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layer structure for a thickness of 25 nm. It is also interesting to note that the hysteresis loop is almost perfectly rectangular. If the strayfield is taken into account, the coercive field increases by about 3%, which can be attributed to the additional uniaxial anisotropy caused by the shape anisotropy.

[0050] The variation of $K(z)$ can take many different form. The rise can be linear, or follow any polynomial or other rising function. It can have plateaus or steps, connected by rising segments. It can also have decreasing segments. In some embodiments, the functional form of $K(z)$ is chosen to optimize the switching properties of the recording media, e.g. by increasing the thermal energy barrier while keeping the writing field, or coercive field, essentially unchanged, or even decreasing it.

[0051] FIG. 3 illustrates the angular dependence of the coercive field $H_c(\alpha)$ as a function of the angle α that is measured between the easy axis and the external field. So the coercive field is measured for different angles α. The solid line shows the angular dependence of the trilayer of FIG. 2. The dotted line shows the angular dependence of the coercive field if the anisotropy in the softest layer of the nucleation host is set to zero. In contrast to single phase media, the coercive field does not have a minimum for a field angle of 45°. The pinning force to depin the domain wall at the hard/soft interfaces depends inversely from the cosine of the angle between the easy axis and the external field. It can be seen that the coercive field $H_c(\alpha=20°)$ is smaller than $H_c(\alpha=45°)$. A similar dependence can be found if instead of the coercive field the field $H_m(\alpha)$ is introduced, where H_m is the field that is required to decrease the magnetization of the saturated film ($M_z/M_s=1$) to $M_z/M_s= - 0.5$. Differences of the field H_m and H_c occur if the media comprises of a thick soft layer with high magnetization.

[0052] FIG. 4 shows the hysteresis loop of an exchange spring perpendicular recording film consisting of 14 x 14 grains. The parameters of this embodiment are for illustrative purposes only. The average grain diameter is 5nm. The film thickness is 23 nm. The exchange field between the grains is about 0.25T. The thickness of the nucleation layer is equal to the thickness of the hard magnetic storage layer which is 10.5 nm. The two layers are separated by a 2 nm thick optional coupling layer 22. The exchange constant in the coupling layer is varied from $A = 1 \times 10^{-12}$ J/m to the bulk value of the exchange in the nucleation layer and the storage layer which is $A = 1 \times 10^{-11}$ J/m. The hysteresis loops show that with increasing coupling the coercive field decreases. Furthermore the hysteresis curves for $A = 1 \times 10^{-12}$ J/m

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and $A = 2 \times 10^{-12}$ J/m show that the slope of the hysteresis loop $k = \frac{dM}{dH}\frac{H_c}{M_s}$ changes in the interval $-0.7 < M/M_s < 0.7$, significantly. For $A = 2 \times 10^{-12}$ J/m the slope k changes in the interval $-0.7 < M/M_s < 0.7$ by about a factor of 2.5. In embodiments the anisotropy of hard magnetic storage layer 24 and the exchange coupling between nucleation host 21 and hard magnetic storage layer 24 is chosen to keep the change of the slope k smaller than 3. A ratio $k_{max} / k_{min} < 3$ indicates a strong coupling between nucleation host 21 and hard magnetic storage layer 24.

[0053] Furthermore the squareness S of the hysteresis loops was calculated. $S = 1 - \left.\frac{dM}{dH}\frac{H_c}{M_s}\right|_{H_c}$. For the fully coupled case ($A = 1 \times 10^{-11}$ J/m) the squareness is 0.8. It is important to note that for all calculations the hysteresis loops are not desheared.

[0054] FIG. 5 illustrates the reduction of the coercive field for nucleation host 21 with thickness t_G and a continuously increasing anisotropy, fully exchange coupled to the hard magnetic storage layer. The value of the anisotropy constant of the hard magnetic storage layer is changed from 1MJ/m³ to 4MJ/m³. FIG. 4 shows the reduction of the coercive field of hard magnetic storage layer 24 with a thickness of 20 nm and a value of the anisotropy constant of K_{hard} that is coupled to a G-layer. The anisotropy constant depends quadratically on the depth z in the layer, $K(z) = z^2 K_{hard}/t_G^2$. The grain has the maximum anisotropy (K_{hard}) at the surface of nucleation host 21. The thickness of nucleation host 21 is t_G. This embodiment does not have hard magnetic storage layer 24.

[0055] FIG. 6 illustrates the influence of the thickness of hard magnetic storage layer 24 on the energy barrier of the bilayer structure. The particular parameters are for illustrative purposes only – other embodiments have different parameters. The thickness of nucleation host is 20 nm (limit of infinite thick soft layer). The anisotropy in hard magnetic storage layer 24 is $K_{hard} = 1 \times 10^6$J/m³. The grain diameter is 6 nm. The energy barrier levels out for thicknesses larger than 20nm. It is important to stress that at zero field the energy barrier does not depend on nucleation host 21. Due to thermal fluctuations a domain wall is formed in the nucleation host. The energy of the domain wall successively increases as it is driven by thermal fluctuations in the harder layers. The domain wall has largest energy when it is located in the hardest layer. The difference this highest energy state minus the energy of the homogenous state when the spins in the grain point up (down) denotes the energy barrier. For

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all structures the highest energy state is given by the domain wall energy in the hard magnetic storage layer which is independent if a nucleation host 21 is present. The demagnetizing field of the structure may slightly decrease the energy barrier. The decrease of the energy barrier may be larger if a nucleation host is present as without nucleation host 21. In embodiments the energy barrier of a typical grain of hard magnetic storage layer 24 is smaller by 25% of the energy barrier of a typical grain of hard magnetic storage layer 24 without the nucleation host at most.

[0056] We note that parameters of an unknown magnetic recording media can be characterized by different methods. For example, an energy barrier of a hard magnetic storage layer can be determined: (i) by depositing only the hard magnetic storage layer on a non-magnetic substrate, or (ii) by removing a nucleation host from a multilayer structure; or (iii) by performing a micromagnetic calculation with parameters appropriate for the multilayer.

[0057] While the present invention has been particularly shown and described with reference to certain embodiments, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention. Accordingly, the disclosure was intended merely as illustrative and the scope of the invention is limited only as specified in the appended claims.

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WHAT IS CLAIMED IS:

1. A magnetic recording medium, comprising:
an essentially non-magnetic substrate; and
an exchange coupled magnetic multilayer structure, comprising:
a nucleation host with an anisotropy varying in the film normal direction; and
a hard magnetic storage layer;
wherein the anisotropy assumes more than one value in substantial magnetic portions of the nucleation host.

2. The magnetic recording medium of claim 1, wherein an exchange coupling between the nucleation host and the hard magnetic storage layer is sufficiently strong and the nucleation host is sufficiently hard so that the derivative k of the normalized magnetization with respect to the external field normalized to the coercive field does not change by more than a factor of 3 in a magnetization interval $-0.7 < M_z/M_s < 0.7$, wherein: $k = \frac{dM}{dH}\frac{H_c}{M_s}$, M being a magnetization of the recording medium, M_z being a component of the magnetization perpendicular to a plane of the recording medium, H being an external magnetic field parallel to a normal of the layers, dM/dH being the derivative of the magnetization with respect to the external magnetic field, H_c being a coercive field, M_s being a saturation magnetization.

3. The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layer are in direct contact.

4. The magnetic recording medium of claim 1, wherein the nucleation host, comprises of ferromagnetic layers with increasing anisotropy from layer to layer.

5. The magnetic recording medium of claim 1, wherein the nucleation host, comprises a ferromagnetic layer with a continuous change of anisotropy in the film normal direction.

6. The magnetic recording medium of claim 1, wherein the nucleation host and the hard magnetic storage layers comprise ferromagnetic layers with increasing

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anisotropy values.

7. The magnetic recording medium of claim 1, wherein the hard magnetic storage layer comprises at least one of Cr, Pt, Ta, B, Fe, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn and Ni.

8. The magnetic recording medium of claim 1, wherein a coercive field of the nucleation host is less than 1/2 of a coercive field of the hard magnetic storage layer.

9. The magnetic structure of claim 1 wherein a $H_c(\alpha=20°) < H_c(\alpha=45°)$, wherein $H_c(\alpha)$ is the coercive field if the angle between the external field and the film normal is α.

10. The magnetic structure of claim 1 wherein a $H_m(\alpha=20°) < H_m(\alpha=45°)$, wherein $H_m(\alpha)$ is the required field to reduce the normalized magnetization from the saturation to -0.5 if the angle between the external field and the film normal is α.

11. The magnetic recording medium of claim 1, wherein the nucleation host comprises at least one of Fe, Ni, Al, Si, B, Co, Cr, Pt, Ta, Cu, Ag, W, Mo, Ru, Si, Ge, Nb, Co, Pd, Sm, Nd, Dy, Hf, Mn, Ni and O.

12. The magnetic recording medium of claim 1, wherein the nucleation host has a thickness smaller than 30 nm.

13. The magnetic recording medium of claim 1, wherein the nucleation host comprises grains with an average diameter greater than 2 nm and less than 10 nm.

14. The magnetic recording medium of claim 1, wherein a height of a plurality of grains is greater than a diameter of the grains.

15. The magnetic recording medium of claim 1, wherein the nucleation host is in direct contact with the hard magnetic storage layer.

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16. The magnetic recording medium of claim 1, wherein the nucleation host is separated from the hard magnetic storage layer by a layer of thickness less than 5nm.

17. The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic storage layer by a strong exchange coupling layer.

18. The magnetic recording medium of claim 1, wherein the nucleation host is coupled to the hard magnetic layer by antiferromagnetic coupling.

19. The magnetic recording medium of claim 1, where parameters of the medium comprise:
a anisotropy constant in the nucleation host K^n_1 as a function of the layer depth
a hard magnetic storage layer anisotropy constant K^h_1;
a nucleation host grain diameter;
a hard magnetic storage layer grain diameter;
an exchange constant between grains in the nucleation host;
an exchange constant between grains of the hard magnetic storage layer;
a saturation polarization in the nucleation host as a function of the layer depth;
a saturation polarization of the hard magnetic storage layer;
a layer thickness of the nucleation host;
a layer thickness of the magnetic storage layer and
an exchange constant between the nucleation host and the hard magnetic layer.

20. The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive magnetic field of the hard magnetic storage layer is less than 1/2 of the coercive magnetic field of the hard magnetic storage layer without the nucleation host.

21. The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that an energy barrier of a typical grain of the hard magnetic storage layer is smaller at most by 25% of the energy barrier of a typical grain of the hard magnetic storage layer without the nucleation host.

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22. The magnetic recording medium of claim 19, wherein an energy barrier of the hard magnetic storage layer is determined by at least one of:
depositing only the hard magnetic storage layer on the non-magnetic substrate;
removing the nucleation host from the multilayer structure;
and performing a micromagnetic calculation with parameters appropriate for the multilayer.

23. The magnetic recording medium of claim 19, wherein a parameter of the magnetic multilayer has a value such that a coercive field of the magnetic multilayer increases when grains of the recording media are misaligned relative to a normal of the non-magnetic substrate.

24. The magnetic recording medium of claim 1, wherein the thickness of the nucleation host has a value such that the in plane component of a magnetization of a remanent state is less than 20% of a total magnetization.

25. The magnetic recording medium of claim 1, wherein the recording medium is usable for at least one of perpendicular recording or recording on patterned elements.

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Multilayer Exchange Spring Recording Media

Dieter Suess

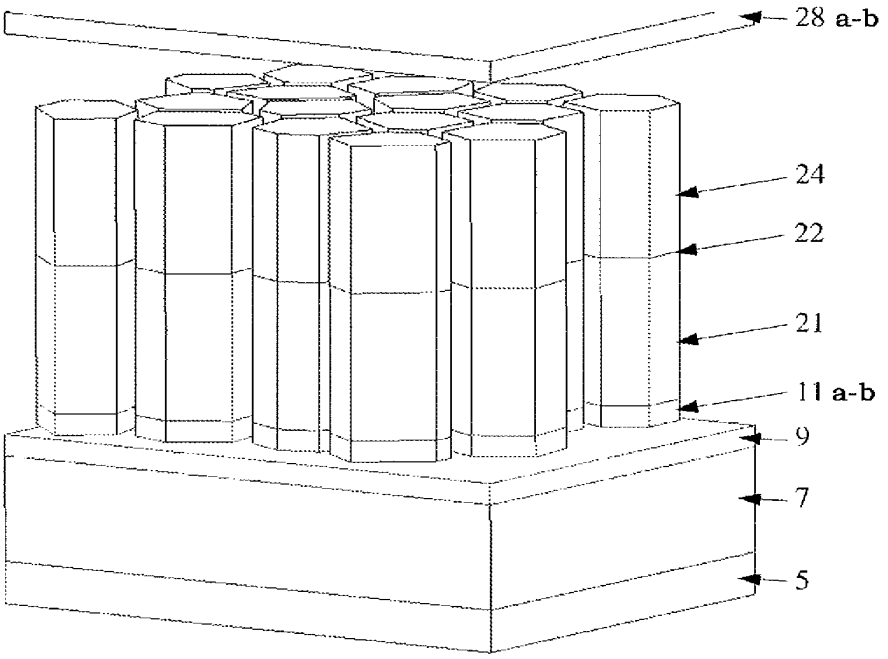
ABSTRACT

A multilayer exchange spring recording media consists of a magnetically hard magnetic storage layer strongly exchange coupled to a softer nucleation host. The strong exchange coupling can be through a coupling layer or direct. The hard magnetic storage layer has a strong perpendicular anisotropy. The nucleation host consists of one or more ferromagnetic coupled layers. For a multilayer nucleation host the anisotropy increases from layer to layer. The anisotropy in the softest layer of the nucleation host can be two times smaller than that of the hard magnetic storage layer. The lateral exchange between the grains is small. The nucleation host decreases the coercive field significantly while keeping the energy barrier of the hard layer almost unchanged. The coercive field of the total structure depends on one over number of layers in the nucleation host. The invention proposes a recording media that overcomes the writeability problem of perpendicular recording media.

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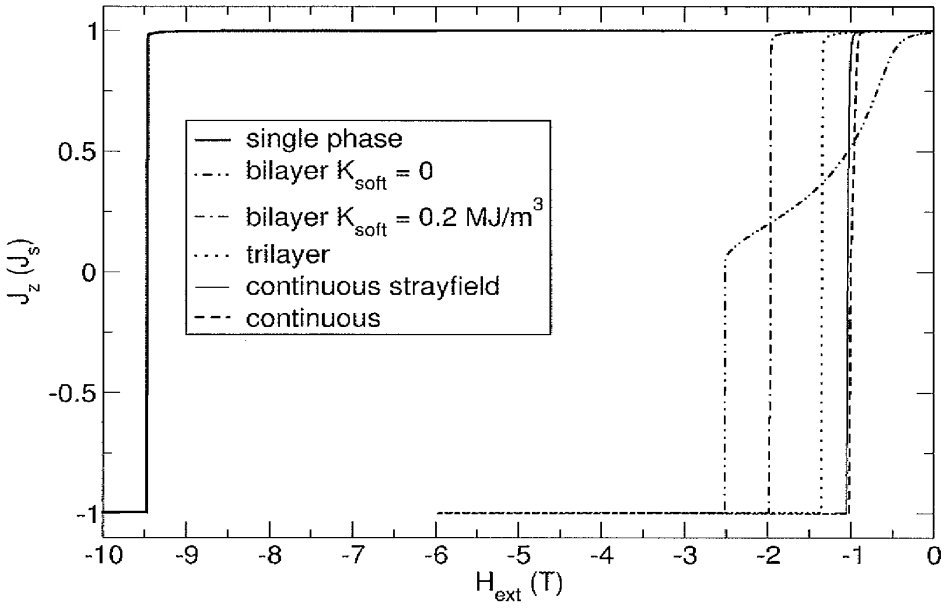
Multilayer Exchange Spring Recording Media, Dieter Suess

Fig. 1



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Fig. 2



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Fig. 3

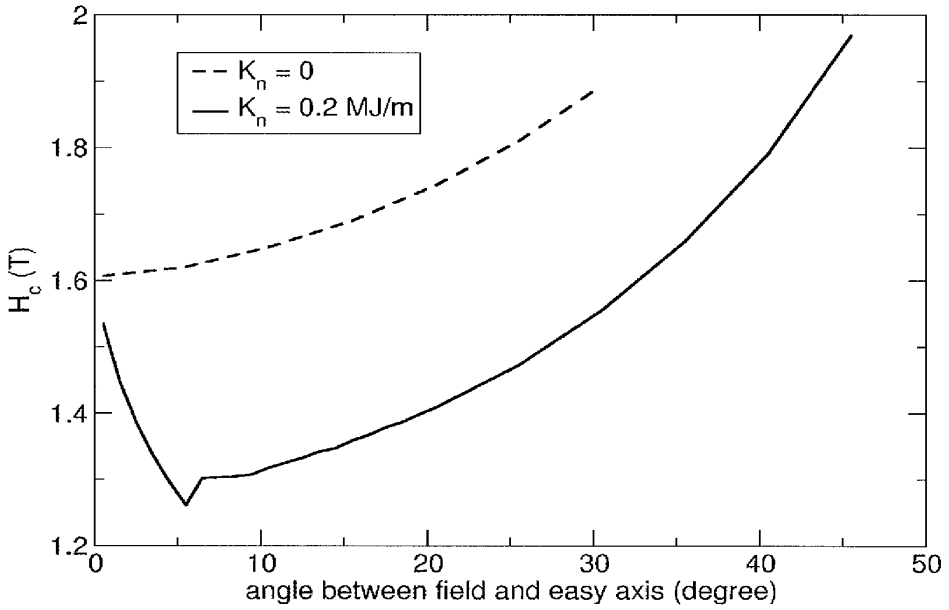
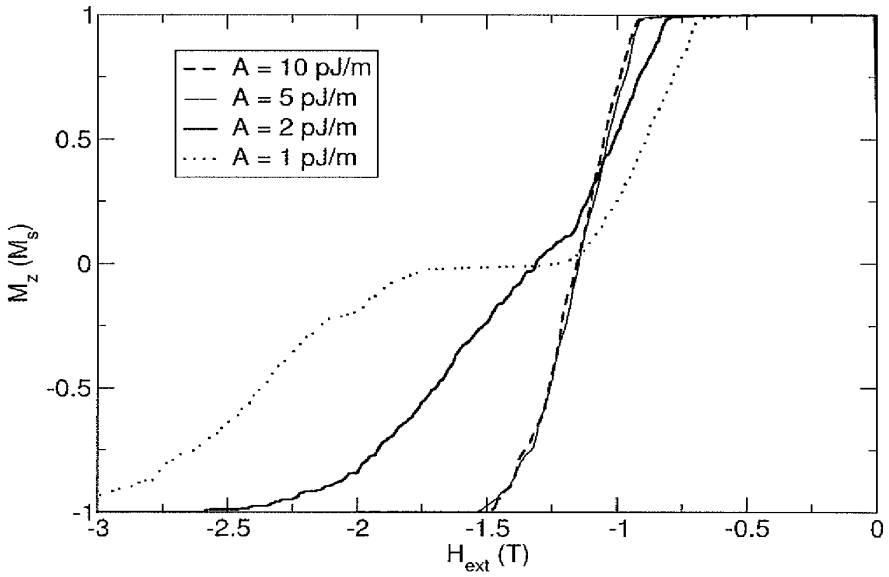
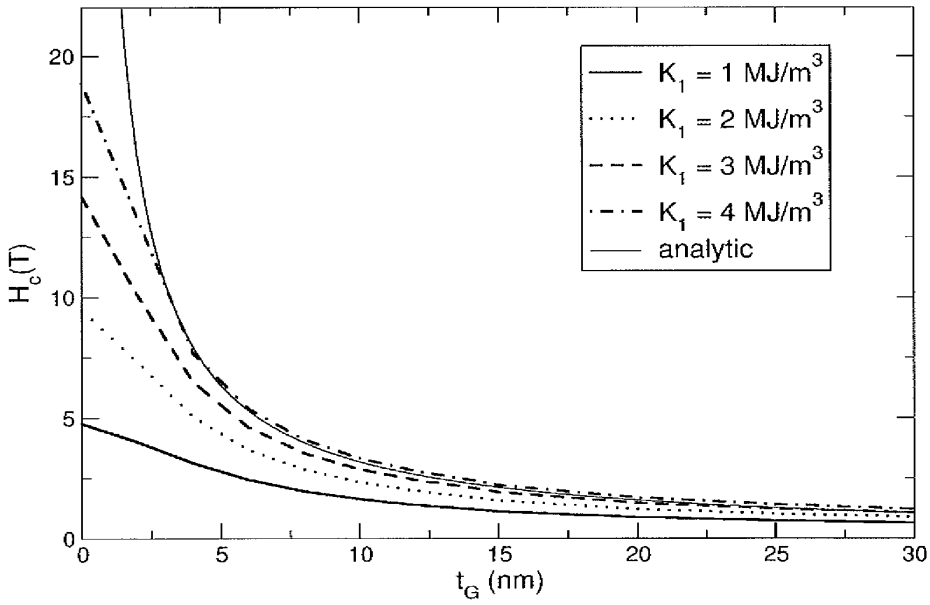

2
1.8
1.6
1.4
1.2
H_c (T)
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K_n = 0.2 MJ/m
0
10
20
30
40
50
angle between field and easy axis (degree)

Fig. 4



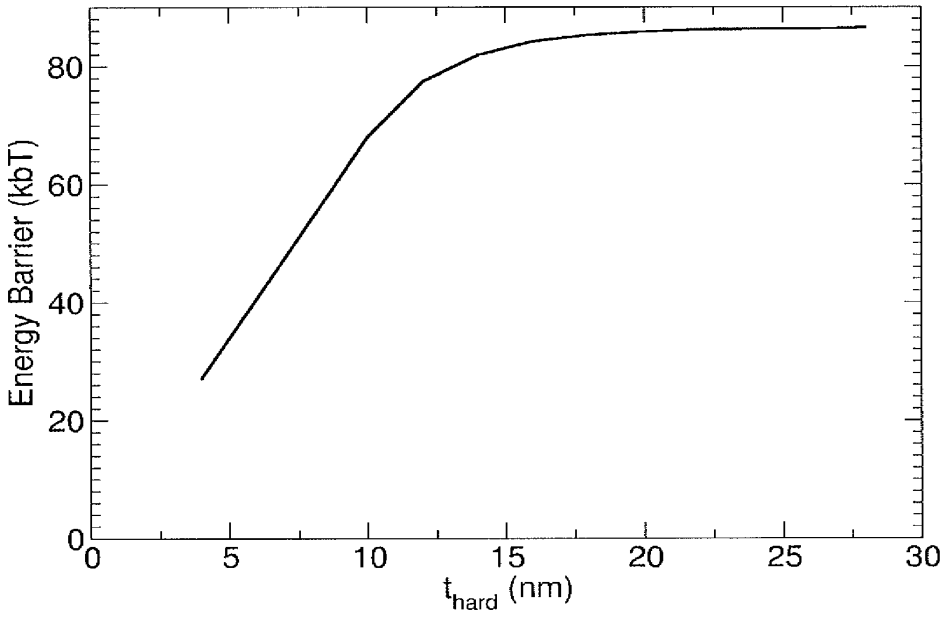
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Fig. 5



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Fig. 6



RESONAC HARD DISK CORPORATION and RESONAC CORPORATION
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PTO/SB/01A (10-05)
Approved for use through 07/31/2006. OMB 0651-0032
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	Multilayer Exchange Spring Recording Media

As the below named inventor(s), I/we declare that:

This declaration is directed to:

☑ The attached application, or

☐ Application No. _____ filed on _____

☐ As amended on _____ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT International filing date of the continuation-in-part application.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

All statements made herein of my/own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR(S)

Inventor one: Dieter Suess

Signature: _____ Citizen of: Austria

Inventor two: _____

Signature: _____ Citizen of: _____

☐ Additional inventors or a legal representative are being named on _____ additional form(s) attached hereto.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PTO/SB/06 (12-04)

Filing Date: **11/17/09**

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/619,849

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)		RATE ($)	FEE ($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	**82**		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	**270**		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	**110**		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	**25** minus 20 =	**5**	x$26	**130**	OR	x$52	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	**1** minus 3 =	*	x$110			x$220	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			195			390	
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	**592**		TOTAL	

APPLICATION AS AMENDED – PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDI-TIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDI-TIONAL FEE ($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDI-TIONAL FEE ($)	OR	RATE ($)	ADDI-TIONAL FEE ($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
						TOTAL ADD'T FEE		OR	TOTAL ADD'T FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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