

Exhibit EE
Claim Chart for U.S. Patent No. 10,367,138 and Western Digital

On information and belief, Western Digital Corporation and Western Digital Technologies, Inc. (collectively, “Western Digital” or “WD”) Accused Products, including their hard disk drives (“HDDs”), infringe U.S. Patent No. 10,367,138.

US 10,367,138	Exemplary Western Digital Infringement
12. A magnetic tunnel junction (MTJ) device, comprising:	If the preamble is limiting, each of WD’s hard disk drives (the “WD Accused Products”) includes a tunneling magnetoresistive (TMR) reading head, which is a magnetic tunnel junction (MTJ) device as claimed. <i>See, e.g.,</i> Terris presentation (Western Digital presentation):¹

¹ Bruce D Terris, “Magnetic Recording and Magnetic Memory,” presentation at IEEE Magnetism Society Summer School, Virginia Commonwealth University, June 5, 2019, (Copy accessible at <https://egr.vcu.edu/media/engineering/documents/mne/TerrisSummerSchool2019fordistribution.pdf>)

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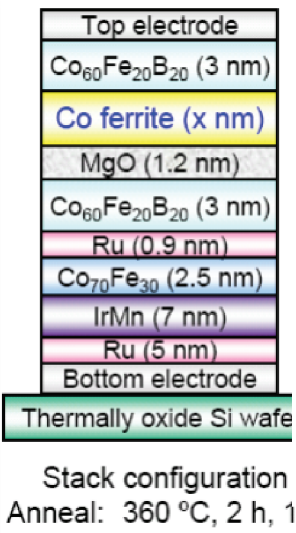
² 2023 10-K, available at <https://investor.wdc.com/static-files/9468af6f-967f-4709-bcaf-c0e9510264dd>, at 8.

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	Patent, Abstract; 7:56-57. The '006 Patent lists Zheng Gao as an inventor, who according to LinkedIn is presently Global Director for a “joint Dev and MFG team thin film sensor wafer process” at HGST, a WD company. Zheng Gao · 2nd Director at HGST, a Western Digital company San Jose, California, United States · Contact info Experience  HGST, a Western Digital brand 15 yrs 2 mos Global Director Jan 2016 - Present · 8 yrs 2 mos San Jose, CA Joint Dev and MFG Team Thin Film Sensor Wafer Process
a first ferromagnetic material layer that includes Co, Fe, and B;	The WD Accused Products comprise a first ferromagnetic material layer that includes Co, Fe, and B. For example, a 2013 presentation by a member of HGST’s Read Head Development team describes a “Thin Film Read Magnetic Sensor” with the following structure comprising a MgO layer between ferromagnetic layers including two Co₆₀Fe₂₀B₂₀ (namely, “CoFeB”) layers.³ The CoFeB layers are ferromagnetic material layers and include a first ferromagnetic material layer. HGST was acquired as a subsidiary of WD in 2012, and since 2018 WD has transitioned away from hard disk drive products

³ https://nccavs-usergroups.avcs.org/wp-content/uploads/PAG2013/2013_4gao.pdf at 12.

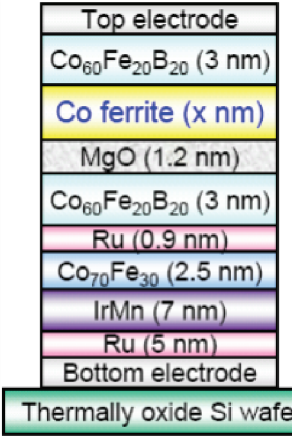
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	using the HGST brand into the WD branding.⁴ The same presentation cites Dr. Yuasa's 2004 publication in a slide titled "TMR Barrier from Year 2004."⁵  Stack configuration Anneal: 360 °C, 2 h, 1
a barrier layer disposed on the first ferromagnetic material layer, the barrier layer comprising a magnesium oxide (MgO) layer that is a poly-crystalline MgO in which	The WD Accused Products comprise a magnesium oxide (MgO) barrier layer disposed on the first ferromagnetic material layer. On information and belief, the MgO barrier layer in the WD Accused Products is a poly-crystalline MgO in which (001) crystal plane is preferentially oriented. For example, WD's '006 Patent illustrates a barrier layer 420 in FIG. 4B that is described as including "MgO with (001) crystalline texture." '006 Patent, 10:7-13.

⁴ <https://www.guru3d.com/story/western-digital-moves-away-from-the-hgst-branding>.

⁵ See *supra*, footnote 3 at 10.

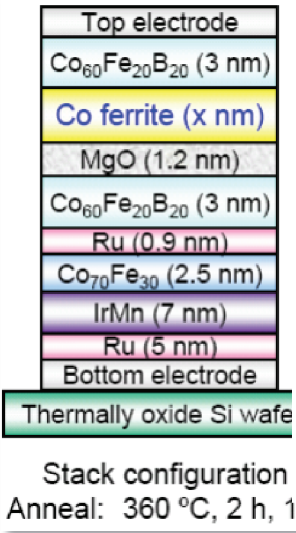
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(001) crystal plane is preferentially oriented; and	Further, the 2013 presentation by HGST describes a “Thin Film Read Magnetic Sensor” with the following structure comprising a MgO layer between ferromagnetic layers including two CoFeB layers and disposed on the first ferromagnetic material layer.⁶  Stack configuration Anneal: 360 °C, 2 h, 1
a second ferromagnetic material layer that is disposed on the barrier layer and includes Co, Fe, and B, and	The WD Accused Products comprise a second ferromagnetic material layer that is disposed on the barrier layer and includes Co, Fe, and B. For example, the 2013 presentation by HGST describes a “Thin Film Read Magnetic Sensor” with the following structure comprising a MgO layer between ferromagnetic layers including two CoFeB layers, which include a second ferromagnetic material layer that is disposed on the barrier layer and includes Co, Fe, and B.⁷

⁶ See *supra*, footnote 3.

⁷ See *supra*, footnote 3.

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	 Stack configuration Anneal: 360 °C, 2 h, 1
wherein each of the first and second ferromagnetic material layers is entirely crystallized, and	On information and belief, the WD Accused Products have a first and second ferromagnetic material layers that is entirely crystallized. For example, the 2013 presentation by HGST indicates that the two Co₆₀Fe₂₀B₂₀ layers (namely, the first and second ferromagnetic material layers) have undergone anneal.⁸ On information and belief, each of the first and second ferromagnetic material layers in the WD Accused Products is entirely crystallized after anneal.

⁸ See *supra*, footnote 3 at 12.

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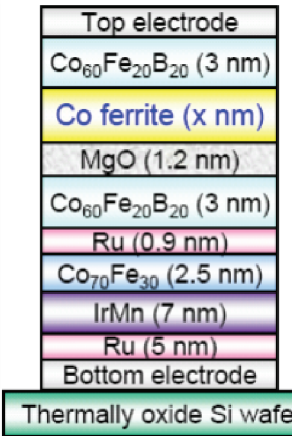
US 10,367,138	Exemplary Western Digital Infringement
	 Stack configuration Anneal: 360 °C, 2 h, 1 For example, a WD patent (U.S. Patent No. 8,914,970, the “’970 Patent”) titled “method for making a tunneling magnetoresistive (TMR) sensor” describes that “[t]he AP1 and AP2 layers, as well as the free ferromagnetic layer 110, are typically formed of <i>crystalline CoFeB</i>.” ‘970 Patent, 4:27-29. Another WD patent (U.S. Patent No. 8,427,791, the “’791 Patent”) describes that “[g]enerally, these adjacent layers are amorphous magnetic layers, such as CoFeB and the like. In order to obtain a high MR ratio in amorphous CoFeB/crystalline MgO/amorphous CoFeB MTJs, an annealing step is necessary in order to produce <i>crystallized bcc CoFeB</i> (100)/MgO(100)/<i>crystallized bcc CoFeB</i> (100).” ‘791 Patent, 1:39-44. As another example, in another WD patent (U.S. Patent No. 7,751,156, the “’156 Patent), it is described that “when MgO barrier layer 717 is deposited on the amorphous CoFeB pinned layer 716, it spontaneously grows with a very strong 100 crystallographic orientation. During anneal, <i>the CoFeB immediately contacting the MgO barrier layer 717 crystallizes</i> thus forming the desired CoFeX/MgO/CoFeX structure, and gives rise to very large TMR coefficients.” ‘156 Patent, 7:34-40.

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wherein a value of x in MgO_x for the MgO layer is greater than 0 and less than 1.	In the WD Accused Products, the MgO layer has oxygen vacancy, and a value of x in MgO_x for the MgO layer is greater than 0 and less than 1. For example, WD's '006 Patent describes oxygen vacancies in the MgO barrier due to presence of B in the free layer. '006 Patent, 7:54-63. layer 330. For the highest TMR, amorphous CoFeB is commonly used in the free layer to achieve the proper crystallization of an MgO barrier in the sputtered magnetic tunnel junctions; likewise, amorphous CoB can be used to achieve an appropriate TMR. However, the presence of B in the free layer may cause oxygen vacancies in the MgO barrier, which may result in decreased TMR and increased interlayer coupling. Aspects disclosed herein facilitate increased TMR and decreased interlayer coupling even if B is present in the free layer. In addition, the Findings of Fact, Conclusions of law, and Decision in the American Arbitration Association Case No. 651600012907 dated November 18, 2011 ("Arbitration Decision"),⁹ state that WD, through wrongful conduct, introduced an MgO TMR head product into the market. In the arbitration between Seagate and WD, the Seagate products reflecting its alleged Trade Secret 3 had a MgO barrier layer formed from a tri-layer Mg/MgO/Mg structure; forming the final MgO barrier layer uses an anneal process, which would distribute oxygen atoms throughout the tri-layer structure to form a uniform MgO barrier layer; and this results in oxygen vacancy defects in the MgO barrier layer at least because there are fewer O atoms than Mg atoms in the Mg/MgO/Mg tri-layer structure. Arbitration Decision at 10:

⁹ Available at https://amlawdaily.typepad.com/01302012western_interim.pdf.

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	<i>Trade Secret 3</i> 19. Seagate asserts that its use of a trilayer barrier layer in a TMR reader constructed by depositing a layer of magnesium (Mg), followed by a layer of magnesium oxide (MgO), followed by another layer of magnesium (Mg) is a trade secret. Seagate further asserts that three to four Seagate employees spent almost two years working on this development and that its use of a trilayer barrier layer significantly improved the performance of its reader, resulting in signal-to-noise and yield improvements. 20. In June 2007, Seagate made public its use of an Mg/MgO/Mg barrier layer in a TMR reader. At that time, a patent application Seagate filed with the United States Patent and Trademark Office that disclosed this use was published. In addition, in May 2007, a patent application Headway Technologies, Inc. filed with the United States Patent and Trademark Office that disclosed the use of “a tunnel barrier having a Mg/MgO/Mg configuration” was published. Furthermore, in that arbitration Seagate contended WD had used Seagate’s alleged tri-layer “secret,” indicating that WD’s HDDs copied Seagate’s tri-layer Mg/MgO/Mg structure.¹⁰

¹⁰ In the Arbitration Decision, the arbitrator did not reach the issue of whether WD misappropriated the alleged tri-layer trade secret (Trade Secret 3) because of a finding that Seagate did not adequately prove alleged Trade Secret 3 qualified for trade secret protection. Arbitration Decision at 10-11. Nothing in the Arbitration Decision indicates that WD proffered any evidence that its design did not use the tri-layer structure, however.

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	WD has also disclosed its use of a MgO tunnel barrier in its read/write heads, as discussed above regarding the previous limitation and incorporated here.