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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	4123.0460004
First Named Inventor	Zhenyu LU
Title	STAIRCASE STRUCTURE FOR MEMORY DEVICE
Priority Mail Express® Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [ ] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [ ] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [✓] **Specification** [*Total Pages* 23] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. [✓] **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 10]
6. **Inventor's Oath or Declaration** [*Total Pages* 5] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. [ ] Newly executed (original or copy)
   b. [✓] A copy from a prior application (37 CFR 1.63(d))
7. [✓] **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   [ ] Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. [ ] Computer Readable Form (CRF)
   b. [ ] Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] Paper
   c. [ ] Statements verifying identity of above copies

ADDRESS TO:

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

ACCOMPANYING APPLICATION PAPERS

10. [ ] **Assignment Papers** (cover sheet & document(s))
    Name of Assignee: Yangtze Memory Technologies Co., Ltd.
11. [ ] **37 CFR 3.73(c) Statement** (*when there is an assignee*) [✓] **Power of Attorney**
12. [ ] **English Translation Document** (*if applicable*)
13. [✓] **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    [ ] Copies of citations attached
14. [ ] **Preliminary Amendment**
15. [ ] **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. [ ] **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. [ ] **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. [✓] **Other:** Authorization to Treat a Reply as Incorporating an Extension of Time Under 37 C.F.R. § 1.136(a)(3)

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

[✓] The address associated with Customer Number: 26111 **OR** [ ] Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Yuanfeng Gao/	Date	2021/09/13
Name (Print/Type)	Yuanfeng Gao	Registration No. (Attorney/Agent)	79573

This collection of information is required by 37 CFR 1.53(b). 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: *To Be Assigned*
Applicant: YANGTZE MEMORY TECHNOLOGIES CO., LTD.	Art Unit: *To Be Assigned*
Application No.: *To Be Assigned (Continuation of Appl. No. 16/885,858; Filed May 28, 2020)*	Examiner: *To Be Assigned*
Filed: *Herewith*	Atty. Docket: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

Authorization to Treat a Reply as Incorporating an Extension of Time Under 37 C.F.R. § 1.136(a)(3)

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

The U.S. Patent and Trademark Office is hereby authorized to treat any concurrent or future reply that requires a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. The U.S. Patent and Trademark Office is hereby authorized to charge all required extension of time fees to our Deposit Account No. 19-0036, if such fees are not otherwise provided for in such reply.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yuanfeng Gao/

Yuanfeng Gao
Agent for Applicant
Registration No. 79,573

Date: 2021/09/13

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Washington, D.C. 20005-3934
(202) 371-2600

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Zhenyu		LU	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
City	Wuhan, Hubei	**State/Province**	
Postal Code	430000	**Country** [i]	CN

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jun		CHEN	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
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Postal Code	430000	**Country** [i]	CN

Inventor 3 Remove

Legal Name

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IPR2025-00229

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiaowang		DAI	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
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City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country [i]	CN

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jifeng		ZHU	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Postal Code	430000	Country [i]	CN

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Qian		TAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yu Ru		HUANG	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Postal Code	430000	**Country** [i]	CN

Inventor 7 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Si Ping		HU	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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Postal Code	430000	**Country** [i]	CN

Inventor 8 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Lan		YAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country i	CN

Inventor 9 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Li Hong		XIAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

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City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country i	CN

Inventor 10 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	A Man		ZHENG	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence i	CN

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City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country i	CN

Inventor 11 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kun		BAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence i	CN

Mailing Address of Inventor:

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Micron v. YMTC
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

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City	Wuhan, Hubei	**State/Province**	
Postal Code	430000	**Country** i	CN

Inventor 12 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Haohao		YANG	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence i	CN

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City	Wuhan, Hubei	**State/Province**	
Postal Code	430000	**Country** i	CN

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	26111		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE		
Attorney Docket Number	4123.0460004	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	10	**Suggested Figure for Publication (if any)**	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	26111		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	16/885858	2020-05-28

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/885858	Continuation of	16/126956	2018-09-10	10680003	2020-06-09

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/126956	Continuation of	PCT/CN2018/098962	2018-08-06

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
201710750398.4	CN	2017-08-28	38A6

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:	

If the Applicant is an Organization check here. ☒

Organization Name	Yangtze Memory Technologies Co., Ltd.

Mailing Address Information For Applicant:

Address 1	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
Address 2			
City	Wuhan, Hubei	**State/Province**	
Country CN		Postal Code	430000
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

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Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

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See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yuanfeng Gao/			Date (YYYY-MM-DD)	2021-09-13
First Name	Yuanfeng	Last Name	Gao	Registration Number	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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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Privacy Act Statement

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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.

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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 CooperationTreaty.

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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.

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COMBINED DECLARATION AND ASSIGNMENT

DECLARATION

As the below named inventors, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 16/126,956

filed on September 10, 2018

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. § 1001 by fine or imprisonment of not more than five (5) years, or both.

ASSIGNMENT

In consideration of the sum of One Dollar ($1.00) or equivalent and other good and valuable consideration paid to each of the below named inventors, each of the below named inventors, hereby sell and assign to **Yangtze Memory Technologies Co., Ltd.**, a corporation formed under the laws of China, whose mailing address is 18 Gaoxin 4th Road, East Lake High-Tech Development Zone, Wuhan, Hubei, China (hereafter referred to as the Assignee), his/her entire right, title and interest, including the right to sue for past infringement and to collect for all past, present and future damages, for the United States of America (as defined in 35 U.S.C. § 100) and throughout the world,

(a) in the invention(s) known as **STAIRCASE STRUCTURE FOR MEMORY DEVICE** for which application(s) for patent in the United States of America is identified above, in any and all applications thereon, in any and all Letters Patent(s) therefor, and

(b) in any and all applications that claim the benefit of the patent application identified above in part (a), including non-provisional applications, continuing (continuation, divisional, or continuation-in-part) applications, reissues, extensions, renewals and reexaminations of the patent application or Letters Patent therefor listed above in part (a), to the full extent of the term or terms for which Letters Patents issue, and

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(c) in any and all inventions described in the patent application identified above in part (a), and in any and all forms of intellectual and industrial property protection derivable from such patent application, and that are derivable from any and all continuing applications, reissues, extensions, renewals and reexaminations of such patent application, including, without limitation, patents, applications, utility models, inventor's certificates, and designs together with the right to file applications therefor; and including the right to claim the same priority rights from any previously filed applications under the International Agreement for the Protection of Industrial Property, or any other international agreement, or the domestic laws of the country in which any such application is filed, as may be applicable;

all such rights, title and interest to be held and enjoyed by the above-named Assignee, its successors, legal representatives and assigns to the same extent as all such rights, title and interest would have been held and enjoyed by the Assignor had this assignment and sale not been made.

The below named inventors agree to execute all papers necessary in connection with the application(s) and any non-provisional, continuing (continuation, divisional, or continuation-in-part), reissue, reexamination or corresponding application(s) thereof and also to execute separate assignments in connection with such application(s) as the Assignee may deem necessary or expedient.

The below named inventors agree to execute all papers necessary in connection with any patent enforcement action (judicial or otherwise) related to the application(s) or any non-provisional, continuing (continuation, divisional, or continuation-in-part), reissue or reexamination application(s) thereof and to cooperate with the Assignee in every way possible in obtaining evidence and going forward with such patent enforcement action.

The below named inventors hereby represent that he/she has full right to convey the entire interest herein assigned, and that he/she has not executed, and will not execute, any agreement in conflict therewith.

The below named inventors hereby represent that he/she understands that the patent practitioners associated with **CUSTOMER NUMBER 26111** are the legal representatives of, and attorneys for, the assignee, and are NOT the legal representatives of, and attorneys for, the inventors.

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IN WITNESS WHEREOF, executed by the below named inventors on the date opposite his/her name.

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STAIRCASE STRUCTURE FOR MEMORY DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Non-provisional Patent Application No. 16/885,858, titled "Staircase Structure for Memory Device," filed on May 28, 2020, which is a continuation of U.S. Non-provisional Patent Application No. 16/126,956, titled "Staircase Structure for Memory Device," filed on September 10, 2018 and issued as U.S. Patent No. 10,680,003 on June 9, 2020, which claims priority to PCT Application No. PCT/CN2018/098962 filed on August 6, 2018, which claims priority to Chinese Patent Application No. 201710750398.4 filed on August 28, 2017, the entire contents of which are incorporated herein by reference.

BACKGROUND

[0002] Planar memory cells are scaled to smaller sizes by improving process technology, circuit design, programming algorithm, and fabrication process. However, as feature sizes of the memory cells approach a lower limit, planar process and fabrication techniques become challenging and costly. As a result, memory density for planar memory cells approaches an upper limit.

[0003] A three-dimensional (3D) memory architecture can address the density limitation in planar memory cells. The 3D memory architecture includes a memory array and peripheral devices for controlling signals to and from the memory array. The 3D memory architecture also includes a stack of word lines horizontally arranged over a substrate, with vertical semiconductor channels that intersect the word lines. The intersection of a word line and a vertical semiconductor channel forms a memory cell.

BRIEF SUMMARY

[0004] Embodiments of the present disclosure are directed to a staircase structure for a memory device (e.g., 3D memory device). The disclosed embodiments provide numerous benefits including, but not limiting to, yield and manufacturing cost improvements.

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[0005] In some embodiments, a semiconductor structure includes a staircase structure disposed over a substrate. The staircase structure includes a plurality of layer stacks, where each layer stack includes a first material layer disposed over a first portion of a second material layer. The staircase structure further includes a plurality of landing pads respectively disposed on the plurality of layer stacks, where each landing pad is disposed over a second portion of the second material layer of a respective layer stack. Each of the landing pads is adjacent to a respective side of the first material layer and extends over a respective top surface of the second material layer. The first material layer is made of an insulating material, including silicon oxide, aluminum oxide or a combination thereof. The second material layer is made of a first conductive material. The plurality of landing pads are made of a second conductive material. The first conductive material can be the same or different from the second material. Each of the first and the second conductive materials includes tungsten, silicide, nickel, titanium, platinum, aluminum, titanium nitride, tantalum nitride, tungsten nitride, or a combination thereof. The second material layer of each layer stack is disposed over a portion of the first material layer of an adjacent layer stack. One of the plurality of landing pads is thicker than the first material layer of a corresponding layer stack and is insulated from another landing pad disposed on an adjacent layer stack.

[0006] In some embodiments, a method for forming a semiconductor structure includes forming a plurality of layer stacks over a substrate, where each layer stack includes a first material layer over a portion of a second material layer. The method further includes forming a hard mask layer over the plurality of layer stacks, forming a staircase structure on the plurality of layer stacks to expose a portion of the first material layer of each layer stack, forming a landing pad over a portion of the second material layer of the each layer stack, and removing the portion of the hard mask layer. The method further includes removing the landing pad and the second material layer of the each layer stack to form a recess in each layer stack, disposing a conductive material in the recess of each layer stack, and forming a dielectric layer over the staircase structure. The formation of the landing pad includes removing a portion of the second material layer from a side of each layer stack to form a recess, disposing a material layer over the staircase structure to fill the recess in each layer stack and removing a portion of the material layer to form a spacer at the side of each layer stack and a side of the portion of the hard mask layer. The

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formation of the landing pad further includes removing a portion of the first material layer of each layer stack using the spacer and the portion of the hard mask layer as a mask, disposing a dielectric layer over the staircase structure and removing the spacer and a portion of the dielectric layer. The disposing of the dielectric layer over the staircase structure includes disposing the dielectric layer over a portion of the second material layer, a portion of a side of the first material layer and a portion of a side of the spacer. The removing of the portion of the hard mask and the portion of the top layer stack in the plurality of layer stacks includes using dry etching, wet etching or a combination thereof. The trimming the mask stack include etching the mask stack incrementally and inwardly from a boundary of the mask stack. The removing of the portion of the hard mask includes using a wet etch process with tetramethylammonium hydroxide (TMAH), potassium hydroxide (KOH), a base, or a combination thereof. The formation of each layer stack and the hard mask layer includes deposition techniques using chemical vapor deposition (CVD), physical vapor deposition (PVD), plasma-enhanced CVD (PECVD), low pressure CVD (LPCVD), sputtering, metal-organic chemical vapor deposition (MOCVD), atomic layer deposition (ALD), or a combination thereof.

[0007] In some embodiments, a memory device includes a memory string disposed over the substrate and a staircase structure disposed adjacent to the memory string. The staircase structure includes a plurality of layer stacks, where each layer stack of the plurality of layer stacks includes an insulating layer disposed over a first portion of the a conductive layer, where a second portion of the conductive layer is in contact with a side surface of the insulating layer. The conductive layer of the each layer stack is disposed over a portion of the insulating layer of an adjacent layer stack. The second portion of the conductive layer is thicker than the first portion of the conductive material layer.

[0008] Other aspects of the present disclosure can be understood by those skilled in the art in light of the description, the claims, and the drawings of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying drawings, which are incorporated herein and form a part of the specification, illustrate embodiments of the present disclosure and, together with the description, further serve to explain the principles of the present disclosure and to enable a person skilled in the art to make and use the present disclosure.

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[0010] FIG. 1 illustrates a cross-sectional view of a hard mask layer and a plurality of dielectric layer pairs over a substrate, according to some embodiments.

[0011] FIG. 2A illustrates a cross-sectional view of a staircase structure, according to some embodiments.

[0012] FIG. 2B illustrates a cross-sectional view of a staircase structure, according to some embodiments.

[0013] FIG. 3 illustrates a cross-sectional view of a staircase structure with a material layer disposed therein, according to some embodiments.

[0014] FIG. 4 illustrates a cross-sectional view of a staircase structure with spacers, according to some embodiments.

[0015] FIG. 5 illustrates a cross-sectional view of a staircase structure after removal of an insulating layer, according to some embodiments.

[0016] FIG. 6 illustrates a cross-sectional view of a staircase structure with a dielectric layer disposed thereon, according to some embodiments.

[0017] FIG. 7 illustrates a cross-sectional view of a staircase structure with landing pads, according to some embodiments.

[0018] FIG. 8 illustrates a cross-sectional view of a staircase structure with a dielectric layer disposed thereon, according to some embodiments.

[0019] FIG. 9 is a flowchart of a method for forming a memory device, according to some embodiments.

DETAILED DESCRIPTION

[0020] Although specific configurations and arrangements are discussed, it should be understood that this is done for illustrative purposes only. A person skilled in the art will recognize that other configurations and arrangements can be used without departing from the spirit and scope of the present disclosure. It will be apparent to a person skilled in the art that the present disclosure can also be employed in a variety of other applications.

[0021] It is noted that references in the specification to "one embodiment," "an embodiment," "an example embodiment," "some embodiments," etc., indicate that the embodiment described can include a particular feature, structure, or characteristic, but every embodiment can not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases do not necessarily refer to the same embodiment.

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Further, when a particular feature, structure or characteristic is described in connection with an embodiment, it would be within the knowledge of a person skilled in the art to affect such feature, structure or characteristic in connection with other embodiments whether or not explicitly described.

[0022] In general, terminology can be understood at least in part from usage in context. For example, the term "one or more" as used herein, depending at least in part upon context, can be used to describe any feature, structure, or characteristic in a singular sense or can be used to describe combinations of features, structures or characteristics in a plural sense. Similarly, terms, such as "a," "an," or "the," again, can be understood to convey a singular usage or to convey a plural usage, depending at least in part upon context. In addition, the term "based on" can be understood as not necessarily intended to convey an exclusive set of factors and may, instead, allow for existence of additional factors not necessarily expressly described, again, depending at least in part on context.

[0023] The meaning of "on," "above," and "over" in the present disclosure should be interpreted in the broadest manner such that "on" not only means "directly on" something, but also includes the meaning of "on" something with an intermediate feature or a layer therebetween. Moreover, "above" or "over" not only means "above" or "over" something, but can also include the meaning it is "above" or "over" something with no intermediate feature or layer therebetween (i.e., directly on something).

[0024] Further, spatially relative terms, such as "beneath," "below," "lower," "above," "upper," and the like, can be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. The spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. The apparatus can be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein can likewise be interpreted accordingly.

[0025] As used herein, the term "substrate" refers to a material onto which subsequent material layers are added. The substrate includes a top surface and a bottom surface. The top surface of the substrate is where a semiconductor device is formed, and therefore the semiconductor device is formed at a top side of the substrate. The bottom surface is opposite to the top surface and therefore a bottom side of the substrate is opposite to the top side of the substrate. The substrate itself can be patterned. Materials added on top of

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the substrate can be patterned or can remain unpatterned. Furthermore, the substrate can include a wide array of semiconductor materials, such as silicon, germanium, gallium arsenide, indium phosphide, etc. Alternatively, the substrate can be made from an electrically non-conductive material, such as a glass, a plastic, or a sapphire wafer.

[0026] As used herein, the term "layer" refers to a material portion including a region with a thickness. A layer has a top side and a bottom side where the bottom side of the layer is relatively close to the substrate and the top side is relatively away from the substrate. A layer can extend over the entirety of an underlying or overlying structure, or can have an extent less than the extent of an underlying or overlying structure. Further, a layer can be a region of a homogeneous or inhomogeneous continuous structure that has a thickness less than the thickness of the continuous structure. For example, a layer can be located between any set of horizontal planes between, or at, a top surface and a bottom surface of the continuous structure. A layer can extend horizontally, vertically, and/or along a tapered surface. A substrate can be a layer, can include one or more layers therein, and/or can have one or more layer thereupon, thereabove, and/or therebelow. A layer can include multiple layers. For example, an interconnect layer can include one or more conductor and contact layers (in which contacts, interconnect lines, and/or vias are formed) and one or more dielectric layers.

[0027] As used herein, the term "nominal/nominally" refers to a desired, or target, value of a characteristic or parameter for a component or a process operation, set during the design phase of a product or a process, together with a range of values above and/or below the desired value. The range of values can be due to slight variations in manufacturing processes or tolerances. As used herein, the term "about" indicates the value of a given quantity that can vary based on a particular technology node associated with the subject semiconductor device. Based on the particular technology node, the term "about" can indicate a value of a given quantity that varies within, for example, 10–30% of the value (e.g., ±10%, ±20%, or ±30% of the value).

[0028] In the present disclosure, the term "horizontal/horizontally/lateral/laterally" means nominally parallel to a lateral surface of a substrate.

[0029] As used herein, the term "3D memory device" refers to a semiconductor device with vertically oriented strings of memory cell transistors (referred to herein as "memory strings," such as NAND strings) on a laterally-oriented substrate so that the memory

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strings extend in the vertical direction with respect to the substrate. As used herein, the term "vertical/vertically" means nominally perpendicular to the lateral surface of a substrate.

[0030] In some embodiments, a NAND string or a 3D memory device includes a semiconductor channel (e.g., a silicon channel) that extends vertically through a plurality conductor/dielectric layer pairs, where the semiconductor channel is surrounded by a dielectric stack. The plurality of conductor/dielectric layer pairs are also referred to herein as an "alternating conductor/dielectric stack." The conductor layer of the alternating conductor/dielectric stack can be used as a word line (e.g., to electrically connect one or more control gates). An intersection of a word line and the semiconductor channel forms a memory cell. Vertically-oriented memory strings require an electrical connection between a word line and an access line (e.g., back end of line (BEOL) interconnection) to select a memory cell along the memory string for read and write functions, where the electrical connection is provided by forming a staircase structure at the plurality of conductor/dielectric pairs.

[0031] The 3D memory device can include a plurality of staircase structures disposed adjacent to a plurality of memory strings for word line fan-out, according to some embodiments. As the demand for higher storage capacity continues to increase, the number of vertical levels of the staircase structures also increases. As a result, when applying a BEOL process to form interconnects on the staircase structures, an upper portion of the staircase structures is exposed to the BEOL process for a longer period of time than a lower portion of the staircase structures. This differential in BEOL exposure time increases the process variation of the final 3D memory device, thus introducing challenges in balancing manufacturing yield and process complexity/cost.

[0032] In the present disclosure, a staircase structure refers to a set of surfaces that include at least two horizontal surfaces (e.g., along an x-y plane) and at least two vertical surfaces (e.g., along a z-axis). Each horizontal surface is adjoined to a first vertical surface that extends upward from a first edge of the horizontal surface, and is also adjoined to a second vertical surface that extends downward from a second edge of the horizontal surface. Each of the horizontal surfaces is referred as a "step" or "stair" of the staircase structure. A horizontal direction can refer to a direction (e.g., the x-axis or the y-axis) parallel with a top surface of the substrate (e.g., the substrate that provides the

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fabrication platform for formation of structures over it). A vertical direction can refer to a direction (e.g., the z-axis) perpendicular to the top surface of the structure.

[0033] The staircase structure can be formed from a plurality of layer stacks by repetitively etching and trimming the each layer stack using a mask layer, where each layer stack is also referred to as a "staircase layer" (or "SC layer") of the staircase structure in the present disclosure. A step of the staircase structure exposes a portion of a top surface of a layer stack (e.g. a SC layer) of the plurality of layer stacks. In some embodiments, the staircase structure includes a plurality of layer stacks.

[0034] FIG. 1 illustrates a structure 100 with an alternating layer stack formed over a substrate 101 and a hard mask layer 106 formed over the alternating layer stack. A layer stack within the alternating layer stack can include a dielectric layer pair with an insulating layer 102 over a sacrificial layer 104. In some embodiments, sacrificial layer 104 can be disposed over insulating layer 102. Insulating layer 102 can include silicon oxide. Sacrificial layer 104 can include silicon nitride. In some embodiments, a thickness of insulating layer 102 or sacrificial layer 104 is between 10 nm and 200 nm. In some embodiments, a thickness of hard mask layer 106 is between 10 nm and 200 nm. In some embodiments, the layers in the alternating layer stack can be different thicknesses.

[0035] In some embodiments, substrate 101 includes any suitable material for supporting a memory structure (e.g., 3D memory structure). For example, substrate 101 can include silicon, silicon germanium, silicon carbide, silicon on insulator (SOI), germanium on insulator (GOI), glass, gallium nitride, gallium arsenide, any suitable III-V compounds, any other suitable material, or combinations thereof.

[0036] In some embodiments, sacrificial layer 104 can include any suitable material different from insulating layer 102. For example, sacrificial layer 104 can include poly-crystalline silicon, silicon nitride, poly-crystalline germanium, poly-crystalline germanium-silicon, any other suitable materials, or combinations thereof. In some embodiments, sacrificial layer 104 can include silicon nitride.

[0037] Insulating layer 102 can include any suitable insulating materials, such as silicon oxide or aluminum oxide.

[0038] In some embodiments, sacrificial layer 104 can be a conductive material layer. The conductive material layer can include any suitable conductive material. In some embodiments, the conductive material layer can include poly-crystalline silicon, tungsten,

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silicide, nickel, titanium, platinum, aluminum, titanium nitride, tantalum nitride, tungsten nitride, any other suitable material, or combinations thereof.

[0039] In some embodiments, hard mask layer 106 can be a poly-crystalline semiconductor layer including poly-crystalline silicon, poly-crystalline germanium, poly-crystalline germanium-silicon, any other suitable material, or combinations thereof. In some embodiments, hard mask layer 106 can be a metal layer, including cobalt, nickel, tungsten, copper, or silver. In some embodiments, hard mask layer 106 can be a metal silicide layer, including $CoSi_x$, $NiSi_x$, or WSi_x. In some embodiments, hard mask layer 106 can be an organic material layer formed by spin-coating or self-assembling of organic molecules.

[0040] The formation of insulating layer 102, sacrificial layer 104, and hard mask layer 106 can include any suitable deposition methods such as, for example, chemical vapor deposition (CVD), physical vapor deposition (PVD), plasma-enhanced CVD (PECVD), low pressure chemical vapor deposition (LPCVD), sputtering, metal-organic chemical vapor deposition (MOCVD), atomic layer deposition (ALD), sputtering, thermal evaporation, e-beam evaporation, molecular beam-epitaxy (MBE), any other suitable deposition method, or combinations thereof. In some embodiments, insulating layer 102, sacrificial layer 104, the conductive material layer, and hard mask layer 106 are each formed by CVD. In some embodiments, the formation of hard mask layer 106 further includes applying a thermal anneal process to form a silicide layer.

[0041] FIGs. 2A-2B illustrate a cross-sectional view of staircase structures 200A and 200B, according to some embodiments. Staircase structure 200A includes a hard mask 206 and a plurality of layer stacks 202/204. Each layer stack 202/204 is also referred to herein as an "SC layer." The steps in staircase structure 200A is formed by repeating an etch-trim process on structure 100 using a mask stack (not shown). After the formation of the steps, the mask stack is removed. In some embodiments, a step exposes a portion of a top surface of an SC layer. In some embodiments, a step exposes a side of a SC layer. In some embodiments, after repeating the etch-trim process, a portion of a top-most SC layer of staircase structure 200A is exposed and another portion of the top-most SC layer is covered by hard mask layer 206. An etch process is also applied to laterally etch a portion of sacrificial layer 204 of each SC layer. As a result, each step of staircase structure 200B has a recess (e.g. recess 220, 222, 224..., etc.). In some embodiments, a lateral dimension

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of each recess is between 10 nm and 300 nm. In some embodiments, a lateral dimension "a" of each step is between 100 nm and 1500 nm.

[0042] In some embodiments, the mask stack (not shown in FIG. 2A) can include a photoresist or carbon-based polymer material. In some embodiments, the mask stack is removed after forming staircase structure 200A. The etch-trim process includes an etch process and a trim process. In some embodiments, the etch process includes using any suitable etchants (e.g., wet etch and/or dry etch) to sequentially remove a portion of hard mask layer 106 and a portion of the layer stack, including a portion of insulating layer 102 and a portion of sacrificial layer 104. For example, as shown in FIG.2A, hard mask layer 206, insulating layer 202, and sacrificial layer 204 are formed after removing a portion of hard mask layer 106, a portion of insulating layer 102, and a portion of sacrificial layer 104.

[0043] In the etch process, an etchant for insulating layer 102 has a higher etching selectivity over sacrificial layer 104, and/or vice versa. In some embodiments, the etchant for hard mask layer 106 has a higher etching selectivity over insulating layer 102 and sacrificial layer 104, and/or vice versa. Accordingly, an underlying layer stack can function as an etch-stop layer so that a single layer stack is patterned/etched, according to some embodiments. In some embodiments, insulating layer 102 and sacrificial layer 104 are etched using an anisotropic etch process, such as reactive ion etch (RIE) or other dry etch process. In some embodiments, the etchant includes carbon-fluorine (CF_4) based gases or hexafluoroethane (C_2F_6) based gases. In some embodiments, an etchant includes phosphoric acid and can be used to remove both insulating layer 102 and sacrificial layer 104. The methods and etchants to remove the layer stack described herein are exemplary. Other methods and etchants are within the spirit and scope of the present disclosure.

[0044] The trim process includes applying a suitable etch process (e.g., an isotropic dry etch or a wet etch) on the mask stack at directions parallel to a surface of the substrate. The mask stack is etched incrementally and inwardly from a boundary of the mask stack. The amount of trimmed mask stack can be related to the lateral dimension "a" of each steps of staircase structure 200A.

[0045] The process for forming the recess structure (e.g. recess 220, 222, 224…, etc.) uses an etch process similar to the etching techniques for removing sacrificial layer 104 as

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described above. In some embodiments, the process etches sacrificial layer 204 at a higher etching rate than that of insulating layer 202 or hard mask layer 206.

[0046] FIG. 3 illustrates a cross-sectional view of a staircase structure 300 with a material layer 310 disposed thereon, according to some embodiments. Material layer 310 is conformally disposed on staircase structure 200B, including on a top surface of hard mask layer 206, a side of hard mask layer 206, a top surface of each SC layer (e.g. each step) of staircase structure 200B, and a recess of the each SC layer. In some embodiments, material layer 310 fills each recesses of staircase structure 200B. Material layer 310 can be made of similar material as hard mask layer 106, where the formation of material layer 310 can be similar to that of hard mask layer 106. In some embodiments, a thickness of material layer 310 is thicker than that of sacrificial layer 204. In some embodiments, a thickness of material layer 310 is thinner than that of the SC layer.

[0047] FIG. 4 illustrates a cross-sectional view of a staircase structure 400 with spacers 410, according to some embodiments. Each of spacers 410 is formed at a side of each SC layer of staircase structure 300. In some embodiments, spacer 410 is formed at a side of hard mask layer 206. Spacer 410 is formed by removing a portion of material layer 310 from staircase structure 300 using similar techniques as removing hard mask layer 106. In some embodiments, material layer 310 is removed from a top surface of staircase structure 300 and a top surface of hard mask layer 206. In some embodiments, spacer 410 fills a recess (e.g. recess 220, 222, or 224) of each SC layer of staircase structure 300. In some embodiments, spacer 410 covers a side of sacrificial layer 204 of each SC layer of staircase structure 300. In some embodiments, spacer 410 covers a portion of a side of insulating layer 202 of each SC layer of staircase structure 300. In some embodiments, spacer 410 and hard mask layer 106 are made of the same material.

[0048] FIG. 5 illustrates a cross-sectional view of a staircase structure 500 after removal of a portion of insulating layer 202, according to some embodiments. In FIG. 5, the portion of insulating layer 202 of each SC layer of staircase structure 400 is removed using spacers 410 and hard mask layer 206 as masks. Insulating layer 502 is formed after removing the portion of insulating layer 202 using similar techniques as removing insulating layer 102. As illustrated in FIG. 5, each SC layer of staircase structure 500 exposes a portion of a top surface of sacrificial layer 204 and spacer 410 of each SC layer.

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In some embodiments, a side of insulating layer 502 of each SC layer of staircase structure 500 is exposed.

[0049] FIG. 6 illustrates a cross-sectional view of a staircase structure 600 with a dielectric layer 620 disposed thereon, according to some embodiments. Dielectric layer 620 covers a top surface of staircase structure 500 and a portion of a side of staircase structure 500. In some embodiments, dielectric layer 620 covers a portion of each spacer 410 of staircase structure 500. In some embodiments, dielectric layer 620 covers a top surface of hard mask layer 206, a portion of a top surface of sacrificial layer 204, and a portion of a side of insulating layers 502 of each SC layer of staircase structure 500. In some embodiments, dielectric layer 620 has poor step-coverage on staircase structure 500. For example, the poor step-coverage includes a thickness of dielectric layer 620 that is substantially thinner at a side of staircase structure 600 than that at a top surface of staircase structure 600. In some embodiments, dielectric layer 620 is discontinuous between each SC layer of staircase structure 600. In some embodiments, a portion of spacer 410 or a portion of a side of insulating layer 502 of each SC layer of staircase structure 600 is exposed.

[0050] In some embodiments, dielectric layer 620 can be a nitride layer, including silicon nitride, silicon oxynitride, any suitable materials, or combinations thereof. In some embodiments, dielectric layer 620 and each sacrificial layer 204 of staircase structure 600 are made of the same material. In some embodiments, a thickness of dielectric layer 620 at a top surface of staircase structure 600 is thinner than that of insulating layer 502 of each SC layer of staircase structure 600. Dielectric layer 620 can be formed using deposition techniques including, but not limiting to plasma-enhanced CVD (PECVD), low pressure CVD (LPCVD), physical vapor deposition (PVD), high density plasma (HDP), atomic layer deposition (ALD), any suitable deposition techniques, or combinations thereof.

[0051] FIG. 7 illustrates a cross-sectional view of a staircase structure 700 with landing pads 720, according to some embodiments. In FIG. 7, spacers 410 and a portion of dielectric layer 620 are removed from staircase structure 600. After removing spacers 410 and the portion of dielectric layer 620, a landing pad 720 is formed over each SC layer of staircase structure 700. As shown in FIG. 7, landing pad 720 is in contact with sacrificial layer 204 of each SC layer of staircase structure 700. Both landing pad 720 and sacrificial

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layer 204 of the SC layer are disposed over a portion of insulating layer 502 of another vertically adjacent SC layer. In some embodiments, landing pad 720 is formed over hard mask layer 206. In some embodiments, landing pad 720 of a SC layer is thicker than insulating layer 502 of the SC layer. Landing pad 720 can also be discontinuous from another landing pad 720 disposed on another vertically adjacent SC layer. In some embodiments, landing pad 720, dielectric layer 620 and sacrificial layer 204 are made of the same material.

[0052] Removal of spacers 410 and the portion of dielectric layer 620 can use an etch process similar to that which removes hard mask layer 106 and sacrificial layer 104, where the etch process has high etching selectivity to insulating layers 502 as described above. In some embodiments, more than two etch processes are applied to etch dielectric layer 620 and spacers 410, in which the etch processes have high etching selectivity to insulating layers.

[0053] FIG. 8 illustrates a cross-sectional view of a staircase structure 800 with a dielectric layer 825 disposed thereon, according to some embodiments. Staircase structure 800 is formed by removing hard mask layer 206 from staircase structure 700. Further, a wordline layer 804 for each SC layer of staircase structure 800 is formed by replacing landing pad 720 and sacrificial layer 204 of each step of staircase structure 700 with one or more conducting material layers, including poly-crystalline silicon, tungsten, silicide, nickel, tungsten, titanium, platinum, aluminum, titanium nitride, tantalum nitride, tungsten nitride, any other suitable material, or combinations thereof. As shown in FIG. 8, wordline layer 804 includes landing pad 820 and conductive layer 840. Wordline layer 804 of an SC layer is disposed over a portion of insulating layer 502 of another vertically adjacent SC layer. In some embodiments, a length of wordline layer 804 is shorter in a horizontal direction (e.g., x-direction) than that of insulating layer 502 of another vertically adjacent SC layer. In some embodiments, landing pad 820 is thicker than insulating layer 502 and is insulated from another landing pad 820 disposed on another vertically adjacent SC layer. A dielectric layer 825 is disposed on staircase structure 700. Each wordline layer 804, including landing pad 820 and a conductive layer 840, of staircase structure 800 can control a portion of a memory string in the stacked storage region of a memory device (e.g., 3D memory device). In some embodiments, each wordline layer 804 of staircase structure 800 is a wordline of the memory device, where

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conductive layer 840 contacts a portion of a memory string of a memory device, and landing pad 820 contacts a portion of a side of insulating layer 502. In some embodiments, a thickness of landing pad structure 820 of word line 804 is thicker than that of conductive layer 840 of wordline layer 804. In some embodiments, an edge of wordline layer 804 of each step of staircase structure 800 has landing pad structure 820, where landing pad 820 is made of the same or different conductive material as conductive layer 840.

[0054] In some embodiments, hard mask layer 206 of staircase structure 700 is removed using a wet etch process. In some embodiments, an etchant used in the wet etch process includes tetramethylammonium hydroxide (TMAH). In some embodiments, a landing pad 720 over hard mask layer 206 is lifted-off after the wet etch process. In some embodiments, hard mask layer 206 is removed using similar techniques as removing hard mask layer 106.

[0055] In some embodiments, replacement of landing pad 720 and sacrificial layer 204 of each SC layer with the conductive material includes formation of one or more recesses in each SC layer by removing landing pad 720 and sacrificial layer 204 from each SC layer, followed by filling the one or more conductive material layers in the one or more recesses. The removal of landing pad 720 or sacrificial layer 204 can be similar to the techniques of removing sacrificial layer 104. In some embodiments, the removal of landing pad 720 uses different techniques from the removal of sacrificial layer 204. The filling of the conductive material can be similar to the techniques of depositing metallic hard mask layer 106. In some embodiments, the filling of a recess formed by the removal of landing pad 720 uses different techniques and/or conductive material from the filling of another recess formed by the removal of sacrificial layer 204.

[0056] In some embodiments, the formation of dielectric layer 825 uses similar techniques as forming insulating layer 102 or sacrificial layer 104. In some embodiments, the formation of dielectric layer 825 uses a spin-coating process. In some embodiments, dielectric layer 825 includes any suitable dielectric materials, such as silicon oxide or a spin-on-dielectric material. In some embodiments, the formation of dielectric layer 825 further includes a planarization process, such as chemical-mechanical planarization (CMP). In some embodiments, dielectric layer 825 is made of the same material as

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insulating layer 102 or sacrificial layer 104. In some embodiments, dielectric layer 825 is disposed on each step of staircase structure 800.

[0057] FIG. 9 is a flowchart of a method 900 for forming a memory device (e.g., 3D memory device), according to some embodiments. The operations of method 900 can be used to form memory device structures illustrated in FIGs. 1-8. The operations shown in method 900 are not exhaustive and that other operations can be performed as well before, after, or between any of the illustrated operations. In some embodiments, some operations of exemplary method 900 can be omitted or include other operations that are not described here for simplicity. In some embodiments, operations of method 900 can be performed in a different order and/or vary.

[0058] In operation 910, an alternating stack and a hard-mask layer are formed over a substrate. The substrate can include any suitable material for forming a memory structure—e.g., a 3D memory device. For example, the substrate can include silicon, silicon germanium, silicon carbide, SOI, GOI, glass, gallium nitride, gallium arsenide, plastic sheet, and/or other suitable III-V compound.

[0059] In operation 910, a layer stack in the alternating layer stack can include a dielectric layer pair with a first material layer and a second material layer. In some embodiments, the first material layer can be an insulating layer. The second material layer can be a sacrificial layer or a conductive material layer. The sacrificial layer can include materials such as silicon nitride, poly-crystalline silicon, poly-crystalline germanium, poly-crystalline germanium-silicon, any other suitable material, or combinations thereof. The insulating layer can include silicon oxide, aluminum oxide, or other suitable materials. The conductive material layer can include tungsten, titanium nitride, tantalum nitride, tungsten nitride, any other suitable material, or combinations thereof. Each of the insulating, sacrificial, and conductive material layers can include materials formed by one or more thin film deposition processes including, but not limiting to, CVD, PVD, ALD, or any combinations thereof.

[0060] The hard mask layer can be a poly-crystalline semiconductor layer, including poly-crystalline silicon. In some embodiments, the hard mask layer can be a metal layer, such as cobalt, nickel, tungsten, copper, or silver. In some embodiments, the hard mask layer can be a silicide layer, including $CoSi_x$, $NiSi_x$, or WSi_x . In some embodiments, the hard mask layer can be an organic material layer. The hard mask layer can be formed

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using similar techniques as forming the alternating layer stack. In some embodiments, the formation of the hard mask layer includes a thermal anneal process.

[0061] In operation 920, a staircase structure is formed, where a layer of each layer stack in the staircase structure is recessed. Each step of the staircase structure can be formed by repeating an etch-trim process using a mask stack. In some embodiments, the mask stack can include a photoresist or carbon-based polymer material. The etch-trim process includes an etch process and a trim process. In some embodiments, the etch process etches a portion of the hard mask layer and a portion of the layer stack. In some embodiments, the etch process etches a portion of the hard mask layer and a portion of a plurality of layer stacks. In some embodiments, one or more etchants are used in the etch process, and each of the etchants etches the first material layer at a higher etch rate than the second material layer or the hard mask layer. In some embodiments, the one or more etchants etches one of the first material layer, the second material layer and the hard mask layer at a higher etch rate than the other two of the first material layer, the second material layer and the hard mask layer. In some embodiments, the etch process can control the formation of steps of the staircase structure because high etching selectivity between the first and the second material layer allows the etch process to stop on a surface of a layer stack of the alternating layer stack.

[0062] The trim process includes a suitable etch (e.g., an isotropic dry etch or a wet etch) of the mask stack and is performed at a direction parallel to a surface of the substrate. The amount of trimmed mask stack can be related to the lateral dimensions of the staircase structure. After the repetitive etch-trim process, the resulting staircase structure includes a plurality of layer stacks (or plurality of SC layers). In some embodiments, the staircase structure includes a plurality of steps, where each of the steps exposes a side and a portion of a top surface of each SC layer. In some embodiments, the height of each of the steps is one level, which is equal to the thickness of a SC layer.

[0063] Further, in operation 920, a layer of each SC layer is recessed. The recess process uses similar techniques as etching the alternating layer stack. In some embodiments, a sacrificial layer of each SC layer is recessed using the recess process. In some embodiments, the recess process etches a sacrificial layer of each SC layer and has higher etching selectivity to an insulating layer of each SC layer and the hard mask layer. As a result, the staircase structure includes a plurality of steps, where a SC layer exposed by a

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step has a lateral recess structure. The formation of the staircase structure is described above with respect to FIGs. 2A-2B.

[0064] In operation 930, a spacer is formed at a side of each step of the staircase structure. A material layer is disposed on the staircase structure. In some embodiments, the material layer fills a recess in each of the SC layers. In some embodiments, the material layer is conformally disposed on the staircase structure. In some embodiments, the material layer is made of a similar material as the hard mask layer. In some embodiments, formation of the material layer uses similar techniques as forming the hard mask layer.

[0065] Further, in operation 930, a portion of the material layer is removed to form a spacer at a side of each of the SC layers. The removal of the material layer uses similar techniques as removing the hard mask layer. In some embodiments, the material layer is completely removed from a top of each of the SC layers. In some embodiments, the material layer is completely removed from a top of the hard mask layer. In some embodiments, the spacer fills in the recess of each of the SC layers. The spacer and the hard mask layer can be made of the same material. The formation of the spacers is described above with respect to FIGs. 3-4.

[0066] In operation 940, a portion of a layer of each of the SC layers is removed using the spacers and hard mask layer as a mask. In some embodiments, a portion of an insulating layer of each of the SC layers is removed. The removal of the portion of the layer of each of the SC layers uses similar techniques as removing the alternating layer stack. An example of operation 940 is described above with respect to FIG. 5.

[0067] In operation 950, a landing pad is formed at each layer stack of the staircase structure. A dielectric layer is disposed to cover a top surface and a portion of a side of the staircase structure, including a portion of a side of each spacer and a side of an insulating layer of each of the SC layers. The dielectric layer is substantially thinner at a side of the staircase structure than at a top surface of the staircase structure. In some embodiments, the dielectric layer is discontinuous between steps of the staircase structure. The dielectric layer can be a nitride layer. In some embodiments, the dielectric layer and the sacrificial layer are made of the same material, where forming the dielectric layer uses similar techniques as forming the sacrificial layer.

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[0068] Operation 950 further includes removing a portion of the dielectric layer and the spacer to form a landing pad on each of the SC layers. The removal of the spacer and the dielectric layer uses an etch process similar to that for forming the staircase structure from the alternating layer stack and the hard mask layer. In some embodiments, the dielectric layer is completely removed from a side of each of the SC layers. In some embodiments, after removing the spacer and the portion of the dielectric layer, the dielectric layer remaining on each of the SC layer forms the landing pad. The landing pad and the sacrificial layer can be made of the same material. The formation of landing pads is described above with respect to FIGs 6-7.

[0069] In operation 960, a wordline layer at each layer of the staircase structure is formed. For example, the hard mask layer on a top surface of the staircase structure can be removed using an etch process. The etch process can include a wet etch process using tetramethylammonium hydroxide (TMAH). In some embodiments, the etch process lifts-off a landing pad at a top of the hard mask layer. Operation 960 further includes forming word lines of the memory device (e.g., 3D memory device) by replacing each of the landing pads and the insulating layers of each of the SC layers with one or more conductive material. This replacement starts from forming a recess at each SC layer of the staircase by removing the landing pad and the insulating layer of each SC layer. The one or more conductive material is disposed in the recess of each SC layer to form a word line in the staircase structure. After forming the word lines, a dielectric layer is disposed over the staircase structure for the BEOL interconnect process.

[0070] The foregoing description of the specific embodiments will so fully reveal the general nature of the present disclosure that others can, by applying knowledge within the skill of the art, readily modify and/or adapt for various applications such specific embodiments, without undue experimentation, without departing from the general concept of the present disclosure. Therefore, such adaptations and modifications are intended to be within the meaning and range of equivalents of the disclosed embodiments, based on the disclosure and guidance presented herein. It is to be understood that the phraseology or terminology herein is for the purpose of description and not of limitation, such that the terminology or phraseology of the present specification is to be interpreted by the skilled artisan in light of the disclosure and guidance.

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[0071] Embodiments of the present disclosure have been described above with the aid of functional building blocks illustrating the implementation of specified functions and relationships thereof. The boundaries of these functional building blocks have been arbitrarily defined herein for the convenience of the description. Alternate boundaries can be defined so long as the specified functions and relationships thereof are appropriately performed.

[0072] The Summary and Abstract sections can set forth one or more but not all exemplary embodiments of the present disclosure and thus are not intended to limit the present disclosure and the appended claims.

[0073] The breadth and scope of the present disclosure should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

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WHAT IS CLAIMED IS:

1. A staircase structure of a memory device, comprising:

a first material layer and a second material layer, wherein the first material layer comprises an insulating material and is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises:

a bottom surface; and

an upper surface opposite to the bottom surface, wherein the upper surface is above a top surface of the first material layer.

2. The staircase structure of claim 1, wherein the landing pad comprises a first side surface and a second side surface, wherein the first side surface is in contact with the first material layer, and wherein the second side surface is laterally displaced from a third side surface of the second portion of the second material layer.

3. The staircase structure of claim 1, wherein the upper surface is laterally displaced and vertically above the top surface of the first material layer.

4. The staircase structure of claim 1, wherein the second material layer comprises a first conductive material and the landing pad comprises a second conductive material different from the first conductive material.

5. The staircase structure of claim 1, further comprising a dielectric layer in contact with the bottom surface of the landing pad, a side surface of the landing pad, and a side surface of the second portion of the conductive layer.

7. The staircase structure of claim 1, further comprising another first material layer, wherein the second material layer is disposed over the another first material layer, and wherein a side surface of the another first material layer is laterally displaced from a side surface of the landing pad.

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8. The staircase structure of claim 1, wherein a thickness of the landing pad is greater than a thickness of the first material layer.

9. A staircase structure of a memory device, comprising:

a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer.

10. The staircase structure of claim 9, further comprising a dielectric layer in contact with a bottom surface of the landing pad, the second side surface of the landing pad, and the side surface of the second portion of the conductive layer.

11. The staircase structure of claim 9, wherein the second material layer comprises a first conductive material, and wherein the landing pad comprises a second conductive material different from the first conductive material.

12. The staircase structure of claim 9, wherein the landing pad comprises a conductive material.

13. The staircase structure of claim 12, wherein the conductive material comprises tungsten, silicide, nickel, titanium, platinum, aluminum, titanium nitride, tantalum nitride, tungsten nitride, or a combination thereof.

14. The staircase structure of claim 9, wherein the second material layer is disposed over a first portion of another first material layer, and wherein a side surface of a second portion of the another first material layer is laterally displaced from the second surface of the landing pad.

15. The staircase structure of claim 9, wherein a thickness of the landing pad is greater than a thickness of the first material layer.

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16. A memory device, comprising:

a memory string disposed over the substrate; and

a staircase structure disposed adjacent to the memory string, wherein the staircase structure comprises:

a conductive layer comprising first and second portions;

an insulating layer disposed over the first portion of the conductive layer, wherein the insulating layer comprises a first thickness; and

a landing pad disposed on the second portion of the conductive layer and in contact with a side surface of the insulating layer, wherein the landing pad comprises a second thickness greater than the first thickness.

17. The memory device of claim 16, wherein the conductive layer comprises a first conductive material and the landing pad comprises a second conductive material different from the first conductive material.

18. The memory device of claim 16, wherein the conductive layer is disposed over a first portion of another insulating layer, wherein a second portion of the another insulating layer is laterally displaced from the conductive layer.

19. The memory device of claim 16, wherein a side surface of the landing pad is laterally displaced from a side surface of the second portion of the conductive layer.

20. The memory device of claim 19, further comprising a dielectric layer in contact with a bottom surface of the landing pad, the side surface of the landing pad, and the side surface of the second portion of the conductive layer.

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ABSTRACT

A semiconductor structure is disclosed. The semiconductor structure includes a staircase structure disposed over a substrate. The staircase structure includes a plurality of layer stacks, where each layer stack is made of a first material layer over a portion of a second material layer. The staircase structure further includes a plurality of landing pads, where each landing pad is disposed over another portion of the second material layer of a respective layer stack.

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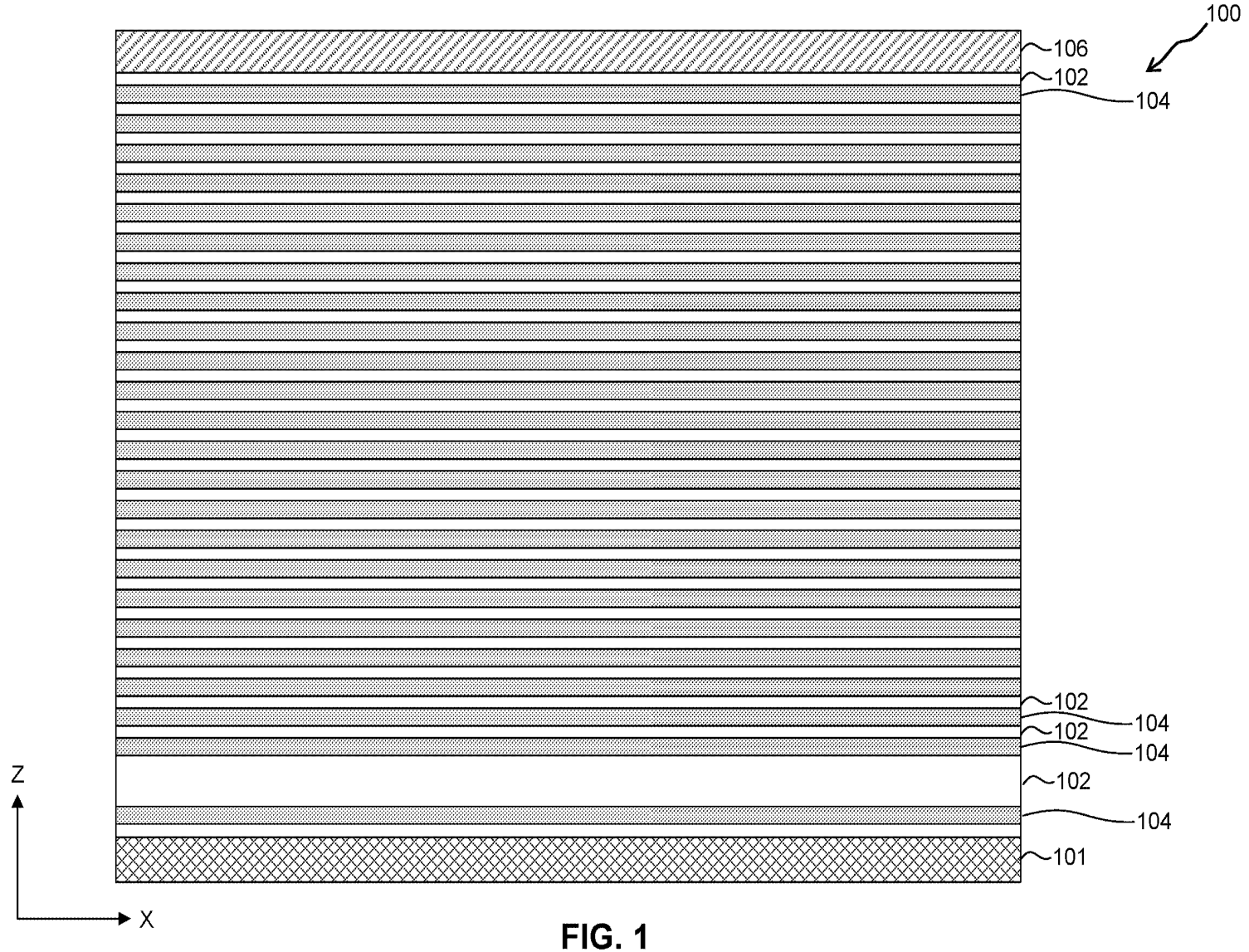


FIG. 1

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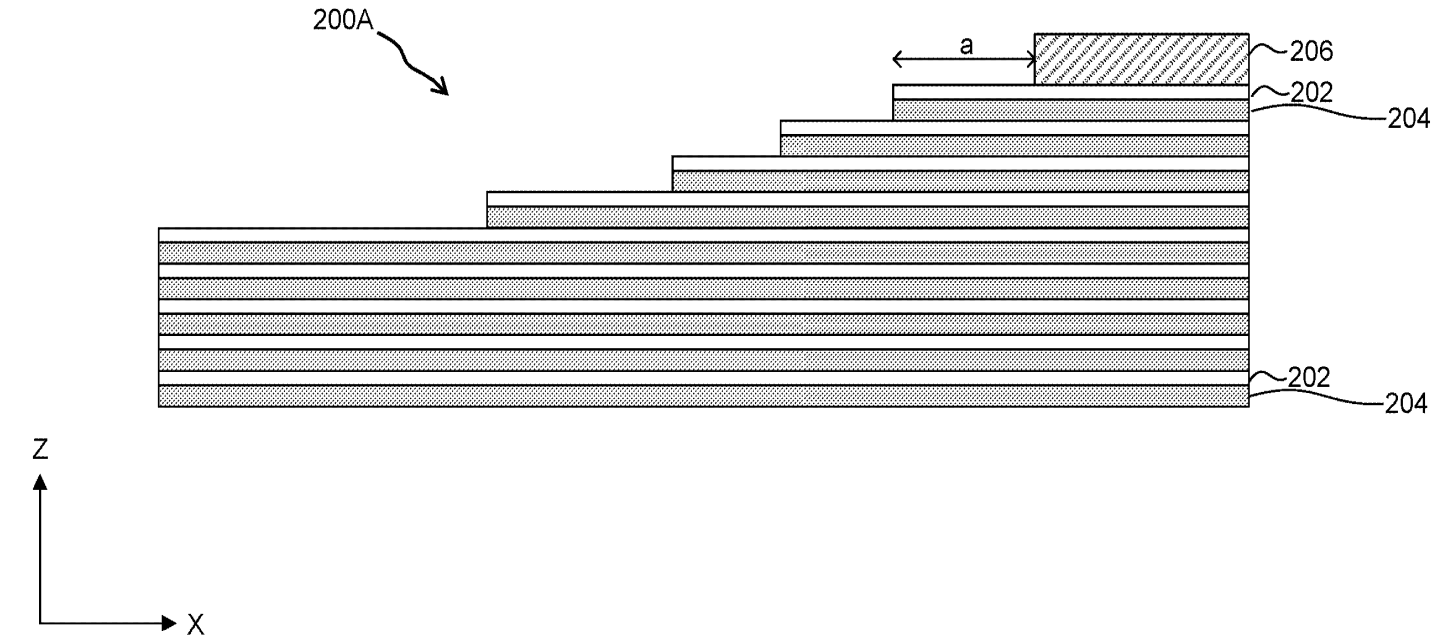


FIG. 2A

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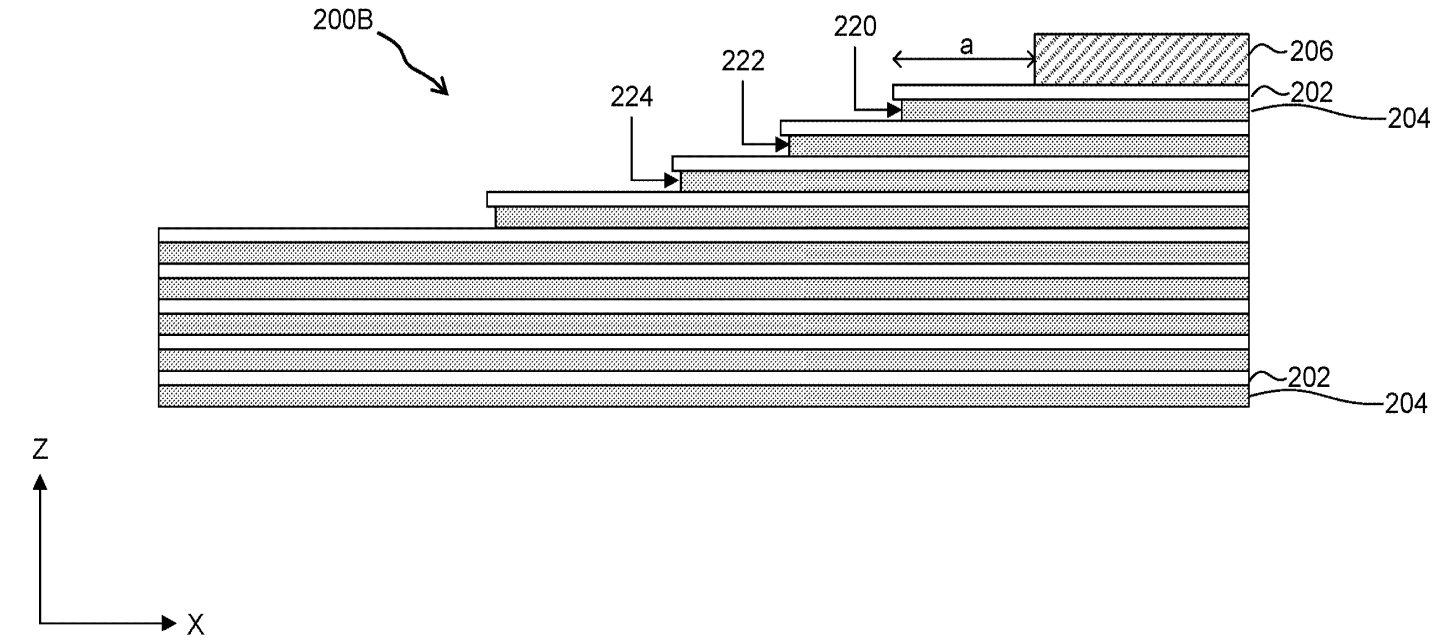


FIG. 2B

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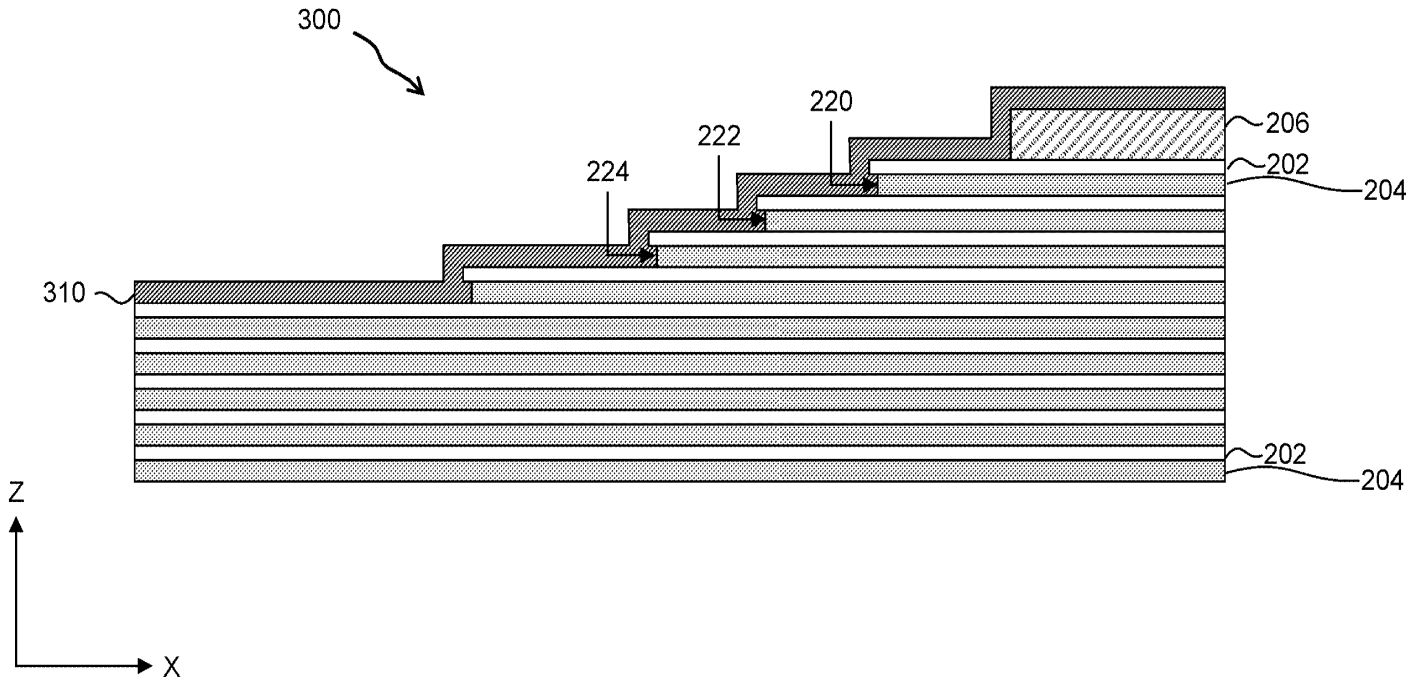


FIG. 3

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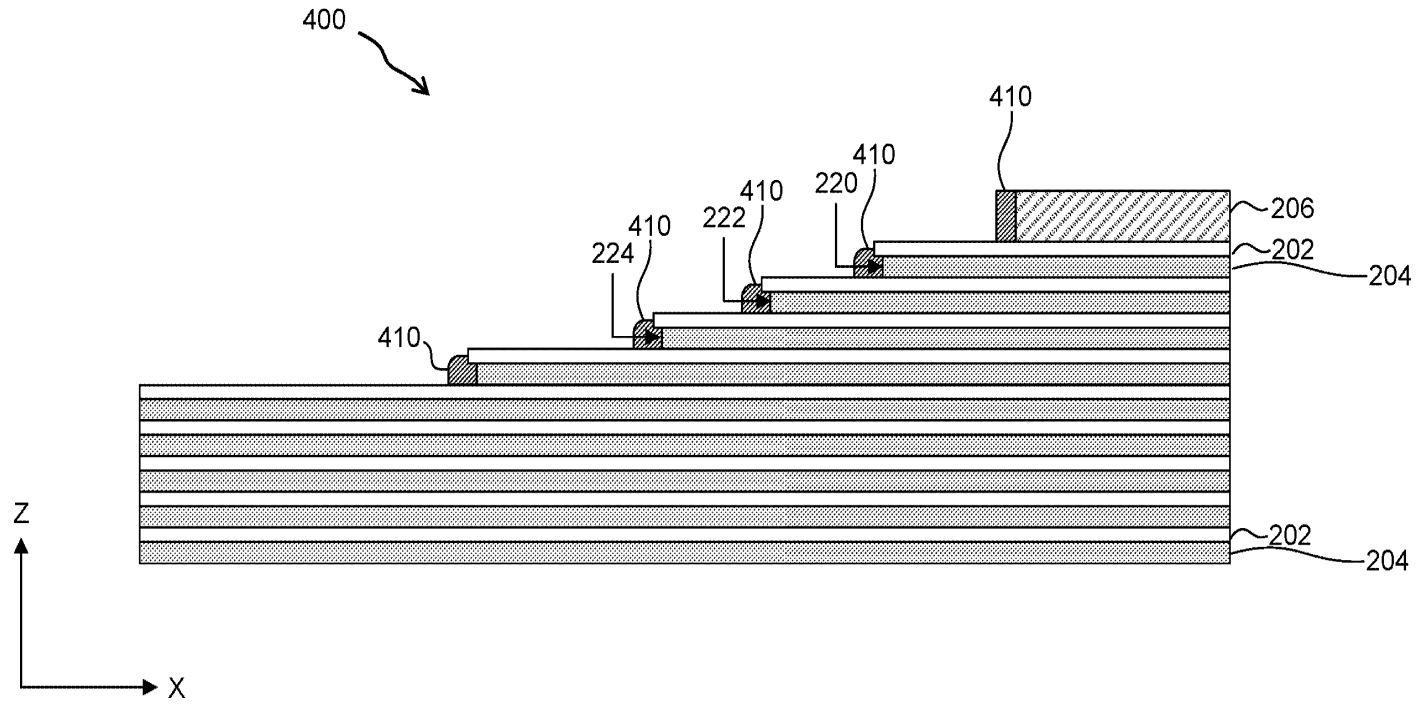


FIG. 4

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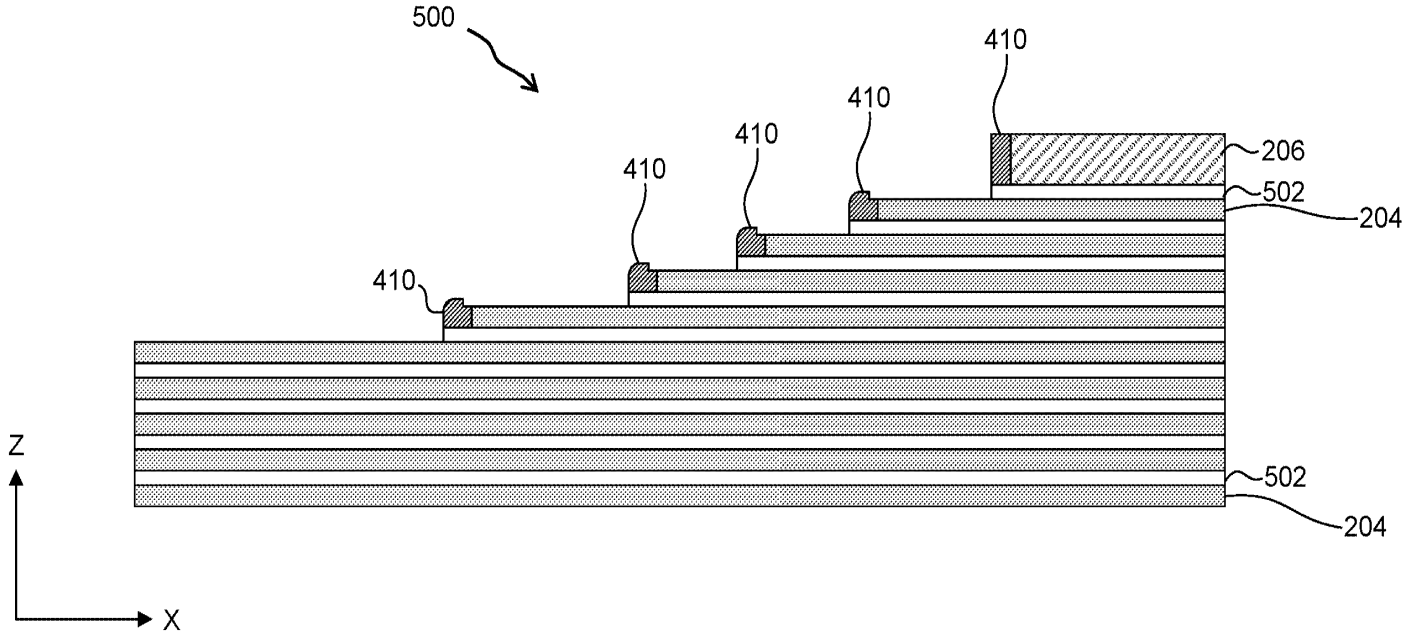


FIG. 5

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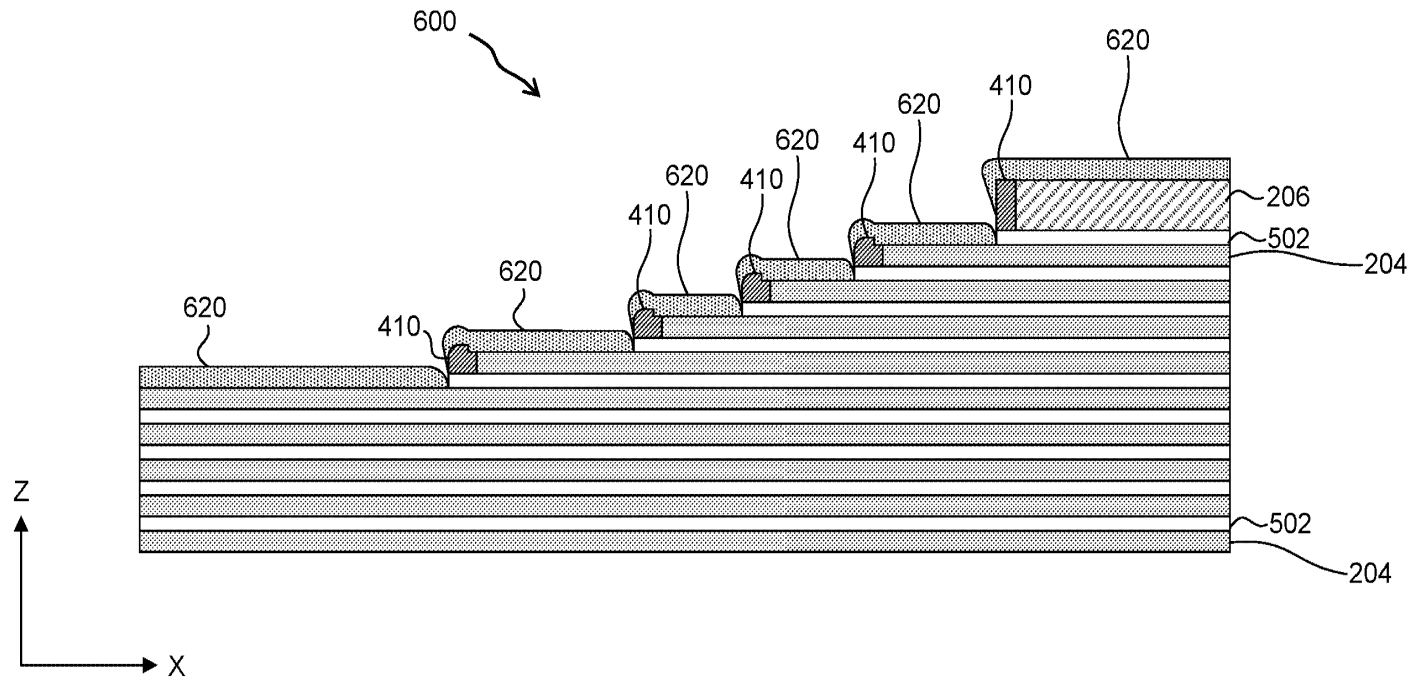


FIG. 6

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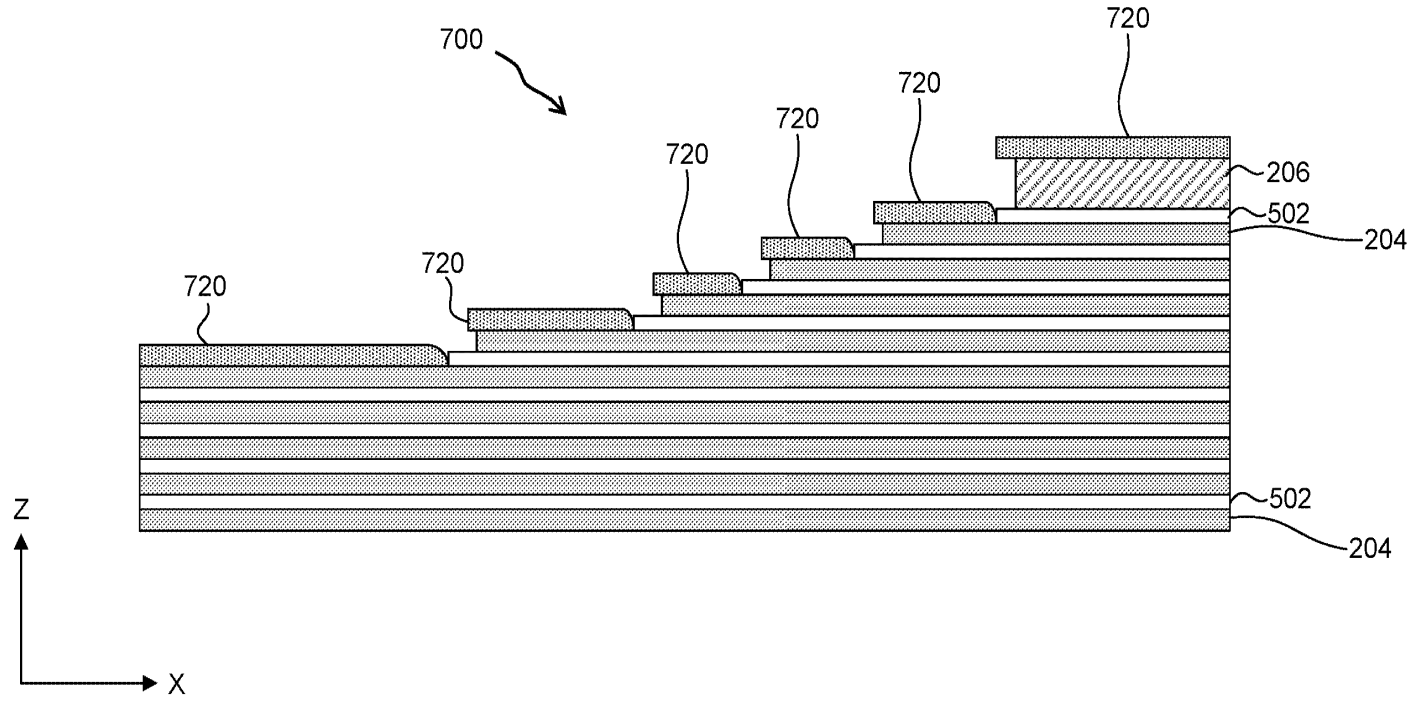


FIG. 7

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Micron v. YMTC
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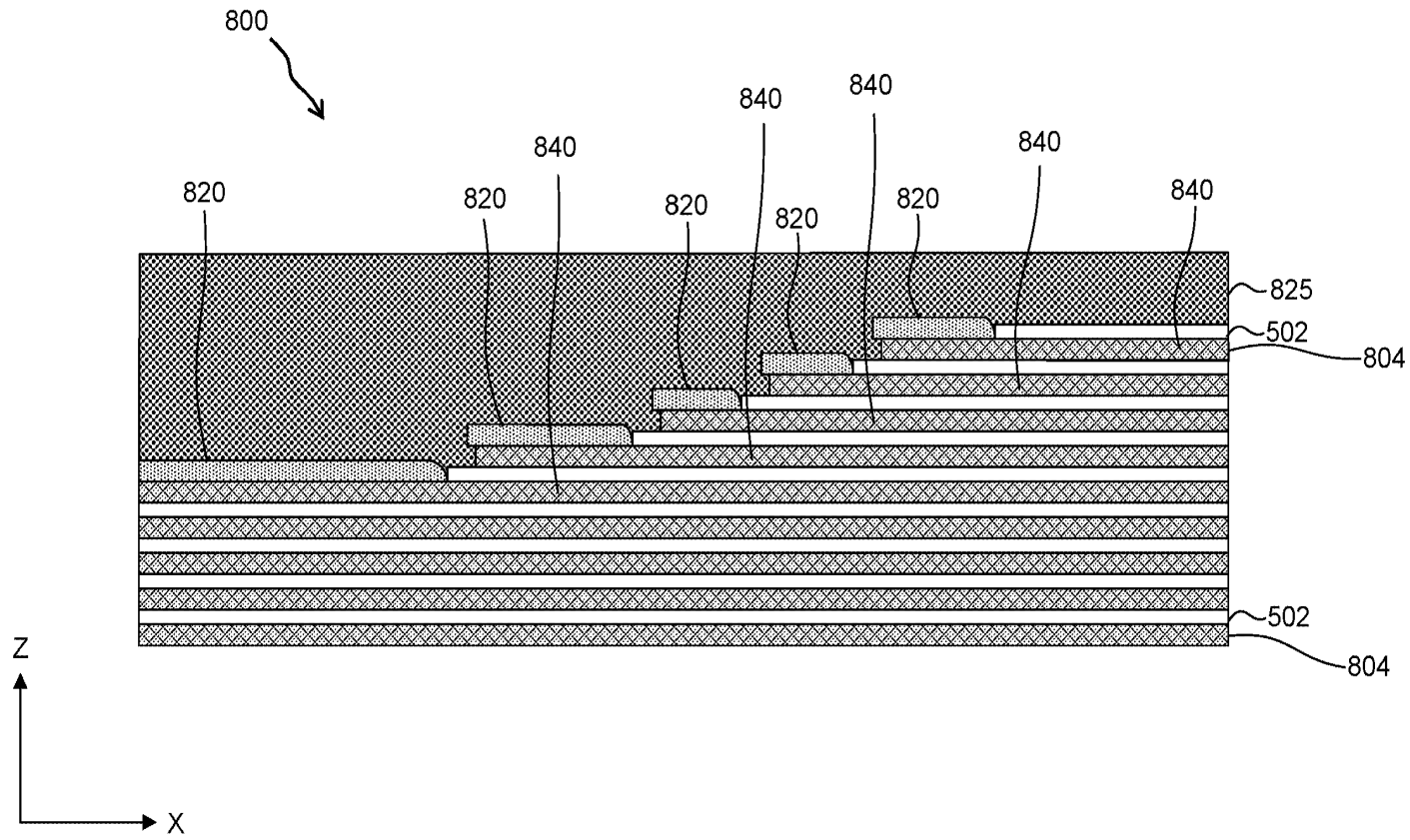


FIG. 8

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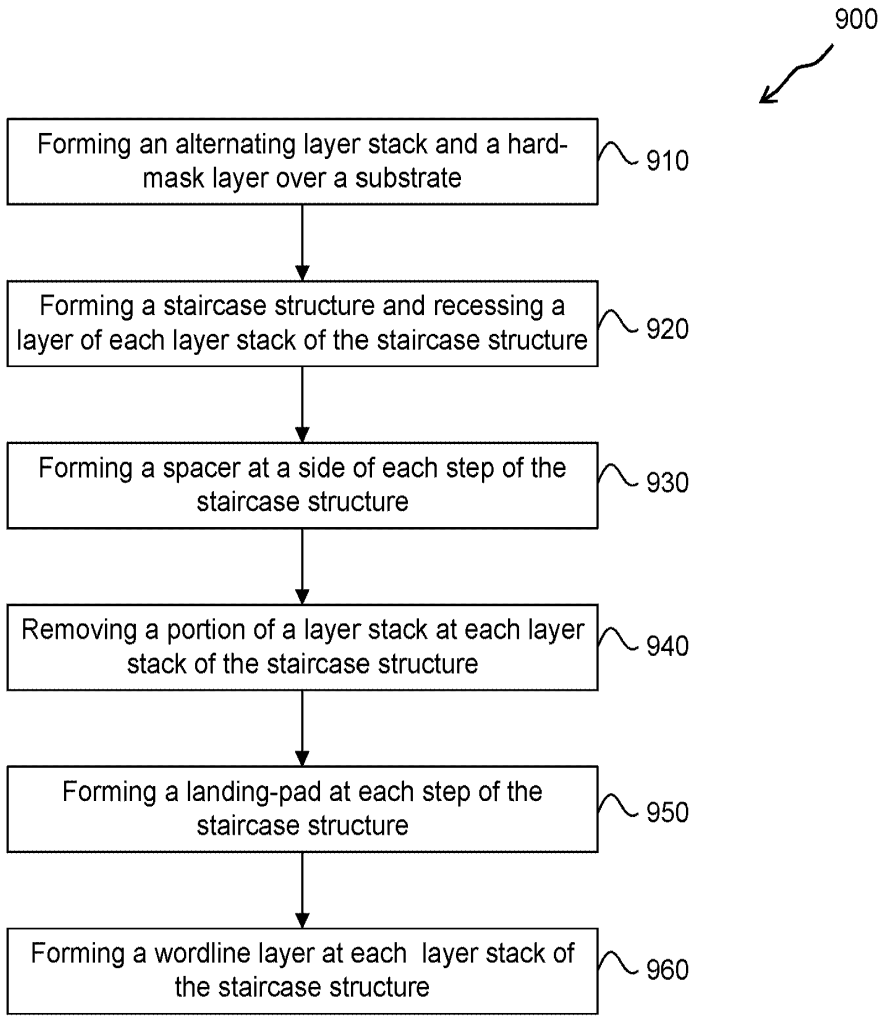


FIG. 9

Micron Ex. 1002, p. 52
Micron v. YMTC
IPR2025-00229

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
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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	To Be Assigned
Filing Date	Herewith
First Named Inventor	Zhenyu LU
Title	STAIRCASE STRUCTURE FOR MEMORY DEVICE
Art Unit	To Be Assigned
Examiner Name	To Be Assigned
Attorney Docket Number	4123.0460004

SIGNATURE of Applicant or Patent Practitioner

Signature	/Yuanfeng Gao/	Date (Optional)	2021/09/13
Name	YUANFENG GAO	Registration Number	79,573
Title (if Applicant is a juristic entity)	Agent for Applicant		
Applicant Name (if Applicant is a juristic entity)	Yangtze Memory Technologies Co., Ltd.		

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 one (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

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. 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

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

(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: 26111

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 or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number: 26111

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):

Yangtze Memory Technologies Co., Ltd.

☐ 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		Date (Optional)	
Name	Simon Shi-Ning Yang		
Title	CEO		

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 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.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: *To Be Assigned*
Applicant: YANGTZE MEMORY TECHNOLOGIES CO., LTD.	Art Unit: *To Be Assigned*
Application No.: *To Be Assigned (Continuation of Appl. No. 16/885,858; Filed May 28, 2020)*	Examiner: *To Be Assigned*
Filing Date: *Herewith*	Atty. Docket: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

Information Disclosure Statement

Mail Stop Amendment

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Forms PTO/SB/08a or its equivalent and/or PTO/SB/08b or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Where the publication date of a listed document does not provide a month of publication, the year of publication of the listed document is sufficiently earlier than the effective U.S. filing date and any foreign priority date so that the month of publication is not in issue. Applicant has listed publication dates on the attached IDS Forms based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves 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 should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

Applicant has checked the appropriate boxes below.

☐ 1. Statement under 37 C.F.R. 1.704(d). Each item of information contained in this Information Disclosure Statement: (i) was first cited in any communication from a patent office in a counterpart[1] foreign or international application or from the Office; and this communication was not received by any individual designated in Sec. 1.56(c) more than thirty days prior to the filing of this information disclosure statement; OR (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in Sec. 1.56(c) more than thirty days prior to the filing of the information disclosure statement.

☒ 2. Filing under 37 C.F.R. § 1.97(b). This Information Disclosure Statement is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national

[1] The term counterpart foreign patent application means that a claim for priority has been made in either the U.S. application or a foreign application based on the other, or that the disclosures of the U.S. and foreign patent applications are substantively identical (e.g., an application filed in the European Patent Office claiming the same U.K. priority as claimed in the U.S. application).

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stage as set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

☐ 3. Filing under 37 C.F.R. § 1.97(c). This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an action that otherwise closes prosecution in the application.

☐ a. Statement under 37 C.F.R. § 1.97(e)(1). I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. Statement under 37 C.F.R. § 1.97(e)(2). I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ c. The required fee is provided through online credit card payment authorization in the amount of $_____ in payment of the fee under 37 C.F.R. § 1.17(p).

Atty. Dkt. No. 4123.0460004

☐ 4. Filing under 37 C.F.R. § 1.97(d) This Information Disclosure Statement is being filed more than three months after the U.S. filing date and after the mailing date of a Final Rejection or Notice of Allowance, but on or before payment of the Issue Fee. The required fee is provided through online credit card payment authorization in the amount of $_____ in payment of the fee under 37 C.F.R. § 1.17(p); in addition:

☐ a. Statement under 37 C.F.R. § 1.97(e)(1). I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. Statement under 37 C.F.R. § 1.97(e)(2). I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ 5. The patent family for one or more foreign language documents submitted herewith includes a United States patent, and other patent, in the English language. Copies of both the particular foreign patent(s) or published foreign patent applications cited in the foreign patent office communication, and that are not already of record in this application, are enclosed. Copies of the related United States or other English language patent or published

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application from the family list, if not already of record, are listed on the accompanying SB/08A form. For the purposes of a statement under 37 CFR 1.97(e)(1), the United States or other English language patent or published application are to be construed as being cited by the foreign patent office. MPEP 609.04(b)(V).

☐ 6. The document(s) was/were cited in a search report by a foreign patent office in a counterpart foreign application. Submission of an English language version of the search report that indicates the degree of relevance found by the foreign office is provided in satisfaction of the requirement for a concise explanation of relevance. MPEP 609.04(a)(III).

☐ 7. A concise explanation of the relevance of the non-English language document(s) appears below in accordance with 37 C.F.R. § 1.98(a)(3).

☐ 8. Copies of documents **FP1-FP3 and NPL1** are submitted. However, in accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of U.S. patents and patent application publications cited as documents **US1-US27** on the attached IDS Forms are submitted.

☒ 9. Copies of the **US1-US27, FP1-FP3,** and **NPL1** documents were cited by or submitted to the Office in an IDS that complies with 37 C.F.R. § 1.98(a)-(c) in Application No. 16/885,858, filed May 28, 2020, which is relied upon for an earlier filing date under 35 U.S.C. § 120. Thus, copies of these documents are not attached. 37 C.F.R. § 1.98(d).

☒ 10. It is expected that the examiner will review the prosecution and cited art in the parent Application No. 16/885,858 in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

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☐ 11. In accordance with the Federal Circuit decision in *Dayco Prods., Inc. v. Total Containment, Inc.* 329 F.3d 1358 (Fed. Cir. 2003), Applicants submit herewith Office Actions from the co-pending U.S. Patent Application No._____, filed _____, as documents _____ to _____. The identification of these Office Actions is not to be construed as a waiver of secrecy as to those applications now or upon issuance of the present application as a patent. The Examiner is respectfully requested to consider the cited applications and the art cited therein during examination.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yuanfeng Gao/

Yuanfeng Gao
Agent for Applicant
Registration No. 79,573

Date: 2021/09/13

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

17312933_1

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Micron v. YMTC
IPR2025-00229

Equivalent of Form PTO/SB/08a (07-09)

Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	*To Be Assigned*
				Filing Date	*Herewith*
				First Named Inventor	Zhenyu LU
				Art Unit	*To Be Assigned*
				Examiner Name	*To Be Assigned*
Sheet	1	of	2	Attorney Docket Number	4123.0460004

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
	US1	2015/0255385 A1	09-10-2015	Lee et al.	
	US2	2019/0081070 A1	03-14-2019	Lu et al.	
	US3	9,419,013 B1	08-16-2016	Lee et al.	
	US4	9,741,563 B2	08-22-2017	Xiang et al.	
	US5	2017/0084532 A1	03-23-2017	Son et al.	
	US6	10,403,641 B2	09-03-2019	Kim et al.	
	US7	10,002,880 B1	06-19-2018	Nagashima	
	US8	9,478,487 B2	10-25-2016	Yang et al.	
	US9	9,373,540 B2	06-21-2016	Hyun	
	US10	9,343,452 B2	05-17-2016	Yun et al.	
	US11	9,331,082 B2	05-03-2016	Lee et al.	
	US12	9,006,884 B2	04-14-2015	Lee et al.	
	US13	2015/0255386 A1	09-10-2015	Lee et al.	
	US14	2013/0270714 A1	10-17-2013	Lee et al.	
	US15	2011/0031630 A1	02-10-2011	Hashimoto	
	US16	2018/0130701 A1	05-10-2018	Chun et al.	
	US17	2013/0056818 A1	03-07-2013	Iino et al.	
	US18	2017/0271256 A1	09-21-2017	Inatsuka	
	US19	2013/0043509 A1	02-21-2013	Cho et al.	
	US20	2018/0301460 A1	10-18-2018	Yoo et al.	
	US21	2019/0006385 A1	01-03-2019	Kim et al.	
	US22	2018/0166380 A1	06-14-2018	Pare et al.	
	US23	2019/0280001 A1	09-12-2019	Terasawa et al.	
	US24	10,395,982 B2	08-27-2019	Nam et al.	
	US25	9,941,153 B1	04-10-2018	Yang	
	US26	9,520,402 B1	12-13-2016	Haller et al.	
	US27	9,711,603 B2	07-18-2017	Lim et al.	

Examiner Signature		Date Considered	

*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] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Equivalent of Form PTO/SB/08a (07-09)

Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	*To Be Assigned*
				Filing Date	*Herewith*
				First Named Inventor	Zhenyu LU
				Art Unit	*To Be Assigned*
				Examiner Name	*To Be Assigned*
Sheet	2	of	2	Attorney Docket Number	4123.0460004

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]
	FP1	CN 106601746 A	04-26-2017	Samsung Electronics Co Ltd		
	FP2	CN 107644876 A	01-30-2018	Yangtze Memory Tech Co Ltd		
	FP3	KR 20110015338 A	02-15-2011	Hynix Semiconductor Inc.		

17307616.1

Examiner Signature		Date Considered	

*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] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Equivalent of Form PTO/SB/08b (7-09)

Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	*To Be Assigned*
				Filing Date	*Herewith*
				First Named Inventor	Zhenyu LU
				Art Unit	*To Be Assigned*
				Examiner Name	*To Be Assigned*
Sheet	1	of	1	Attorney Docket Number	4123.0460004

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]
	NPL1	International Search Report and Written Opinion of the International Searching Authority directed to related International Patent Application No. PCT/CN2018/098962, mailed November 7, 2018; 8 pages.	
	NPL2		
	NPL3		
	NPL4		
	NPL5		
	NPL6		
	NPL7		
	NPL8		
	NPL9		

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17307625.1

Examiner Signature		Date Considered	

*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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PATENT AND TRADEMARK OFFICE

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	09/13/2021 11:06:37 AM ET	4123.0460004

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Catherine Saunders
PATENT CENTER #	60310021	AUTHORIZED BY	Yuanfeng Gao
CUSTOMER #	26111	FILING DATE	-
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Zhenyu LU

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1008	E20219CB09111495	Catherine Saunders

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1111	UTILITY PATENT APPL. SEARCH FEE	700.00	1	700.00
1011	BASIC FILING FEE - UTILITY (PAPER FILING ALSO REQUIRES NON-ELECTRONIC FILING FEE UNDER 1.16(T))	320.00	1	320.00
1311	PATENT APPL. EXAMINATION FEE	800.00	1	800.00
			TOTAL AMOUNT:	$1,820.00

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 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

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**09/13/2021 11:06:37 AM ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Catherine Saunders
PATENT CENTER #	60310021	FILING DATE	-
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu LU
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Yuanfeng Gao

Documents

TOTAL DOCUMENTS: 12

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2021-09-13-Filing-Bundle-4123-0460004.PDF		66	-	1486 KB
2021-09-13-Filing-Bundle-4123-0460004-LET..pdf	(1-3)	3	Miscellaneous Incoming Letter	247 KB
2021-09-13-Filing-Bundle-4123-0460004-TRNA.pdf	(4-4)	1	Transmittal of New Application	196 KB
2021-09-13-Filing-Bundle-4123-0460004-136A.pdf	(5-5)	1	Authorization for Extension of Time all replies	121 KB
2021-09-13-Filing-Bundle-4123-0460004-ADS.pdf	(6-17)	12	Application Data Sheet	114 KB

2021-09-13-Filing-Bundle-4123-0460004-OATH.pdf	(18-22)	5	Oath or Declaration filed	139 KB
2021-09-13-Filing-Bundle-4123-0460004-SPEC.pdf	(23-41)	19	Specification	162 KB
2021-09-13-Filing-Bundle-4123-0460004-CLM.pdf	(42-44)	3	Claims	59 KB
2021-09-13-Filing-Bundle-4123-0460004-ABST.pdf	(45-45)	1	Abstract	54 KB
2021-09-13-Filing-Bundle-4123-0460004-DRW.NONBW.pdf	(46-55)	10	Drawings-other than black and white line drawings	90 KB
2021-09-13-Filing-Bundle-4123-0460004-PA...pdf	(56-57)	2	Power of Attorney	670 KB
2021-09-13-Filing-Bundle-4123-0460004-TRAN.LET.pdf	(58-63)	6	Transmittal Letter	152 KB
2021-09-13-Filing-Bundle-4123-0460004-IDS.pdf	(64-66)	3	Information Disclosure Statement (IDS) Form (SB08)	193 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2021-09-13-Filing-Bundle-4123-0460004.PDF	39ED33FA17CE44367D8D79B7CCB9C2F385EA0CE1CF8EF9DA233CF10B37B4A56A4B87CCBB3984593553D89BD92860673E76FD3B6794D6F34FC807EBB072DF65BA
2021-09-13-Filing-Bundle-4123-0460004-LET..pdf	86D983F0B6CACAD836F0C5DFCB17EC12606D30F9DF8587209464911F4403A04CD257FDED0C39BFF116BDAC025CB1EEA468C2210470B526023F9F22EFA438C50F

2021-09-13-Filing-Bundle-4123-0460004-TRNA.pdf	2AA441618D2DC1D737A0499B37BF1F60C771BA4001E2BE4E98B9429FEAD7034D7202CA0592C2332A44E9E9C90316879026FCA622630011F05613BFBB227F772F
2021-09-13-Filing-Bundle-4123-0460004-136A.pdf	DBD0E61780F24220C78FBAD5C78512A2974B309D09464293523E76504DC02632183A5FEC255DED16D1569CB15B1D2903839FE304BD11F40857905DF5F0F74A87
2021-09-13-Filing-Bundle-4123-0460004-ADS.pdf	6554FC135899FCE2B8E28217699BB792651C2A7A3478912B8FE62B1216B43393374C62107F1DA25094BC76E51CBD321EBC954CC2A479AE83425D47149C1184CA
2021-09-13-Filing-Bundle-4123-0460004-OATH.pdf	FCEE6C89054CF5A79297CA92CE41D21F6BA5FC17B71F455E6E819FF5B0B426CA22B9A1A670C9ABD82201E0FF11EA8FF511A9212B500CB8FA90BDCC9C7DFF0DCE
2021-09-13-Filing-Bundle-4123-0460004-SPEC.pdf	F46394EFEDD59168213DC02F27427B9CCDA9E8A4F86D281BFF1426523D897010359FE76F74FED153D995E6C55C88374604F5B685112DF981D714D51BECE7B31F
2021-09-13-Filing-Bundle-4123-0460004-CLM.pdf	A233F03B56E6F5634B65842607E3B59A62A3C1F3AE2F90083794FCB234B6B5B9360910CA670CF1E681BC98605040FBE7E2B48EE49713D6F34A49478E172F27EB
2021-09-13-Filing-Bundle-4123-0460004-ABST.pdf	F131740B3462430DC5BB4251BE0DC4CCB5723141716E413F660ADDA2D7BE000C7817D66EF51B39435546DE24988748C882024D479303DF022476780D113F170E
2021-09-13-Filing-Bundle-4123-0460004-DRW.NONBW.pdf	EAC9489F1BBB9C912C4C95A99CF65E8F3ABDC5FCC0135B37A2F613379E7175F3B2897177C16DC47268DB9816A49929B8A7106EC05129C57C83B5B508B3AAB92C
2021-09-13-Filing-Bundle-4123-0460004-PA...pdf	1B64B40A33FEB7BCEAE3284DBE0EB4084F9966D12255F8343AE5EEE29CA1D905AAD63BDC767AE247A81E2A46BDA47C1BA874824C59A49CDC06BED8F333E9CE36
2021-09-13-Filing-Bundle-4123-0460004-TRAN.LET.pdf	F3F751AECC01E173A0C51E71094D007FF678400C26C8C5FED45B85A8743A9EFB547D73EC042EB25AA2313AF7503DA087621042471727847F5EEBC11E45941CFD

2021-09-13-Filing-Bundle-4123-0460004-IDS.pdf	0B83963DB12BEDE9C7D1249166B124B8C465B0603FBFD0AE7DE077A51CAEF7590263F8FDB5A68B4D9C4D56A0FC1E7C9F2D18E9B6C40C66FC91EC4B13C5FD2038

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 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.

YUANFENG GAO
PATENT AGENT
202-772-8731
YGAO@STERNEKESSLER.COM

September 13, 2021

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Re: U.S. Non-Provisional Patent Application under 37 C.F.R. § 1.53(b)
(*Continuation of Appl. No. 16/885,858; Filed: May 28, 2020*)
Appl. No. *To Be Assigned*; Filed: *Herewith*
For: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

The following documents are transmitted herewith under 37 C.F.R. § 1.53(b) for appropriate action by the U.S. Patent and Trademark Office:

1. Payment made electronically for **$1,820.00** to cover Patent Application fee (*including basic filing, search, and examination fees*);

2. Utility Patent Application Transmittal Form (PTO/AIA/15);

3. Authorization to Treat a Reply As Incorporating An Extension of Time Under 37 C.F.R. § 1.136(a)(3);

4. U.S. Utility Patent Application entitled:

   STAIRCASE STRUCTURE FOR MEMORY DEVICE

   and naming as Inventors:
   Zhenyu LU
   Jun CHEN
   Xiaowang DAI|
   Jifeng ZHU
   Qian TAO
   Yu Ru HUANG
   Si Ping HU
   Lan YAO
   Li Hong XIAO
   A Man ZHENG

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IPR2025-00229

Kun BAO
Haohao YANG
the application consisting of:

a. An Application Data Sheet (37 C.F.R. § 1.76)(PTO/AIA/14);

b. A copy of the signed Inventors' Declaration, as originally filed in prior U.S. Appl. No. *16/885,858*;

c. A specification containing **23** total pages:

i. 19 pages of description prior to any claims;

ii. 3 pages (20 claims);

iii. a one page abstract;

d. 10 sheets of drawings: (*Figures 1, 2A, 2B, and 3-9*);

5. An executed Power of Attorney by Applicant (PTO/AIA/82B) and the Transmittal for Power of Attorney form (PTO/AIA/82A);

6. An Information Disclosure Statement (IDS); and

7. IDS Forms (3 pages) listing 31 documents (**US1-US27, FP1-FP3**, and **NPL1**).

The above-listed documents are filed electronically.

Correspondence should be sent to Customer Number 26111.

Fee payment is provided through online credit card payment. The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yuanfeng Gao/

Yuanfeng Gao
Agent for Applicant
Registration No. 79,573

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Y-G/cms
Enclosures
17312752_1

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DocCode – SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: 17447456 Document Date: 09/13/2021

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

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Form Revision Date: March 1, 2019

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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
17/447,456	09/13/2021	2811	1820	4123.0460004	19	3

CONFIRMATION NO. 5572

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

FILING RECEIPT



Date Mailed: 09/24/2021

Receipt is acknowledged of this non-provisional utility 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 FIRST INVENTOR, 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 corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

Inventor(s)

Zhenyu Lu, Residence Not Provided;
Jun Chen, Residence Not Provided;
Xiaowang Dai, Residence Not Provided;
Jifeng Zhu, Residence Not Provided;
Qian Tao, Residence Not Provided;
Yu Ru Huang, Residence Not Provided;
Si Ping Hu, Residence Not Provided;
Lan Yao, Residence Not Provided;
Li Hong Xiao, Residence Not Provided;
A Man Zheng, Residence Not Provided;
Kun Bao, Residence Not Provided;
Haohao Yang, Residence Not Provided;

Applicant(s)

Zhenyu Lu, Residence Not Provided;
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Yu Ru Huang, Residence Not Provided;
Si Ping Hu, Residence Not Provided;
Lan Yao, Residence Not Provided;
Li Hong Xiao, Residence Not Provided;

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A Man Zheng, Residence Not Provided;
Kun Bao, Residence Not Provided;
Haohao Yang, Residence Not Provided;

Assignment For Published Patent Application

Yangtze Memory Technologies Co., Ltd., Wuhan, CHINA

Power of Attorney: None

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 09/23/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/447,456**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No

Title

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Preliminary Class

257

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/447,456

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	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	19 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 480 =	0.00
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

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($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(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($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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))							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 found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

FORMALITIES LETTER

OC000000128636382

Date Mailed: 09/24/2021

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- Complete residence information, either city and state or city and country for **Zhenyu Lu**, **Jun Chen**, **Xiaowang Dai**, **Jifeng Zhu**, **Qian Tao**, **Yu Ru Huang**, **Si Ping Hu**, **Lan Yao**, **Li Hong Xiao**, **A Man Zheng**, **Kun Bao**, and **Haohao Yang** has not been provided. Residence information is required, separately from the mailing address, if the inventor lives at a location which is different from where the inventor customarily receives mail. Also, a valid state code or a valid country code must be provided. For lists of valid state and valid country codes, see the Instructions for Application Data Sheet available at https://www.uspto.gov/patent/forms/forms-patent-applications-filed-or-after-september-16-2012. There is an indication on either the ADS or the inventor's oath or declaration that the mailing address and residence information is not the same for this inventor.
  Applicant must provide the residence information on either:
  - An inventor's oath or declaration in compliance with 37 CFR 1.63, or
  - A properly marked up application data sheet (ADS) in compliance with 37 CFR 1.76.
- A complete mailing address that includes either the city and state or city and country, for each inventor has not been submitted. Applicant must provide the mailing address on either:
  - An inventor's oath or declaration in compliance with 37 CFR 1.63, or
  - A properly marked up application data sheet (ADS) in compliance with 37 CFR 1.76.

  Note that an inventor's mailing address is required even if a correspondence address has been submitted. An inventor's mailing address may not necessarily be the same as the correspondence address for the application and must be separately submitted in the manner set forth above. If the inventor lives at a location which is different from the inventor's mailing address, the inventor's residence (either city and state or city and country) must also be separately submitted in the manner set forth above. For lists of valid state and valid country codes, see the Instructions for Application Data Sheet available at https://www.uspto.gov/patent/forms/forms-patent-applications-filed-or-after-september-16-2012.

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Mailing address information is needed for the following inventor(s): **Zhenyu Lu**, **Jun Chen**, **Xiaowang Dai**, **Jifeng Zhu**, **Qian Tao**, **Yu Ru Huang**, **Si Ping Hu**, **Lan Yao**, **Li Hong Xiao**, **A Man Zheng**, **Kun Bao**, and **Haohao Yang**

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- The ADS received on 09/13/2021 was not properly signed. Therefore, the Office will treat it only as a transmittal letter. See 37 CFR 1.76(e). Inventorship has not been set by this document and any foreign priority or domestic benefit claims contained therein are ineffective. See 37 CFR 1.55 or 37 CFR 1.78.
  If the applicant wishes to submit another ADS:
  - It must be properly signed by a party under 37 CFR 1.33(b), and be signed in compliance with 37 CFR 1.4(d).
  - Changes to the information of record must be properly marked up in compliance with 37 CFR 1.76(c), i.e., must identify the information that is being changed, with underlining for insertions, and strike-through or brackets for text removed. In general, the identification of the information being changed should be made relative to the most recent filing receipt.
  - Benefit and priority claims must be presented in an ADS in compliance with 37 CFR 1.76(c) and within the time periods specified in 37 CFR 1.55 and 1.78.

  If an ADS as set forth above is provided, the filing of the inventor's oath or declaration may be postponed until the application is otherwise in condition for allowance. See 37 CFR 1.53(f). Note that the inventor's oath or declaration must be filed no later than the date on which the issue fee has been paid.

In order to make changes to the information of record, an ADS must be properly signed and properly marked up relative to the current information of record.

Proper signature: The ADS must be signed with a handwritten signature or proper S-signature by:

- A patent practitioner, with the practitioner's registration number accompanying the signature (e.g., immediately below or adjacent to the signature), or
- The applicant, if the applicant is an individual other than the inventor(s) and no power of attorney has been appointed, or
- All of the inventors, if no other applicant has been established and no power of attorney has been appointed.

A proper S-signature consists of only letters and/or Arabic numerals, with appropriate spaces and commas, periods, apostrophes, or hyphens for punctuation contained between a first single forward slash mark before, and a second single forward slash mark after, the S-signature.

Proper markings: The ADS must identify the changes being made with underlining for insertions and strike-through or brackets for text removed. No other markings or indications are acceptable. Where an ADS providing corrected or updated information does not contain all of the sections of the ADS, the entire section in which changes are being made must be included in the ADS. Information of record can generally be found on the latest filing receipt.

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IPR2025-00229

Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

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**.

/wtsige/

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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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

OC000000128636388

Date Mailed: 09/24/2021

Improper Submission of Authorization to Permit Access to Search Results under 37 CFR 1.14(h)(2)

The Authorization to Permit Access to the Search Results from the instant application under 37 CFR 1.14(h)(2) (authorization to permit access to search results) submitted on 09/13/2021 in the above-identified application is not accepted because:

- It was not properly signed. If applicant still wishes to provide authorization to permit access to the search results under 37 CFR 1.14(h)(2), applicant must submit a properly signed authorization (e.g., PTO/SB/69).

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**.

/wtsige/

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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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

OC000000128636385

Date Mailed: 09/24/2021

Improper Submission of Authorization to Permit Access to Application by Participating Offices under 37 CFR 1.14(h)(1) (Priority Document Exchange)

The Authorization to Permit Access to Application-As-Filed by Participating Offices under 37 CFR 1.14(h)(1) (authorization to permit access to application via priority document exchange) submitted on 09/13/2021 in the above-identified application is not accepted because:

- It was not properly signed. If applicant still wishes to provide authorization to permit access under 37 CFR 1.14(h)(1), applicant must submit a properly signed authorization (e.g., PTO/SB/39).

Any authorization should be submitted prior to filing a subsequent foreign application with a participating intellectual property office in which priority is claimed to the above-identified U.S. application to ensure that it is likely that the participating foreign intellectual property office will be successful in its attempt to retrieve a copy of the U.S. priority application from the Office.

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**.

/wtsige/

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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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

IMPROPER CPOA LETTER

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

OC000000128636450

Date Mailed: 09/24/2021

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 09/13/2021. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney has not been accepted because the party who is giving power has not been identified. Power of attorney may only be signed by the applicant for patent (37 CFR 1.42) or the patent owner. A party who is not the applicant must become the applicant in accordance with 37 CFR 1.46(c) and appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. For a reissue application, reexamination proceeding, or supplemental examination proceeding, a patent owner who was not the applicant under 37 CFR 1.46 must appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. See 37 CFR 1.32(b)(4).

/ptnguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

IMPROPER CFR REQUEST

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

OC000000128636459

Date Mailed: 09/24/2021

RESPONSE TO REQUEST FOR CORRECTED FILING RECEIPT

Power of Attorney, Claims, Fees, System Limitations, and Miscellaneous

In response to your request for a corrected Filing Receipt, the Office is unable to comply with your request because:

- Any request to correct or update the name of the applicant must include an application data sheet (ADS) in compliance with 37 CFR 1.76 specifying the correct or updated name of the applicant in the applicant information section. Any request to change the applicant after an original applicant has been specified under 37 CFR 1.46(b) must include a new ADS in compliance with 37 CFR 1.76 specifying the applicant in the applicant information section and comply with 37 CFR 3.71 and 3.73. See 37 CFR 1.46(c).

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**.

/ptnguyen/

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YUANFENG GAO
PATENT AGENT
202-772-8731
YGAO@STERNEKESSLER.COM

Sterne Kessler
STERNE KESSLER GOLDSTEIN & FOX

September 29, 2021

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 5572
Mail Stop Missing Parts

Re: U.S. NonProvisional Patent Application
Appl. No. 17/447,456; Filed: September 13, 2021
For: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

In reply to "Notice to File Missing Parts of Non-Provisional Application," dated September 24, 2021, Applicant transmits the following documents for appropriate action by the U.S. Patent and Trademark Office:

1. Corrected Application Data Sheet;

2. Statement Under § 3.73(c); and

3. Copy of Notice to File Missing Parts of Nonprovisional Application.

The above-listed documents are filed electronically.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036. If extensions of time under 37 C.F.R. § 1.136 other than those otherwise provided for herewith are required to prevent abandonment of the present application, then such extensions of time are hereby petitioned, and any fees therefor are hereby authorized to be charged to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Yuanfeng Gao/

Yuanfeng Gao
Agent for Applicant
Registration No. 79,573

Y-G/cms
Enclosures
17389116_1.docx

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PTO/AIA/14 (02-18)
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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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Zhenyu		LU	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone

City	Wuhan, Hubei	State/Province	
Postal Code	430000	**Country**	CN

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jun		CHEN	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone

City	Wuhan, Hubei	State/Province	
Postal Code	430000	**Country**	CN

Inventor 3 Remove

Legal Name

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Xiaowang		DAI	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
City	Wuhan, Hubei	State/Province	
Postal Code	43000	Country	CN

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jifeng		ZHU	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country	CN

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Qian		TAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country	CN

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yu Ru		HUANG	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone

City	Wuhan, Hubei	State/Province	
Postal Code	430000	**Country** [i]	CN

Inventor 7 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Si Ping		HU	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone

City	Wuhan, Hubei	State/Province	
Postal Code	430000	**Country** [i]	CN

Inventor 8 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Lan		YAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence [i]	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country	CN

Inventor 9 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Li Hong		XIAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

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City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country	CN

Inventor 10 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	A Man		ZHENG	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
City	Wuhan, Hubei	State/Province	
Postal Code	430000	Country	CN

Inventor 11 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kun		BAO	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Address 1	Yangtze Memory Technologies Co., Ltd.		
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
City	Wuhan, Hubei	**State/Province**	
Postal Code	430000	**Country**	CN

Inventor 12 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Haohao		YANG	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Wuhan, Hubei	Country of Residence	CN

Mailing Address of Inventor:

Address 1	Yangtze Memory Technologies Co., Ltd.		
Address 2	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
City	Wuhan, Hubei	**State/Province**	
Postal Code	430000	**Country**	CN

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	26111		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE		
Attorney Docket Number	4123.0460004	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	10	**Suggested Figure for Publication (if any)**	

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PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	26111		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	16/885858	2020-05-28

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IPR2025-00229

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/885858	Continuation of	16/126956	2018-09-10	10680003	2020-06-09

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/126956	Continuation of	PCT/CN2018/098962	2018-08-06

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
201710750398.4	CN	2017-08-28	38A6

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Yangtze Memory Technologies Co., Ltd.		
Mailing Address Information For Applicant:			
Address 1	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
Address 2			
City	Wuhan, Hubei	**State/Province**	
Country	CN	Postal Code	430000
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	Yangtze Memory Technologies Co., Ltd.

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	No. 88 Weilai 3rd Rd, East Lake High-Tech Dev Zone		
Address 2			
City	Wuhan, Hubei	**State/Province**	
Country	CN	Postal Code	430000
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Yuanfeng Gao/			Date (YYYY-MM-DD)	2021/09/29
First Name	Yuanfeng	Last Name	Gao	Registration Number	79,573

Additional Signature may be generated within this form by selecting the Add button.

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PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4123.0460004
	Application Number	
Title of Invention	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. 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.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: YANGTZE MEMORY TECHNOLOGIES CO., LTD.

Application No./Patent No.: 17/447,456 Filed/Issue Date: 09/13/2021

Titled: STAIRCASE STRUCTURE FOR MEMORY DEVICE

YANGTZE MEMORY TECHNOLOGIES CO., LTD., a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 057459, Frame 0635, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). 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/AIA/96 (08-12)
Approved for use through 01/31/2013. 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.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Yuanfeng Gao/	2021/09/29
Signature	Date
Yuanfeng Gao	79573
Printed or Typed Name	Title or Registration Number

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
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

FORMALITIES LETTER

OC000000128636382

Date Mailed: 09/24/2021

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- Complete residence information, either city and state or city and country for **Zhenyu Lu**, **Jun Chen**, **Xiaowang Dai**, **Jifeng Zhu**, **Qian Tao**, **Yu Ru Huang**, **Si Ping Hu**, **Lan Yao**, **Li Hong Xiao**, **A Man Zheng**, **Kun Bao**, and **Haohao Yang** has not been provided. Residence information is required, separately from the mailing address, if the inventor lives at a location which is different from where the inventor customarily receives mail. Also, a valid state code or a valid country code must be provided. For lists of valid state and valid country codes, see the Instructions for Application Data Sheet available at https://www.uspto.gov/patent/forms/forms-patent-applications-filed-or-after-september-16-2012. There is an indication on either the ADS or the inventor's oath or declaration that the mailing address and residence information is not the same for this inventor.
  Applicant must provide the residence information on either:
  - An inventor's oath or declaration in compliance with 37 CFR 1.63, or
  - A properly marked up application data sheet (ADS) in compliance with 37 CFR 1.76.
- A complete mailing address that includes either the city and state or city and country, for each inventor has not been submitted. Applicant must provide the mailing address on either:
  - An inventor's oath or declaration in compliance with 37 CFR 1.63, or
  - A properly marked up application data sheet (ADS) in compliance with 37 CFR 1.76.

  Note that an inventor's mailing address is required even if a correspondence address has been submitted. An inventor's mailing address may not necessarily be the same as the correspondence address for the application and must be separately submitted in the manner set forth above. If the inventor lives at a location which is different from the inventor's mailing address, the inventor's residence (either city and state or city and country) must also be separately submitted in the manner set forth above. For lists of valid state and valid country codes, see the Instructions for Application Data Sheet available at https://www.uspto.gov/patent/forms/forms-patent-applications-filed-or-after-september-16-2012.

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Micron v. YMTC
IPR2025-00229

Mailing address information is needed for the following inventor(s): **Zhenyu Lu**, **Jun Chen**, **Xiaowang Dai**, **Jifeng Zhu**, **Qian Tao**, **Yu Ru Huang**, **Si Ping Hu**, **Lan Yao**, **Li Hong Xiao**, **A Man Zheng**, **Kun Bao**, and **Haohao Yang**

Items Required To Avoid Processing Delays:

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

- The ADS received on 09/13/2021 was not properly signed. Therefore, the Office will treat it only as a transmittal letter. See 37 CFR 1.76(e). Inventorship has not been set by this document and any foreign priority or domestic benefit claims contained therein are ineffective. See 37 CFR 1.55 or 37 CFR 1.78.
  If the applicant wishes to submit another ADS:
  - It must be properly signed by a party under 37 CFR 1.33(b), and be signed in compliance with 37 CFR 1.4(d).
  - Changes to the information of record must be properly marked up in compliance with 37 CFR 1.76(c), i.e., must identify the information that is being changed, with underlining for insertions, and strike-through or brackets for text removed. In general, the identification of the information being changed should be made relative to the most recent filing receipt.
  - Benefit and priority claims must be presented in an ADS in compliance with 37 CFR 1.76(c) and within the time periods specified in 37 CFR 1.55 and 1.78.

  If an ADS as set forth above is provided, the filing of the inventor's oath or declaration may be postponed until the application is otherwise in condition for allowance. See 37 CFR 1.53(f). Note that the inventor's oath or declaration must be filed no later than the date on which the issue fee has been paid.

In order to make changes to the information of record, an ADS must be properly signed and properly marked up relative to the current information of record.

Proper signature: The ADS must be signed with a handwritten signature or proper S-signature by:

- A patent practitioner, with the practitioner's registration number accompanying the signature (e.g., immediately below or adjacent to the signature), or
- The applicant, if the applicant is an individual other than the inventor(s) and no power of attorney has been appointed, or
- All of the inventors, if no other applicant has been established and no power of attorney has been appointed.

A proper S-signature consists of only letters and/or Arabic numerals, with appropriate spaces and commas, periods, apostrophes, or hyphens for punctuation contained between a first single forward slash mark before, and a second single forward slash mark after, the S-signature.

Proper markings: The ADS must identify the changes being made with underlining for insertions and strike-through or brackets for text removed. No other markings or indications are acceptable. Where an ADS providing corrected or updated information does not contain all of the sections of the ADS, the entire section in which changes are being made must be included in the ADS. Information of record can generally be found on the latest filing receipt.

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Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web, including a copy of this Notice and selecting the document description "Applicant response to Pre-Exam Formalities Notice". https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at 1-866-217-9197 or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

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**.

/wtsige/

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UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**09/28/2021 01:20:38 PM ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Catherine Saunders
PATENT CENTER #	60331163	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Yuanfeng Gao

Documents

TOTAL DOCUMENTS: 4

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
Filing-Bundle-4123-0460004.PDF		17	-	591 KB
Filing-Bundle-4123-0460004-PEFR.pdf	(1-1)	1	Applicant Response to Pre-Exam Formalities Notice	175 KB
Filing-Bundle-4123-0460004-ADS.pdf	(2-12)	11	Application Data Sheet	170 KB
Filing-Bundle-4123-0460004-R3.73.pdf	(13-14)	2	Assignee showing of ownership per 37 CFR 3.73	84 KB
Filing-Bundle-4123-0460004-PEFR.pdf	(15-17)	3	Applicant Response to Pre-Exam Formalities Notice	148 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
Filing-Bundle-4123-0460004.PDF	2638FF3C831DC5F67C4646800B45784D488F7F9799941E03CFE27E46C09C4B5E6EF4C246216B35C8DC31231773EA55748CFB7126C0F56FA0055939F8B0AD97C5
Filing-Bundle-4123-0460004-PEFR.pdf	C674CBAD4A5C47E77A505237CFF1A72ED442A2DD71E932BE252A831DE40640A39CDDBE46895524F91EB631DC7D00AB14D68124B878397E2B2A05601A687F7479
Filing-Bundle-4123-0460004-ADS.pdf	CD8BDDB47A566EBA89700EEF6162D96D553D871326F6038A224A991877AF95896A72E1B84E88ADA215AE8BDC8228F1BC5FEF827702F384429415E74CDD494117
Filing-Bundle-4123-0460004-R3.73.pdf	6CD467B009F0B1D698391748FB31362B7A8AF3AB3494EBDD3DEFE74A02D236831C201CCE98C4DEA1464100AF1CEB92B3165EC9B3793282601F09F43AB783F083
Filing-Bundle-4123-0460004-PEFR.pdf	12C4BBC9F29634A1A479C95AFDA932BD40F751EAB45441A6CFDFE1DF683C0E5AB456D25B52E6F3402B7B4959526D91D4D44E73FBA3562D577D3D135080BAC534

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 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	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/447,456	09/13/2021	2811	1820	4123.0460004	19	3

CONFIRMATION NO. 5572

UPDATED FILING RECEIPT

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

OC000000128788482

Date Mailed: 10/01/2021

Receipt is acknowledged of this non-provisional utility 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 FIRST INVENTOR, 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 corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction 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 provided that the request is grantable.

Inventor(s)

Zhenyu Lu, Wuhan, CHINA;
Jun Chen, Wuhan, CHINA;
Xiaowang Dai, Wuhan, CHINA;
Jifeng Zhu, Wuhan, CHINA;
Qian Tao, Wuhan, CHINA;
Yu Ru Huang, Wuhan, CHINA;
Si Ping Hu, Wuhan, CHINA;
Lan Yao, Wuhan, CHINA;
Li Hong Xiao, Wuhan, CHINA;
A Man Zheng, Wuhan, CHINA;
Kun Bao, Wuhan, CHINA;
Haohao Yang, Wuhan, CHINA;

Applicant(s)

Yangtze Memory Technologies Co., Ltd., Wuhan, CHINA;

Assignment For Published Patent Application

Yangtze Memory Technologies Co., Ltd., Wuhan, CHINA

Power of Attorney: None

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

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Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 09/23/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/447,456**

Projected Publication Date: 03/16/2023

Non-Publication Request: No

Early Publication Request: No
Title

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Preliminary Class

257

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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SelectUSA

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 U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/447,456

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	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	19 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 480 =	0.00
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).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

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($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(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($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
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))							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 found in the appropriate box in column 1.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	17/447,456
Filing Date	September 13, 2021
First Named Inventor	Zhenyu Lu
Art Unit	To Be Assigned
Examiner Name	To Be Assigned
Attorney Docket Number	4123.0460004

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
	US1	US- 2014/0057429 A1	02-27-2014	Oh et al.	
	US2	US- 2017/0148805 A1	05-25-2017	Nishikawa et al.	
		US-			
		US-			
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		US-			

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		Date Considered	

*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] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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.**

If you need assistance in completing the form, call 1-800-PTO-9199 (1-800-786-9199) and select option 2.

Electronic Acknowledgement Receipt

EFS ID:	46113876
Application Number:	17447456
International Application Number:	
Confirmation Number:	5572
Title of Invention:	STAIRCASE STRUCTURE FOR MEMORY DEVICE
First Named Inventor/Applicant Name:	Zhenyu Lu
Customer Number:	26111
Filer:	Donald J. Featherstone/Jon Baitlon
Filer Authorized By:	Donald J. Featherstone
Attorney Docket Number:	4123.0460004
Receipt Date:	05-JUL-2022
Filing Date:	13-SEP-2021
Time Stamp:	15:46:54
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		2022-07-05-sIDS1-Bundle-4123-0460004.pdf	407092 56e2b04d6b63e36b36528ce819bd07089bdb0c27	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Miscellaneous Incoming Letter	1	1
	Transmittal Letter	2	7
	Information Disclosure Statement (IDS) Form (SB08)	8	8
Warnings:			
Information:			
	Total Files Size (in bytes):	407092	

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.

DONALD J. FEATHERSTONE
DIRECTOR
202-772-8629
DONF@STERNEKESSLER.COM

July 5, 2022

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 5572
Art Unit: To Be Assigned
Attn: Mail Stop Amendment

Re: U.S. Utility Patent Application
Appl. No. 17/447,456; Filed: September 13, 2021
For: **Staircase Structure For Memory Device**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

Transmitted herewith for appropriate action are the following documents:

1. First Supplemental Information Disclosure Statement; and

2. Form PTO/SB/08a (1 sheet) listing 2 documents (**US1-US2**).

The above-listed items are filed electronically.

In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

DJF/jcb
Enclosures

18688121_1

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: 5572
Applicant: YANGTZE MEMORY TECHNOLOGIES CO., LTD.	Art Unit: *To Be Assigned*
Application No.: 17/447,456	Examiner: *To Be Assigned*
Filing Date: September 13, 2021	Atty. Docket: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

First Supplemental Information Disclosure Statement

Mail Stop Amendment

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

Listed on accompanying IDS Form PTO/SB/08a or its equivalent are documents that may be considered material to the patentability of this application as defined in 37 C.F.R. §1.56, and in compliance with the duty of disclosure requirements of 37 C.F.R. §§ 1.97 and 1.98.

Applicant has listed publication dates on the attached IDS Form based on information presently available to the undersigned. However, the listed publication dates should not be construed as an admission that the information was actually published on the date indicated.

Applicant reserves 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 should not be construed as a representation that a search has been made, or that information more material to the examination of the present patent application does not exist. The Examiner is specifically requested not to rely solely on the material submitted herewith.

Applicant has checked the appropriate boxes below.

☐ 1. Statement under 37 C.F.R. 1.704(d). Each item of information contained in this Information Disclosure Statement: (i) was first cited in any communication from a patent office in a counterpart[1] foreign or international application or from the Office; and this communication was not received by any individual designated in Sec. 1.56(c) more than thirty days prior to the filing of this information disclosure statement; OR (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in Sec. 1.56(c) more than thirty days prior to the filing of the information disclosure statement.

☒ 2. Filing under 37 C.F.R. § 1.97(b). This Information Disclosure Statement is being filed within three months of the date of filing of a national application other than a continued prosecution application (CPA), OR within three months of the date of entry of the national stage as set forth in 37 C.F.R. § 1.491 in an international application, OR before the mailing date of a first Office Action on the merits OR before the mailing of a first Office Action

[1] The term counterpart foreign patent application means that a claim for priority has been made in either the U.S. application or a foreign application based on the other, or that the disclosures of the U.S. and foreign patent applications are substantively identical (e.g., an application filed in the European Patent Office claiming the same U.K. priority as claimed in the U.S. application).

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after the filing of a request for continued examination under 37 C.F.R. § 1.114. No statement or fee is required.

☐ 3. Filing under 37 C.F.R. § 1.97(c). This Information Disclosure Statement is being filed more than three months after the U.S. filing date AND after the mailing date of the first Office Action on the merits, but before the mailing date of a Final Rejection, or Notice of Allowance, or an action that otherwise closes prosecution in the application.

☐ a. Statement under 37 C.F.R. § 1.97(e)(1). I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. Statement under 37 C.F.R. § 1.97(e)(2). I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ c. The required fee is provided through online credit card payment authorization in the amount of $260.00 in payment of the fee under 37 C.F.R. § 1.17(p).

☐ 4. Filing under 37 C.F.R. § 1.97(d) This Information Disclosure Statement is being filed more than three months after the U.S. filing date and after the mailing date of a Final Rejection or

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Notice of Allowance, but on or before payment of the Issue Fee. The required fee is provided through online credit card payment authorization in the amount of $260.00 in payment of the fee under 37 C.F.R. § 1.17(p); in addition:

☐ a. Statement under 37 C.F.R. § 1.97(e)(1). I hereby state that each item of information contained in this Information Disclosure Statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☐ b. Statement under 37 C.F.R. § 1.97(e)(2). I hereby state that no item of information in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application and, to my knowledge after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

☐ 5. The patent family for one or more foreign language documents submitted herewith includes a United States patent, and other patent, in the English language. Copies of both the particular foreign patent(s) or published foreign patent applications cited in the foreign patent office communication, and that are not already of record in this application, are enclosed. Copies of the related United States or other English language patent or published application from the family list, if not already of record, are listed on the accompanying SB/08A form. For the purposes of a statement under 37 CFR 1.97(e)(1), the United States or

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other English language patent or published application are to be construed as being cited by the foreign patent office. MPEP 609.04(b)(V).

☐ 6. The document(s) was/were cited in a search report by a foreign patent office in a counterpart foreign application. Submission of an English language version of the search report that indicates the degree of relevance found by the foreign office is provided in satisfaction of the requirement for a concise explanation of relevance. MPEP 609.04(a)(III).

☐ 7. A concise explanation of the relevance of the non-English language document(s) appears below in accordance with 37 C.F.R. § 1.98(a)(3).

☒ 8. In accordance with 37 C.F.R. § 1.98(a)(2)(ii), no copies of the U.S. patent application publications cited as documents **US1-US2** on the attached IDS Form are submitted.

☐ 9. Copies of the _____ documents were cited by or submitted to the Office in an IDS that complies with 37 C.F.R. § 1.98(a)-(c) in Application No._____, filed _____, which is relied upon for an earlier filing date under 35 U.S.C. § 120. Thus, copies of these documents are not attached. 37 C.F.R. § 1.98(d).

☒ 10. It is expected that the examiner will review the prosecution and cited art in the parent Application Nos. 16/885,858, filed May 28, 2020 (now U.S. Patent No. 11,145,666); and 16/126,956, filed August 6, 2018 (now U.S. Patent No. 10,680,003), in accordance with MPEP 2001.06(b), and indicate in the next communication from the office that the art cited in the earlier prosecution history has been reviewed in connection with the present application.

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☐ 11. Applicants submit herewith Office Actions from the co-pending U.S. Patent Application No._____, filed _____, as documents _____ to _____.

The identification of these Office Actions is not to be construed as a waiver of secrecy as to those applications now or upon issuance of the present application as a patent. The Examiner is respectfully requested to consider the cited applications and the art cited therein during examination.

It is respectfully requested that the Examiner initial and return a copy of the enclosed IDS Forms, and indicate in the official file wrapper of this patent application that the documents have been considered.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

Date: 7/5/22

1100 New York Avenue, N.W.
Washington, D.C. 20005-3934
(202) 371-2600

18688059.1

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Micron v. YMTC
IPR2025-00229

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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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	17/447,456
Filing Date	September 13, 2021
First Named Inventor	Zhenyu LU
Title	STAIRCASE STRUCTURE FOR MEMORY DEVICE
Art Unit	To Be Assigned
Examiner Name	To Be Assigned
Attorney Docket Number	4123.0460004

SIGNATURE of Applicant or Patent Practitioner

Signature	/Donald J. Featherstone/	Date (Optional)	
Name	Donald J. Featherstone	Registration Number	33,876
Title (if Applicant is a juristic entity)	Attorney for Applicant		
Applicant Name (if Applicant is a juristic entity)	Yangtze Memory Technologies Co., Ltd.		

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 one (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

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
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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

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☑ 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: 26111

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I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Yangtze Memory Technologies Co., Ltd.

☐ Inventor or Joint Inventor (title not required below)

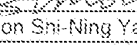
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✓ 1 **SIGNATURE of Applicant for Patent**

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		Date (Optional)	
Name	Simon Shi-Ning Yang		
Title	CEO		

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 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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DONALD J. FEATHERSTONE
DIRECTOR
202-772-8629
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March 7, 2023

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 5572
Art Unit: To Be Assigned

Re: U.S. Utility Patent Application
Appl. No. 17/447,456; Filed: September 13, 2021
For: **Staircase Structure For Memory Device**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

Transmitted herewith for appropriate action is a document entitled: ***An executed Power of Attorney by Applicant (PTO/AIA/82B) and the Transmittal for Power of Attorney form (PTO/AIA/82A)***, which is submitted electronically.

In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

DJF/dxc
Enclosure

19897766_1.DOCX

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**03/07/2023 06:28:44 PM ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Delain Crooks
PATENT CENTER #	61700103	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Donald Featherstone

Documents

TOTAL DOCUMENTS: 3

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2023-03-07-Cover-Letter-4123-0460004.pdf	1	Transmittal Letter	208 KB
2023-03-07-POA-82A-4123-0460004.PDF	1	Power of Attorney	167 KB
2023-03-07-POA-82B-4123-0460004.PDF	1	Power of Attorney	1241 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)

2023-03-07-Cover-Letter-4123-0460004.pdf	EFE97AD08EFD069AD92A1E51ED5E21627A5B890F0F8453268C20F1577C15B4A0EF297108DD3A583109DA592FB96152C1D6224E5A50BB5BF89A1071B74C169745
2023-03-07-POA-82A-4123-0460004.PDF	7BDF0B76E9BAE483E3AFBBE4A9AA64F88F1F9888301B3FE5655C6DE6E5628E41A10E58995B431EEAEB0E4430F745D5284204A6BD02B600B33306F73E19241B29
2023-03-07-POA-82B-4123-0460004.PDF	AB34DEF6BA9F8CC7946B63389ED5201DA13090F57F96326953ACCDBA9284AAC4709DA70820B79C4E96CB1F29BEFE60FFEE14A0611B4FD9D035E4ECB40E4785C1

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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 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 NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

POA ACCEPTANCE LETTER

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

OC000000137547832

Date Mailed: 03/13/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/07/2023.

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**.

/mbeyene/

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004

CONFIRMATION NO. 5572

PUBLICATION NOTICE

26111
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1100 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20005

OC000000137590135

Title:STAIRCASE STRUCTURE FOR MEMORY DEVICE

Publication No.US-2023-0084008-A1
Publication Date:03/16/2023

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/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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证　　明

本证明之附件是向本局提交的下列专利申请文件副本。

申　　请　　号：201710750398.4

申　请　类　型：发明专利

发明 创造 名称：台阶结构及其形成方法

申　　请　　日：2017 年 08 月 28 日

申　　请　　人：长江存储科技有限责任公司

发明人或设计人：吕震宇、陈俊、戴晓望、朱继锋、陶谦、黄郁茹、胡思平、姚兰、肖莉红、郑阿曼、鲍琨、杨号号

局长

申长雨

2019 年 06 月 26 日

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2017107503984

权利要求书

1、一种台阶结构的形成方法，其特征在于，包括：

提供衬底，在所述衬底上形成叠层结构，在所述叠层结构上形成第一掩膜层；

刻蚀所述第一掩膜层和所述叠层结构形成各台阶层；

在各台阶层上形成着陆垫；

去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层。

2、根据权利要求1所述的方法，其特征在于，所述刻蚀所述第一掩膜层和所述叠层结构形成各台阶层，具体为：在所述第一掩膜层上旋涂光阻层，以所述光阻层为掩膜，多次刻蚀所述第一掩膜层和所述叠层结构形成各台阶层。

3、根据权利要求1所述的方法，其特征在于，

所述叠层结构，具体为多个层叠的氮氧层组，所述氮氧层组自上至下依次为氧化物层和氮化物层；

刻蚀所述第一掩膜层和所述叠层结构形成的各台阶层分别对应一个所述氮氧层组。

4、根据权利要求3所述的方法，其特征在于，所述在各台阶层上形成着陆垫，具体包括：

在除最底层台阶层外的其他台阶层中，去除部分氮化物层，使氮化物层相对于氧化物层凹陷，形成第一凹陷结构；

形成第二掩膜层，所述第二掩膜层覆盖各台阶层及剩余的第一掩膜层，并将所述第一凹陷结构完全填充；

去除第二掩膜层，并在所述第一凹陷结构中形成填充结构，所述填充结构高于所述第一凹陷结构并覆盖部分对应的氧化物层的侧面；

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权利要求书

去除各台阶层中的氧化物层，呈现各台阶层中的氮化物层；

形成加固层，所述加固层覆盖各台阶层中的氮化物层、填充结构及剩余的第一掩膜层；

去除部分加固层、所述填充结构和部分剩余的第一掩膜层，形成各台阶层的着陆垫，使除最底层台阶层外的各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构。

5、根据权利要求4所述的方法，其特征在于，所述去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层，具体为：去除当前剩余的第一掩膜层及其上的加固层和其下的氧化物层，并形成覆盖层，所述覆盖层将所述第二凹陷结构完全填充，并覆盖各台阶层。

6、一种台阶结构，其特征在于，包括：

衬底及衬底上的叠层结构；

形成于所述叠层结构上的各台阶层；

形成于各台阶层上的着陆垫；

覆盖各台阶层的覆盖层。

7、根据权利要求6所述的台阶结构，其特征在于，所述叠层结构，具体为多个层叠的氮氧层组，所述氮氧层组自上至下依次为氧化物层和氮化物层。

8、根据权利要求7所述的台阶结构，其特征在于，各台阶层分别对应一个氮氧层组，各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构。

9、根据权利要求8所述的台阶结构，其特征在于，所述覆盖层将所述第二凹陷结构完全填充，并覆盖各台阶层。

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权利要求替换页

1、一种台阶结构的形成方法，其特征在于，包括：

提供衬底，在所述衬底上形成叠层结构，在所述叠层结构上形成第一掩膜层；

刻蚀所述第一掩膜层和所述叠层结构形成各台阶层；

在各台阶层上形成着陆垫；其中，各着陆垫所在层相对于对应的着陆垫形成有凹陷结构；

去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层。

2、根据权利要求 1 所述的方法，其特征在于，所述刻蚀所述第一掩膜层和所述叠层结构形成各台阶层，具体为：在所述第一掩膜层上旋涂光阻层，以所述光阻层为掩膜，多次刻蚀所述第一掩膜层和所述叠层结构形成各台阶层。

3、根据权利要求 1 所述的方法，其特征在于，

所述叠层结构，具体为多个层叠的氮氧层组，所述氮氧层组自上至下依次为氧化物层和氮化物层；

刻蚀所述第一掩膜层和所述叠层结构形成的各台阶层分别对应一个所述氮氧层组。

4、根据权利要求 3 所述的方法，其特征在于，所述在各台阶层上形成着陆垫，具体包括：

在除最底层台阶层外的其他台阶层中，去除部分氮化物层，使氮化物层相对于氧化物层凹陷，形成第一凹陷结构；

形成第二掩膜层，所述第二掩膜层覆盖各台阶层及剩余的第一掩膜层，并将所述第一凹陷结构完全填充；

去除第二掩膜层，并在所述第一凹陷结构中形成填充结构，所述填充结构高于所述第一凹陷结构并覆盖部分对应的氧化物层的侧面；

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去除各台阶层中的氧化物层，呈现各台阶层中的氮化物层；

形成加固层，所述加固层覆盖各台阶层中的氮化物层、填充结构及剩余的第一掩膜层；

去除部分加固层、所述填充结构和部分剩余的第一掩膜层，形成各台阶层的着陆垫，使除最底层台阶层外的各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构。

5、根据权利要求 4 所述的方法，其特征在于，所述去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层，具体为：去除当前剩余的第一掩膜层及其上的加固层和其下的氧化物层，并形成覆盖层，所述覆盖层将所述第二凹陷结构完全填充，并覆盖各台阶层。

6、一种台阶结构，其特征在于，包括：

衬底及衬底上的叠层结构；

形成于所述叠层结构上的各台阶层；

形成于各台阶层上的着陆垫；

覆盖各台阶层的覆盖层。

7、根据权利要求 6 所述的台阶结构，其特征在于，所述叠层结构，具体为多个层叠的氮氧层组，所述氮氧层组自上至下依次为氧化物层和氮化物层。

8、根据权利要求 7 所述的台阶结构，其特征在于，各台阶层分别对应一个氮氧层组，各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构。

9、根据权利要求 8 所述的台阶结构，其特征在于，所述覆盖层将所述第二凹陷结构完全填充，并覆盖各台阶层。

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2017107503984

权利要求替换页

1、一种台阶结构的形成方法，其特征在于，包括：

提供衬底，在所述衬底上形成含有多个氮氧层组的叠层结构，所述氮氧层组自上至下依次为氧化物层和氮化物层；

在所述叠层结构上形成第一掩膜层；

刻蚀所述第一掩膜层和所述叠层结构形成各台阶层；

在除最底层台阶层外的其他台阶层中，去除部分氮化物层，使氮化物层相对于氧化物层凹陷，形成第一凹陷结构；

形成第二掩膜层，所述第二掩膜层覆盖各台阶层及剩余的第一掩膜层，并将所述第一凹陷结构完全填充；

去除第二掩膜层，并在所述第一凹陷结构中形成填充结构，所述填充结构高于所述第一凹陷结构并覆盖部分对应的氧化物层的侧面；

去除各台阶层中的氧化物层，呈现各台阶层中的氮化物层；

形成加固层，所述加固层覆盖各台阶层中的氮化物层、填充结构及剩余的第一掩膜层；

去除部分加固层、所述填充结构和部分剩余的第一掩膜层，形成各台阶层的着陆垫，使除最底层台阶层外的各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构；

去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层。

2、根据权利要求 1 所述的方法，其特征在于，所述刻蚀所述第一掩膜层和所述叠层结构形成各台阶层，具体为：在所述第一掩膜层上旋涂光阻层，以所述光阻层为掩膜，多次刻蚀所述第一掩膜层和所述叠层结构形成各台阶层。

3、根据权利要求 1 所述的方法，其特征在于，所述去除剩余的第一掩膜层，

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并形成覆盖各台阶层的覆盖层，具体为：去除当前剩余的第一掩膜层及其上的加固层和其下的氧化物层，并形成覆盖层，所述覆盖层将所述第二凹陷结构完全填充，并覆盖各台阶层。

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台阶结构及其形成方法

技术领域

本发明涉及半导体技术领域，尤其涉及一种台阶结构及其形成方法。

背景技术

闪存是一种非易变性的存储器，是电可擦除且可编程的只读存储器的一种特殊结构，其运作原理是通过改变晶体管或存储单元的临界电压来控制门极通道的开关以达到存储数据的目的，使存储在存储器中的数据不会因电源中断而消失。闪存以其便捷、存储密度高、可靠性好等优点成为非挥发性存储器研究的热点。从二十世纪八十年代第一个闪存产品问世以来，随着技术的发展和各类电子产品对存储的需求，闪存被广泛的应用于手机、笔记本、掌上电脑和U盘等移动和通讯设备中，并占据了非挥发性半导体存储器的大部分市场份额。

如今，经历了平面型闪存存储器的发展时期，已进入了三维闪存存储器的发展热潮，其主要特色是将平面结构转换为立体结构，通过光刻工艺形成台阶结构，在台阶结构中形成多个横向和纵向的存储单元阵列，并通过在台阶结构中形成水平方向上的字线（Word line）和竖直方向的位线（Bit line）来准确定位各存储区，进而对存储区中的数据进行操作。目前的三维存储器，其台阶结构中字线的厚度是均匀的，然而，随着人们对存储器的容量及体积的要求不断提升，使形成台阶结构的堆栈会不断减小，从而字线的厚度会越来越小，进而导致用单个掩膜来创建台阶间的互连会越来越困难。

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发明内容

为解决现有技术的不足，本发明提供一种台阶结构及其形成方法。

一方面，本发明提供一种台阶结构的形成方法，包括：

提供衬底，在所述衬底上形成叠层结构，在所述叠层结构上形成第一掩膜层；

刻蚀所述第一掩膜层和所述叠层结构形成各台阶层；

在各台阶层上形成着陆垫；

去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层。

可选地，所述刻蚀所述第一掩膜层和所述叠层结构形成各台阶层，具体为：在所述第一掩膜层上旋涂光阻层，以所述光阻层为掩膜，多次刻蚀所述第一掩膜层和所述叠层结构形成各台阶层。

可选地，所述叠层结构，具体为多个层叠的氮氧层组，所述氮氧层组自上至下依次为氧化物层和氮化物层；

刻蚀所述第一掩膜层和所述叠层结构形成的各台阶层分别对应一个所述氮氧层组。

可选地，所述在各台阶层上形成着陆垫，具体包括：

在除最底层台阶层外的其他台阶层中，去除部分氮化物层，使氮化物层相对于氧化物层凹陷，形成第一凹陷结构；

形成第二掩膜层，所述第二掩膜层覆盖各台阶层及剩余的第一掩膜层，并将所述第一凹陷结构完全填充；

去除第二掩膜层，并在所述第一凹陷结构中形成填充结构，所述填充结构高于所述第一凹陷结构并覆盖部分对应的氧化物层的侧面；

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去除各台阶层中的氧化物层，呈现各台阶层中的氮化物层；

形成加固层，所述加固层覆盖各台阶层中的氮化物层、填充结构及剩余的第一掩膜层；

去除部分加固层、所述填充结构和部分剩余的第一掩膜层，形成各台阶层的着陆垫，使除最底层台阶层外的各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构。

可选地，所述去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层，具体为：去除当前剩余的第一掩膜层及其上的加固层和其下的氧化物层，并形成覆盖层，所述覆盖层将所述第二凹陷结构完全填充，并覆盖各台阶层。

另一方面，本发明提供一种台阶结构，包括：

衬底及衬底上的叠层结构；

形成于所述叠层结构上的各台阶层；

形成于各台阶层上的着陆垫；

覆盖各台阶层的覆盖层。

可选地，所述叠层结构，具体为多个层叠的氮氧层组，所述氮氧层组自上至下依次为氧化物层和氮化物层。

可选地，各台阶层分别对应一个氮氧层组，各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构。

可选地，所述覆盖层将所述第二凹陷结构完全填充，并覆盖各台阶层。

本发明的优点在于：

本发明中，通过在各台阶层上形成着陆垫，增加了台阶层之间互联部分的厚度，使得即使是很薄的字线需求，通过单张掩膜来形成台阶间的互连亦是可

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行的。

附图说明

通过阅读下文优选实施方式的详细描述，各种其他的优点和益处对于本领域普通技术人员将变得清楚明了。附图仅用于示出优选实施方式的目的，而并不认为是对本发明的限制。而且在整个附图中，用相同的参考符号表示相同的部件。在附图中：

附图 1 为本发明提供的一种形成台阶结构的方法流程图；

附图 2 和附图 3 为本发明提供的形成台阶层的结构变化示意图；

附图 4 至附图 9 为本发明提供的形成着陆垫的结构变化示意图；

附图 10 为本发明提供的部分台阶结构示意图。

具体实施方式

下面将参照附图更详细地描述本公开的示例性实施方式。虽然附图中显示了本公开的示例性实施方式，然而应当理解，可以以各种形式实现本公开而不应被这里阐述的实施方式所限制。相反，提供这些实施方式是为了能够更透彻地理解本公开，并且能够将本公开的范围完整的传达给本领域的技术人员。

实施例一

根据本发明的实施方式，提供一种台阶结构的形成方法，如图 1 所示，包括：

提供衬底，在衬底上形成叠层结构，在叠层结构上形成第一掩膜层；

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刻蚀第一掩膜层和叠层结构形成各台阶层；

在各台阶层上形成着陆垫（Landing Pad）；

去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层。

根据本发明的实施方式，刻蚀第一掩膜层和叠层结构形成各台阶层，具体为：在第一掩膜层上旋涂光阻层，以光阻层为掩膜，多次刻蚀第一掩膜层和叠层结构形成各台阶层。

根据本发明的实施方式，如图 2 和图 3 所示，叠层结构，具体为多个层叠的氮氧层组，氮氧层组自上至下依次为氧化物层（图中未示出）和氮化物层（图中未示出）；

对应地，刻蚀第一掩膜层和叠层结构形成的各台阶层分别对应一个氮氧层组。

需要说明地，在本实施例中，对叠层结构的氮氧层组的数量及形成的台阶层的数量不作具体限定，具体依需求而定，附图仅用于示例说明。

根据本发明的实施方式，在各台阶层上形成着陆垫，如图 4 至图 9 所示，具体包括：

在除最底层台阶层外的其他台阶层中，去除部分氮化物层，使氮化物层相对于氧化物层凹陷，形成第一凹陷结构（Nitride Recess）；

形成第二掩膜层，第二掩膜层覆盖各台阶层及剩余的第一掩膜层，并将第一凹陷结构完全填充（Poly Dep）；

去除第二掩膜层，并在第一凹陷结构中形成填充结构，填充结构高于第一凹陷结构并覆盖部分对应的氧化物层的侧面（Poly Etch）；

去除各台阶层中的氧化物层，呈现各台阶层中的氮化物层（Oxide Etch）；

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形成加固层，加固层覆盖各台阶层中的氮化物层、填充结构及剩余的第一掩膜层（Niteide Dep）；

去除部分加固层、填充结构和部分剩余的第一掩膜层，形成各台阶层的着陆垫，使除最底层台阶层外的各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构（Nitride/Poly Recess）。

其中，第二掩膜层具体为多晶硅，加固层具体为氮化物。

根据本发明的实施方式，采用低压化学气相沉积（Low Pressure Chemical Vapor Deposition，简称LPCVD）的方法和/或等离子体增强化学气相沉积（Plasma Enhanced Chemical Vapor Deposition，简称PECVD）的方法形成第二掩膜层；

根据本发明的实施方式，采用干法刻蚀（Dry Etch）工艺去除第二掩膜层，并在第一凹陷结构中形成填充结构；

根据本发明的实施方式，采用不良梯形覆盖共形工艺（Poor Step Coverage Conformal Process）形成加固层。

进一步地，在本实施例中，去除剩余的第一掩膜层，并形成覆盖各台阶层的覆盖层，具体为：去除当前剩余的第一掩膜层及其上的加固层和其下的氧化物层，并形成覆盖层，覆盖层将第二凹陷结构完全填充，并覆盖各台阶层。

实施例二

根据本发明的实施方式，提供一种台阶结构，包括：

衬底及衬底上的叠层结构；

形成于叠层结构上的各台阶层；

形成于各台阶层上的着陆垫；

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覆盖各台阶层的覆盖层。

根据本发明的实施方式，叠层结构，具体为多个层叠的氮氧层组，氮氧层组自上至下依次为氧化物层和氮化物层。

根据本发明的实施方式，各台阶层分别对应一个氮氧层组，各台阶层的氮化物层相对于对应的着陆垫凹陷，形成第二凹陷结构。

根据本发明的实施方式，覆盖层将第二凹陷结构完全填充，，并覆盖各台阶层。

本发明中，通过在各台阶层上形成着陆垫，增加了台阶层之间互联部分的厚度，使得即使是很薄的字线需求，通过单张掩膜来形成台阶间的互连亦是可行的。

以上所述，仅为本发明较佳的具体实施方式，但本发明的保护范围并不局限于此，任何熟悉本技术领域的技术人员在本发明揭露的技术范围内，可轻易想到的变化或替换，都应涵盖在本发明的保护范围之内。因此，本发明的保护范围应以所述权利要求的保护范围为准。

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说明书附图

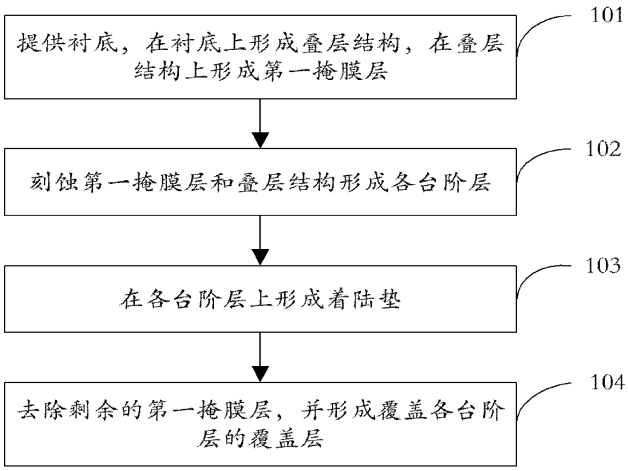


图 1



图 2

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说明书附图

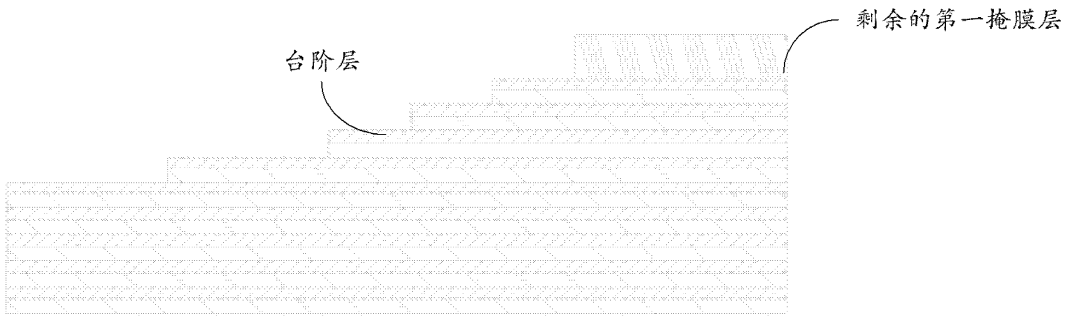


图 3

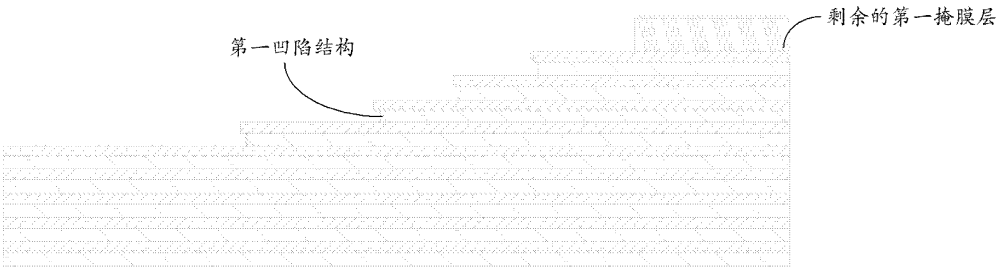


图 4

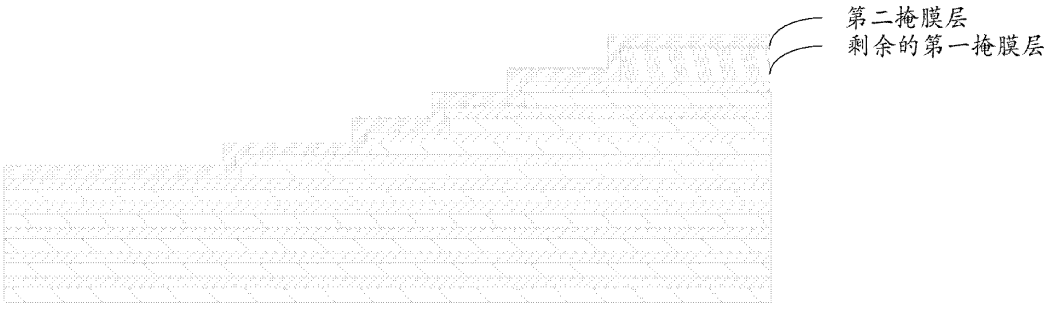


图 5

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说明书附图

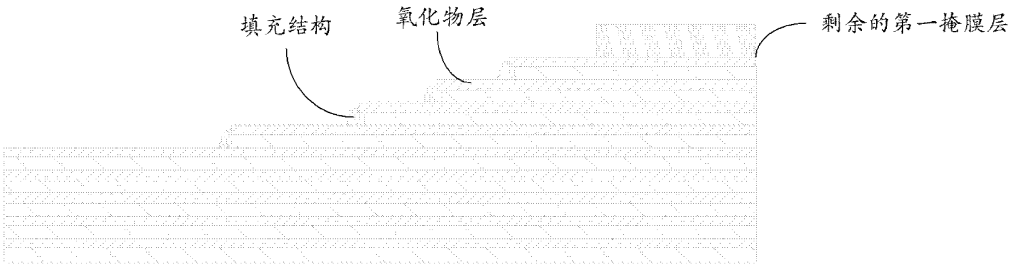


图 6

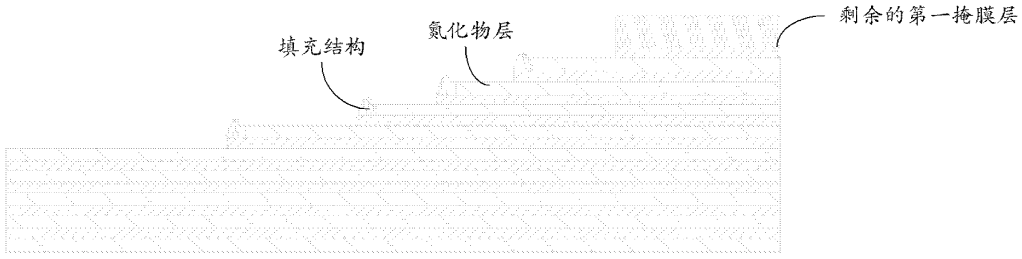


图 7

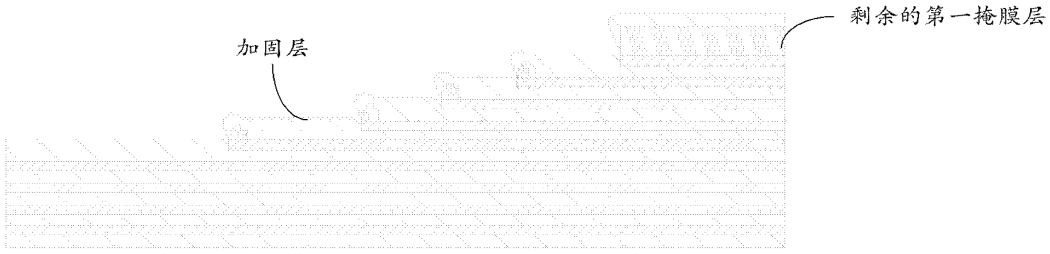


图 8

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说明书附图



图 9

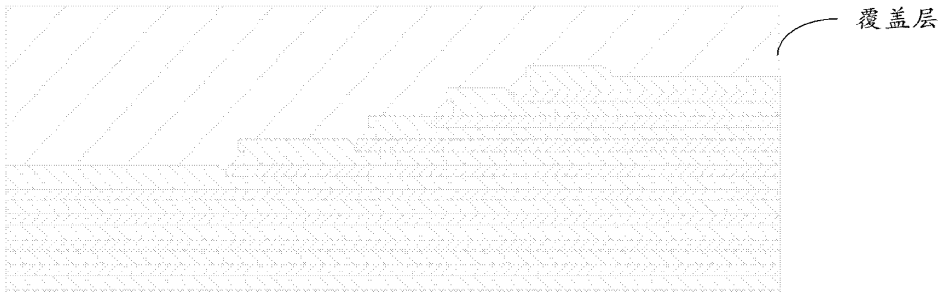


图 10

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Date Mailed: 05/24/2023

Receipt is acknowledged of this non-provisional utility 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 FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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which is a CON of PCT/CN2018/098962 08/06/2018

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/447,456**

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Early Publication Request: No

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Preliminary Class

257

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application

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serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

26111 7590 08/29/2023

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

EXAMINER	
GEYER, SCOTT B	

ART UNIT	PAPER NUMBER
2812	

NOTIFICATION DATE	DELIVERY MODE
08/29/2023	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):

e-office@sternekessler.com

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Office Action Summary	Application No. 17/447,456	Applicant(s) Lu et al.	
	Examiner Scott B Geyer	Art Unit 2812	AIA (FITF) Status Yes

-- 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 24 May 2023.

☐ 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) 1-5 and 7-20 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) 1-9,12,14 and 16 is/are rejected.

8) ☑ Claim(s) 10-11,13,15 and 17-20 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 13 September 2021 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 20210913, 20220705.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

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DETAILED ACTION

Priority

Receipt is acknowledged of certified copies of papers required by 37 CFR 1.55.

Information Disclosure Statement

The references cited within the IDS documents have been considered.

IDS document dates: 13 September 2021 and 05 July 2022.

Claim Objections

The claims are objected to because of the following informality:

The claim set submitted on 13 September 2021 skipped claim number 6, which violates 37 CFR 1.75 (f): "*If there are several claims, they shall be numbered consecutively in Arabic numerals.*"

Appropriate correction is required.

Claim Rejections - 35 USC § 112

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.

Claims 5, 10, and 16 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 applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

Claim 5 recites the limitation "the conductive layer" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 10 recites the limitation "the conductive layer" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim 16 recites the limitation "the substrate" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

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 –
>
> (a)(1) the claimed invention was patented, described in a printed publication, or in public use, on sale, or otherwise available to the public before the effective filing date of the claimed invention.

Claims 1, 3, 4, 5, 7, and 8 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Lee et al. (US 2016/0218107 A1, hereinafter 'Lee').

As to **claim 1**, Lee teaches a staircase structure of a memory device (see drawing figure 4C), comprising:

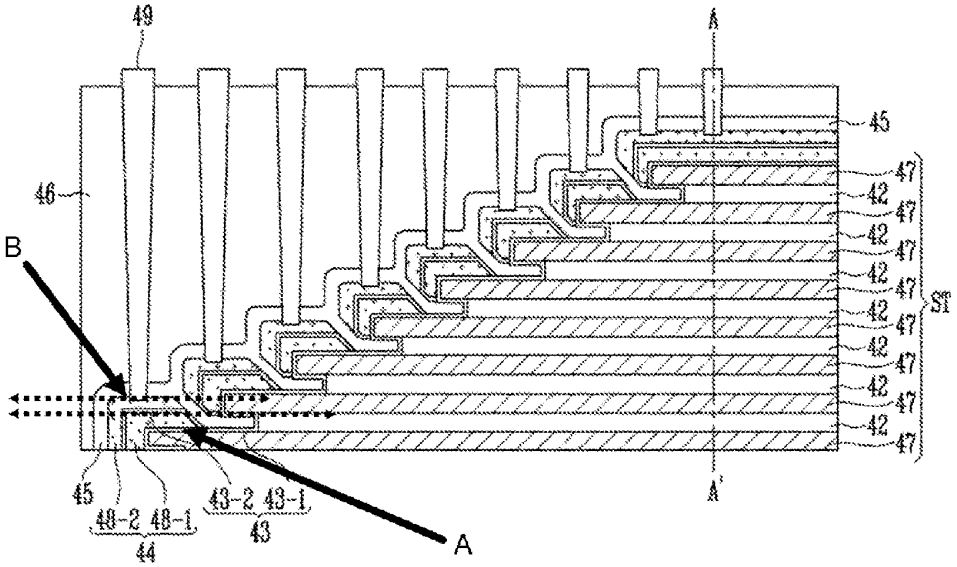
a first material layer (42) and a second material layer (47), wherein the first material layer (42) comprises an insulating material and is disposed over a first portion of the second material layer (47); and

a landing pad (48-2, 43-2, 48-1) disposed over a second portion of the second material layer (47), wherein the landing pad comprises:

a bottom surface (“A”, see annotated drawing figure below); and

an upper surface (“B”, see annotated drawing figure below) opposite to the bottom surface, wherein the upper surface is above a top surface of the first material layer (indicated by the two dashed horizontal lines, see annotated drawing figure below).

FIG. 4C



As to **claim 3**, Lee teaches the upper surface ("A") is laterally displaced and vertically above the top surface of the first material layer (42). See annotated drawing figure 4C above.

As to **claim 4**, Lee teaches the second material layer comprises a first conductive material and the landing pad comprises a second conductive material different from the first conductive material. See e.g. paragraph 0033.

As to **claim 5**, Lee teaches a dielectric layer (43-1, 43-2, and 45) in contact with the bottom surface of the landing pad, a side surface of the landing pad, and a side surface of the second portion of the conductive layer.

As to **claim 7**, Lee teaches another first material layer (i.e. an insulating layer), wherein the second material layer (i.e. the conductive layer) is disposed over the another first material layer, and wherein a side surface of the another first material layer is laterally displaced from a side surface of the landing pad (i.e. Lee teaches multiple stacked insulating and conductive layers, in a staircase pattern).

As to **claim 8**, Lee teaches a thickness of the landing pad is greater than a thickness of the first material layer (as can be plainly seen in figure 4C).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double

patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The filing of a terminal disclaimer by itself is not a complete reply to a nonstatutory double patenting (NSDP) rejection. A complete reply requires that the terminal disclaimer be accompanied by a reply requesting reconsideration of the prior Office action. Even where the NSDP rejection is provisional the reply must be complete. See MPEP § 804, subsection I.B.1. For a reply to a non-final Office action, see 37 CFR

1.111(a). For a reply to final Office action, see 37 CFR 1.113(c). A request for reconsideration while not provided for in 37 CFR 1.113(c) may be filed after final for consideration. See MPEP §§ 706.07(e) and 714.13.

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The actual filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/apply/applying-online/eterminal-disclaimer.

Claims 1-4, 7, 9, 12, and 14 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-4 and 6 of U.S. Patent No. 11,145,666. Although the claims at issue are not identical, they are not patentably distinct from each other because all of the limitations within claims 1-4, 7, 9, 12, and 14 of the instant application are recited within claims 1-4 and 6 of the ‘666 patent.

Specifically, for claim 1 of the instant application, see claim 1 of the ‘666 patent;

for claim 2 of the instant application, see claim 2 of the ‘666 patent;

for claim 3 of the instant application, see claim 3 of the ‘666 patent;

for claim 4 of the instant application, see claim 4 of the ‘666 patent;

for claim 7 of the instant application, see claim 6 of the ‘666 patent;

for claim 9 of the instant application, see claims 1 and 2 of the ‘666 patent;

for claim 12 of the instant application, see claim 4 of the '666 patent;

for claim 14 of the instant application, see claim 6 of the '666 patent.

Allowable Subject Matter

Claims 10, 11, 13, 15, 17, 18, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. (Claim 20 is also objected to, as being dependent upon an objected claim.)

Cited Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: see the attached form PTO-892 for pertinent cited art.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott B. Geyer (telephone: 571-272-1958). The examiner can normally be reached on Monday to Friday, 10AM - 4PM. 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, Charles D Garber (telephone: 571-272-2194). 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 U.S.A. or Canada) or 571-272-1000.

/SCOTT B GEYER/
Primary Examiner, Art Unit 2812

Notice of References Cited	Application/Control No. 17/447,456	Applicant(s)/Patent Under Reexamination Lu et al.	
	Examiner Scott B Geyer	Art Unit 2812	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20160358855-A1	12-2016	OH; Kwang-Seok	H01L23/5226	1/1
*	B	US-20170338240-A1	11-2017	NOGAMI; Jun	H10B43/35	1/1
*	C	US-20160093513-A1	03-2016	HONG; ZHONGSHAN	H01L21/76877	438/696
*	D	US-20150179564-A1	06-2015	LEE; Ki Hong	H10B99/00	257/773
*	E	US-20160218107-A1	07-2016	LEE; Ki Hong	H01L23/528	1/1
*	F	US-20180277558-A1	09-2018	LEE; Nam Jae	H10B43/30	1/1
*	G	US-20200035553-A1	01-2020	YATSUDA; Koichi	H10B41/50	1/1
*	H	US-20170194255-A1	07-2017	OH; Kwang-Seok	H01L21/76829	1/1
*	I	US-20150206895-A1	07-2015	OH; Sung Lae	H01L23/5283	257/324
*	J	US-20150287710-A1	10-2015	Yun; Tae-Hwan	H10B43/35	257/314
*	K	US-20180053686-A1	02-2018	HYUN; Chung-IL	H10B43/50	1/1
*	L	US-20160172296-A1	06-2016	LIM; Tae-Wan	H01L29/4234	257/773
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC 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.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/447,456	Lu et al.
	Examiner	Art Unit
	Scott B Geyer	2812

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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
Parent Applications (16/126,956; 16/885,858) - references checked	08/24/2023	SBG
Text/Intersection searches: H01L23/528, H01L23/5283, H10B41/20, H10B41/40-50, H10B43/20, H10B43/40, H10B43/50	08/24/2023	SBG
PE2E-Search, details attached	08/24/2023	SBG

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	("11145666" "10680003").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/23 05:52 PM
L2	718	((Yangtze WITH Memory).as. (Zhenyu WITH Lu).in. (Jun WITH Chen).in. (Xiaowang WITH Dai).in. (Jifeng WITH Zhu).in. (Qian WITH Tao).in. (Yu WITH Ru WITH Huang).in. (Si WITH Ping WITH Hu).in. (Lan WITH Yao).in. (Li WITH Hong WITH Xiao).in. (A WITH Man WITH Zheng).in. (Kun WITH Bao).in. (Haohao WITH Yang).in.) AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step) WITH memory)	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 11:34 AM
L4	16	("9006884" | "9331082" | "9343452" | "9373540" | "9419013" | "9478487" | "9741563" | "10002880" | "10403641" | "20110031630" | "20130270714" | "20150255385" | "20150255386" | "20170084532" | "20190081070").pn. OR ("10680003").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:36 AM
L5	27	("9006884" | "9331082" | "9343452" | "9373540" | "9419013" | "9478487" | "9520402" | "9711603" | "9741563" | "9941153" | "10002880" | "10395982" | "10403641" | "20110031630" | "20130043509" | "20130056818" | "20130270714" | "20150255385" | "20150255386" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:36 AM

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		"20170084532" | "20170271256" | "20180130701" | "20180166380" | "20180301460" | "20190006385" | "20190081070" | "20190280001").pn. OR ("11145666").urpn. AND (PGPB | USPT | USOC).dbnm.					
L6	27	(Artificial Intelligence) More like doc: US-10680003-B2 Text: (US-11145666-B2 OR US-20200295019-A1 OR US-20190081070-A1 OR US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR TW-201913972-A OR US-20200251381-A1 OR CN-113241350-A OR US-20200051983-A1 OR TW-I721303-B OR US-10896844-B2 OR US-11545388-B2 OR US-20210265203-A1 OR US-20210098288-A1 OR US-11361988-B2 OR US-20230102588-A1 OR CN-113241350-B OR CN-114207823-A OR WO-2020154997-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 11:36 AM
L7	25	(Artificial Intelligence) More like doc: US-11145666-B2 Text: (US-20200295019-A1 OR US-10680003-B2 OR US-20190081070-A1 OR US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR TW-201913972-A OR US-20200051983-A1 OR CN-113241350-A OR TW-I721303-B OR US-20200251381-A1 OR US-11114439-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 11:37 AM

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		CN-110121777-A OR US-11545388-B2 OR US-20210265203-A1 OR US-10896844-B2 OR CN-113241350-B OR US-20210098288-A1 OR US-11361988-B2 OR US-20230102588-A1).did.					
L8	41	(Artificial Intelligence) Similar to: 17/447,456 with 0 CPC Selections and 0 Text Selections Text: (US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR CN-113241350-B OR CN-113241350-A OR TW-201913972-A OR TW-I721303-B OR CN-110121777-A OR CN-107644876-B OR CN-110556383-A OR US-20190081070-A1 OR CN-107919361-A OR US-10727115-B2 OR TW-202137513-A OR CN-110098191-A OR CN-109309095-B OR US-10615124-B2 OR CN-109309095-A OR US-10396035-B2 OR JP-2022508779-A OR TW-I679750-B OR US-20190035733-A1 OR TW-202017150-A OR CN-111293119-B OR TW-I622132-B OR EP-3306664-A1 OR TW-201814839-A OR CN-109326606-A OR JP-2020198387-A OR CN-107017262-A OR US-20200194456-A1 OR TW-I739331-B OR TW-202046322-A OR CN-110634873-A OR CN-112038353-A OR CN-111326498-A OR KR-20200073455-A OR CN-114207821-A OR WO-2021030820-A1 OR TW-202121666-A OR CN-110323226-A	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2023/08/24 11:37 AM

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		OR EP-3827460-A1 OR US-10714492-B2 OR US-20230200064-A1 OR CN-114725064-A OR TW-I758789-B OR JP-7246500-B2 OR CN-111293119-A OR US-20230180477-A1 OR US-20210296346-A1).did.					
L9	28	L4 OR L5	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:38 AM
L10	2	("20140057429" "20170148805").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 11:40 AM
L11	24325	(H10B41/20 H10B41/35 H10B41/41).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L12	36494	(H10B43/20 H10B43/27 H10B43/35 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L13	48024	(H01L23/5283 H01L23/53209 H01L23/53242 H01L23/53257 H01L23/535).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L14	116443	(H01L21/0273 H01L21/31144 H01L21/76805 H01L21/76816 H01L21/76895).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:01 PM
L15	2	("9373540" "20110031630").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 01:16 PM
L18	6492	(H01L23/52-5389).cpc. AND (H10B41/40-50 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/08/24 01:32 PM

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			IBM_TDB)				
L19	7897	H10B$.cpc. AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:32 PM
L20	2086	L18 AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:32 PM
L21	757	L20 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:35 PM
L22	4101	(H01L23/528 H01L23/5283).cpc. AND (H10B41/20 H10B41/40-50 H10B43/20 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:54 PM
L23	2079	L22 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:55 PM
L24	1779	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:56 PM
L37	3	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 05:02 PM

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L38	1779	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 05:02 PM
L39	35	(Artificial Intelligence) More like doc: US-20150179564-A1 Text: (US-9331082-B2 OR US-20160218107-A1 OR US-9640542-B2 OR KR-20150073251-A OR CN-104733462-A OR US-10411029-B2 OR CN-104733462-B OR US-20180277558-A1 OR US-20160027730-A1 OR US-20160111433-A1 OR CN-109411478-A OR US-9524903-B2 OR US-9524975-B2 OR TW-I748002-B OR US-10014313-B1 OR US-9263368-B2 OR US-20220173121-A1 OR US-10283518-B2 OR KR-101533521-B1 OR US-20220173122-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:22 PM
L40	10	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:47 PM
L43	7430	(H10B43/50 OR H10B43/27 OR H10B41/27 OR H10B41/50 OR H10B43/35 OR H10B43/10 OR H10B43/20 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/08/24 06:49 PM

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IPR2025-00229

		H10B43/30 OR H10B69/00 OR H10B99/00).cpc. AND (H01L23/528 OR H01L23/5226 OR H01L23/5283).cpc.	IBM_TDB)				
L45	7100	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:51 PM
L46	2476	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3) AND ((land$3 contact electrode) near4 pad)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:51 PM
L47	1038	L46 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:52 PM
L48	12	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1 OR US-20180053686-A1 OR US-20160172296-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:57 PM
L49	1	"20160218107".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 06:58 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Micron v. YMTC
IPR2025-00229

Receipt date: 07/05/2022

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	17/447,456
Filing Date	September 13, 2021
First Named Inventor	Zhenyu Lu
Art Unit	To Be Assigned
Examiner Name	To Be Assigned
Attorney Docket Number	4123.0460004

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
	US1	US- 2014/0057429 A1	02-27-2014	Oh et al.	
	US2	US- 2017/0148805 A1	05-25-2017	Nishikawa et al.	
		US-			
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FOREIGN PATENT DOCUMENTS

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Examiner Signature	/SCOTT B GEYER/	Date Considered	08/24/2023

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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. /S.B.G/

Bibliographic Data

Application No: 17/447,456

Foreign Priority claimed: (●) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /SCOTT B GEYER/ [ ]

Examiner's Signature | Initials

Title: STAIRCASE STRUCTURE FOR MEMORY DEVICE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/13/2021	257	2812	
RULE			

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/SBG/

CONTINUING DATA

This application is a CON of 16885858 05/28/2020 PAT 11145666

16885858 is a CON of 16126956 09/10/2018 PAT 10680003

16126956 is a CON of PCT/CN2018/098962 08/06/2018

FOREIGN APPLICATIONS

CHINA CN201710750398.4 08/28/2017

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09/23/2021

STATE OR COUNTRY

CHINA

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FILING FEE RECEIVED

$1,820

Receipt date: 09/13/2021

Equivalent of Form PTO/SB/08a (07-09)

Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	*To Be Assigned*
				Filing Date	*Herewith*
				First Named Inventor	Zhenyu LU
				Art Unit	*To Be Assigned*
				Examiner Name	*To Be Assigned*
Sheet	1	of	2	Attorney Docket Number	4123.0460004

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
	US1	2015/0255385 A1	09-10-2015	Lee et al.	
	US2	2019/0081070 A1	03-14-2019	Lu et al.	
	US3	9,419,013 B1	08-16-2016	Lee et al.	
	US4	9,741,563 B2	08-22-2017	Xiang et al.	
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	US6	10,403,641 B2	09-03-2019	Kim et al.	
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	US10	9,343,452 B2	05-17-2016	Yun et al.	
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	US12	9,006,884 B2	04-14-2015	Lee et al.	
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	US17	2013/0056818 A1	03-07-2013	Iino et al.	
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	US19	2013/0043509 A1	02-21-2013	Cho et al.	
	US20	2018/0301460 A1	10-18-2018	Yoo et al.	
	US21	2019/0006385 A1	01-03-2019	Kim et al.	
	US22	2018/0166380 A1	06-14-2018	~~Pare et al.~~ Park et al.	
	US23	2019/0280001 A1	09-12-2019	Terasawa et al.	
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	US25	9,941,153 B1	04-10-2018	Yang	
	US26	9,520,402 B1	12-13-2016	Haller et al.	
	US27	9,711,603 B2	07-18-2017	Lim et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.B.G/

Examiner Signature	/SCOTT B GEYER/	Date Considered	08/24/2023

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				Filing Date	*Herewith*
				First Named Inventor	Zhenyu LU
				Art Unit	*To Be Assigned*
				Examiner Name	*To Be Assigned*
Sheet	2	of	2	Attorney Docket Number	4123.0460004

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]
	FP1	CN 106601746 A	04-26-2017	Samsung Electronics Co Ltd		
	FP2	CN 107644876 A	01-30-2018	Yangtze Memory Tech Co Ltd		
	FP3	KR 20110015338 A	02-15-2011	Hynix Semiconductor Inc.		

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Examiner Signature	/SCOTT B GEYER/	Date Considered	08/24/2023

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Receipt date: 09/13/2021

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Substitute for form 1449/PTO				*Complete if Known*	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT *(Use as many sheets as necessary)*				Application Number	*To Be Assigned*
				Filing Date	*Herewith*
				First Named Inventor	Zhenyu LU
				Art Unit	*To Be Assigned*
				Examiner Name	*To Be Assigned*
Sheet	1	of	1	Attorney Docket Number	4123.0460004

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]
	NPL1	International Search Report and Written Opinion of the International Searching Authority directed to related International Patent Application No. PCT/CN2018/098962, mailed November 7, 2018; 8 pages.	
	NPL2		
	NPL3		
	NPL4		
	NPL5		
	NPL6		
	NPL7		
	NPL8		
	NPL9		

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Examiner Signature	/SCOTT B GEYER/	Date Considered	08/24/2023

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UNITED STATES PATENT AND TRADEMARK OFFICE

USPTO Automated Interview Request (AIR)

Nov 6 2023

This paper requesting to schedule and/or conduct an interview is appropriate because:

This submission is requested to be accepted as an authorization for this interview to communicate via the internet. Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned concerning scheduling of the interview via video conference, instant messaging, or electronic mail, and to conduct the interview in accordance with office practice including video conferencing.

Name(s):
Feng Qian

S-signature:
/Feng Qian/

Registration Number:
74942

U.S. Application Number:
17447456

Confirmation Number:
5572

E-mail Address:
RQian@sternekessler.com

Phone Number:
+1 2027728511

Proposed Time of Interview:
11-13-2023 2:00 PM ET

Alternative Proposed Time(s) of Interview:
11-14-2023 2:00 PM ET

Alternative Proposed Time(s) of Interview:
11-15-2023 2:00 PM ET

Prefered Interview Type:
Telephonic

I am the applicant or applicant's representative for this application.

Topic for Discussion:

Micron Ex. 1002, p. 175
Micron v. YMTC
IPR2025-00229

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

26111 7590 11/16/2023

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

EXAMINER	
GEYER, SCOTT B	

ART UNIT	PAPER NUMBER
2812	

NOTIFICATION DATE	DELIVERY MODE
11/16/2023	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):

e-office@sternekessler.com

Micron Ex. 1002, p. 176
Micron v. YMTC
IPR2025-00229

Applicant-Initiated Interview Summary	**Application No.** 17/447,456	**Applicant(s)** Lu et al.		
	Examiner Scott B Geyer	**Art Unit** 2812	**AIA (First Inventor to File) Status** Yes	**Page** 1 of 1

All Participants (applicant, applicants representative, PTO personnel)	**Title**	**Type**
Scott B Geyer	Primary Examiner	Telephonic
Feng (Rachel) Qian	Agent	

Date of Interview: 13 November 2023

Issues Discussed:

35 U.S.C. 102

The examiner and the applicant's representative discussed possible claim amendments; examiner agreed that cited prior art (Lee et al., US 2016/0218107) would not read on language regarding 'curved' structural feature. Further search and/or consideration would be necessary, depending on officially submitted amendments to any claims.

☑ Attachment

/SCOTT B GEYER/ Primary Examiner, Art Unit 2812	

Applicant is reminded that a complete written statement as to the substance of the interview must be made of record in the application file. It is the applicants responsibility to provide the written statement, unless the interview was initiated by the Examiner and the Examiner has indicated that a written summary will be provided. See MPEP 713.04
Please further see:
MPEP 713.04
Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews, paragraph (b)
37 CFR § 1.2 Business to be transacted in writing

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.

Micron Ex. 1002, p. 177
Micron v. YMTC
IPR2025-00229

Unofficial Communication, Not To Be Entered into the Formal Record

Proposed Agenda for Examiner Telephonic Interview
Date – November 13, 2023 2PM – 2:30PM (EDT)
U.S. Appl. No. 17/447,456
SKGF Ref. No. 4123.0460004

Participants:

For PTO: Examiner Scott B Geyer (Tel: (571)272-1958)
For Applicant: Feng Qian (Reg. #74,942)

Dear Examiner,

We appreciate the opportunity to discuss the Office Action dated August 29, 2023. In particular, we would like to discuss the outstanding 102 rejections and new claims, and any suggestions you might be able to provide that might advance the prosecution of this application.

In particular, we would like to discuss the new claims 21-28:

21. (New) A memory device, comprising:

a substrate;

a staircase structure disposed over the substrate, wherein the staircase structure comprising:

a conductive layer comprising a first portion and a second portion; and

an insulating layer disposed over the first portion of the conductive layer, wherein the second portion of the conductive layer comprises a curved side surface in contact with a side surface of the insulating layer.

22. (New) The memory device of claim 21, wherein the curved side surface comprises a convex side surface.

23. (New) The memory device of claim 21, wherein an upper portion of the curved side surface is separated from the side surface of the insulating layer, and wherein a lower portion of the curved side surface is in contact with the side surface of the insulating layer.

24. (New) The memory device of claim 21, wherein the conductive layer comprises: poly-crystalline silicon, tungsten, silicide, nickel, tungsten, titanium, platinum, aluminum, titanium nitride, tantalum nitride, or tungsten nitride.

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25. (New) The memory device of claim 21, wherein the second portion of the conductive layer comprises a first side surface laterally displaced from the side surface of the insulating layer, and wherein the first portion of the conductive layer comprises a second side surface.

26. (New) The memory device of claim 25, wherein a lateral distance between the first side surface and the second side surface is between 10nm and 300nm.

27. (New) The memory device of claim 21, wherein a length of the second portion of the conductive layer is between 100nm and 1500nm.

28. (New) The memory device of claim 21, further comprising:

a dielectric layer disposed over the staircase structure, wherein the insulating layer comprises a first dielectric material and the dielectric layer comprises a second dielectric material, wherein the first dielectric material is substantially the same as the second dielectric material, and wherein the first dielectric material comprises silicon oxide.

U.S. Patent Application Publication No. 2016/0218107 to Lee et al. ("Lee") does not teach or suggest the claimed "a staircase structure disposed over the substrate, wherein the staircase structure comprising: a conductive layer comprising a first portion and a second portion; and an insulating layer disposed over the first portion of the conductive layer, wherein the second portion of the conductive layer comprises a curved side surface in contact with a side surface of the insulating layer." as recited in new claim 21.

We look forward to our interview to discuss this and any other minor issues further. Please contact the following if you have any questions or comments:

Feng (Rachel) Qian: RQian@sternekessler.com - 202.772.8511

Thank you,

Feng (Rachel)

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
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 17/447,456	Filing Date 09/13/2021	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)			
FOR	NUMBER FILED	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 $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ 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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	11/29/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ 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.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/JAMES T WASHINGTON/
*** 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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APPROVAL LETTER

APPLICATION #	FILING DATE	APPLICANT/PATENT UNDER REEXAMINATION
17/447,456	09/13/2021	Zhenyu Lu

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Electronic terminal disclaimer filed on 11/29/2023

☑ Approved

This patent is subject to a Terminal Disclaimer

Approved / Disapproved by: Electronic Terminal Disclaimer automatically approved

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**11/29/2023 04:26:57 PM Z ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Delain Crooks
PATENT CENTER #	63418208	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Donald Featherstone

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
petition-request.pdf	3	Terminal Disclaimer-Filed (Electronic)	48 KB
grantLetter.pdf	1	Terminal Disclaimer-Electronic-Approved	19 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
petition-request.pdf	12175B65893B53B5E7955DDF31D9BD12A958E1E9C00F4ABB9 A98E4F69431CC958DB1B963512172CC986C230DBBDB0F9EA8

E24554DFA1DDA43E26DDFE565972A3

grantLetter.pdf

B41C119FCDB5A804137AD6A7F0903364EC216C6AEAFAD23C
11B093852339B5B9D5E24DFEADF6258C99137F000403D69AE
B4FDF6C5C1673554F7BBB05E6EE2B50

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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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TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION

APPLICATION #	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET #
17447456	09/13/2021	Zhenyu Lu	4123.0460004

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

☑ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☑ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent interest
YANGTZE MEMORY TECHNOLOGIES CO., LTD.	100%
Total	100%

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Number(s)

Application #	Filing Date

as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the

instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that any such patent granted on the pending reference application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

Patent #
11145666

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

✔ Terminal disclaimer fee under 37 CFR 1.20(d) included with Electronic Terminal Disclaimer request.

Applicant claims the following entity status:
Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statemnts made 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 so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I certify, in accordance with 37 CFR 1.4(d)(4) that I am: An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Signature	Name	Registration #
/Donald J. Featherstone/	Donald Featherstone	33876

* Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP 324.

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	11/29/2023 04:26:57 PM Z ET	4123.0460004

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Delain Crooks
PATENT CENTER #	63418208	AUTHORIZED BY	Donald Featherstone
CUSTOMER #	26111	FILING DATE	09/13/2021
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Zhenyu Lu

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 190036	E2023ASG27476220	Donald Featherstone

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1814	STATUTORY DISCLAIMER, INCLUDING TERMINAL DISCLAIMER	170.00	1	170.00
			TOTAL AMOUNT:	$170.00

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New Applications Under 35 U.S.C. 111

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New International Application Filed with the USPTO as a Receiving Office

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**11/29/2023 05:27:21 PM Z ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Delain Crooks
PATENT CENTER #	63425661	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Donald Featherstone

Documents

TOTAL DOCUMENTS: 4

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2023-11-29-Cover-Letter-4123-0460004.pdf		1	Transmittal Letter	189 KB
2023-11-29-Amendment-Reply-111-4123-0460004.pdf		9	-	145 KB
2023-11-29-Amendment-Reply-111-4123-0460004-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	126 KB
2023-11-29-Amendment-Reply-111-4123-0460004-CLM.pdf	(2-5)	4	Claims	82 KB

2023-11-29-Amendment-Reply-111-4123-0460004-REM.pdf	(6-9)	4	Applicant Arguments/Remarks Made in an Amendment	105 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2023-11-29-Cover-Letter-4123-0460004.pdf	D75E39206E39591BFD9ECEE33F2735F1B14861A557AD4FDF95C5B221CEEF31FEE96D82328BF03ECD9ACA94C44588257C95E1ADF4DDBB27159681EEE77CB04B85
2023-11-29-Amendment-Reply-111-4123-0460004.pdf	D9A5A31E98C5C82690605062D68B3B976B234B25F20704B938FF28B15BA1C4DFA14AFEB1F851EBBB9FB2924DF724953084E195F48E8D4E1AE4E4A2700C88782F
2023-11-29-Amendment-Reply-111-4123-0460004-A....pdf	E1347DDB3A5FC5B8FAACDF0215AEFD19E27618D6AF9C1A739D3DA239D6E126BE9B51C39FC4BBC8FFD49EE1C439D78C3E6FF6419D9C233D1784FDE4CB9DA06804
2023-11-29-Amendment-Reply-111-4123-0460004-CLM.pdf	1EC3AA1E0C5DA2191C6082B1E4CCE1A67A707C91F1262ABDE7AF1336326C93A4AE800B22BD5727444F0651F6C9D6AE6C39EFAD103381FC62A82D3678644C9D47
2023-11-29-Amendment-Reply-111-4123-0460004-REM.pdf	10913309920A68B52789735887575243EE81E8001063674377EC2788897DBDD13282A10D6BAFCF35B595AB47371E1B2F881B5D9AAC6ABFA5F68FCED06B3CBCC9

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: 5572
Applicant: Yangtze Memory Technologies Co., Ltd.	Art Unit: 2812
Application No.: 17/447,456	Examiner: GEYER, Scott B.
Filing Date: September 13, 2021	Atty. Docket No.: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

Amendment and Reply Under 37 C.F.R. § 1.111

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Mail Stop Amendment

Commissioner:

In reply to the Office Action dated **August 29, 2023**, Applicant submits the following Amendment and Remarks.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Cancelled)

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Original) A staircase structure of a memory device, comprising:

a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer.

10. (Currently Amended) The staircase structure of claim 9, further comprising a dielectric layer in contact with a bottom surface of the landing pad, the second side surface of the landing pad, and the side surface of the second portion of the ~~conductive~~ second material layer.

11. (Currently Amended) The staircase structure of claim 9, ~~wherein the second material layer comprises a first conductive material, and wherein the landing pad comprises a second conductive material different from the first conductive material.~~ wherein a lateral distance between the second side surface and the side surface of the second portion of the second material layer is between 10 nm and 300 nm.

12. (Original) The staircase structure of claim 9, wherein the landing pad comprises a conductive material.

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13. (Original) The staircase structure of claim 12, wherein the conductive material comprises tungsten, silicide, nickel, titanium, platinum, aluminum, titanium nitride, tantalum nitride, tungsten nitride, or a combination thereof.

14. (Original) The staircase structure of claim 9, wherein the second material layer is disposed over a first portion of another first material layer, and wherein a side surface of a second portion of the another first material layer is laterally displaced from the second surface of the landing pad.

15. (Currently Amended) The staircase structure of claim 9, ~~wherein a thickness of the landing pad is greater than a thickness of the first material layer.~~ wherein the second material layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

16. (Currently Amended) A memory device, comprising:

a memory string disposed over [[the]] a substrate; and

a staircase structure disposed adjacent to the memory string, wherein the staircase structure comprises:

a conductive layer comprising first and second portions;

an insulating layer disposed over the first portion of the conductive layer, wherein the insulating layer comprises a first thickness; and

a landing pad disposed on the second portion of the conductive layer and in contact with a side surface of the insulating layer, wherein the landing pad comprises a second thickness greater than the first thickness.

17. (Cancelled)

18. (Original) The memory device of claim 16, wherein the conductive layer is disposed over a first portion of another insulating layer, wherein a second portion of the another insulating layer is laterally displaced from the conductive layer.

19. (Currently Amended) The memory device of claim 16, ~~wherein a side surface of the landing pad is laterally displaced from a side surface of the second portion of the conductive layer.~~ wherein

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the conductive layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

20. (Original) The memory device of claim 19, further comprising a dielectric layer in contact with a bottom surface of the landing pad, the side surface of the landing pad, and the side surface of the second portion of the conductive layer.

21. (New) A memory device, comprising:

a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer.

22. (New) The memory device of claim 21, wherein the first side surface comprises a curved side surface.

23. (New) The memory device of claim 22, further comprising another second material layer disposed on the first material layer, wherein a first lateral distance between the first side surface and a side surface of the another second material layer is smaller than a second lateral distance between the second side surface and the side surface of the another second material layer.

24. (New) The memory device of claim 22, wherein the second side surface is laterally displaced from the first side surface, and wherein a first lateral distance between the first side surface and the first portion of the second material layer is smaller than a second lateral distance between the second side surface and the first portion of the second material layer.

25. (New) The memory device of claim 21, wherein the second material layer comprises tungsten, and titanium nitride.

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26. (New) The memory device of claim 21, wherein the second material layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

27. (New) The memory device of claim 21, wherein a lateral distance between the second side surface and the side surface of the second portion of the second material layer is between 10 nm and 300 nm.

28. (New) The memory device of claim 21, further comprising:

a dielectric layer disposed over the first material layer and the landing pad, wherein the first material layer comprises a first dielectric material and the dielectric layer comprises a second dielectric material, wherein the first dielectric material is substantially the same as the second dielectric material, and wherein the first dielectric material comprises silicon oxide.

29. (New) The memory device of claim 21, wherein the second material layer is disposed over a first portion of another first material layer, and wherein a side surface of a second portion of the another first material layer is laterally displaced from the second surface of the landing pad.

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Remarks

Reconsideration of this Application is respectfully requested.

Upon entry of the foregoing amendment, claims 9-16, 18-29 are pending in the application, with claims 9, 16 and 21 being the independent claims. Claims 10, 11, 15, 16 and 19 are sought to be amended. Claims 1-5, 7-8 and 17 are sought to be canceled without prejudice to or disclaimer of the subject matter therein. New claims 21-29 are sought to be added. These changes are believed to introduce no new matter, since they are supported by at least by paragraphs [0051]-[0069] and FIGs. 7-9 of the Published Specification (See US2023/0084008A1), and their entry is respectfully requested.

Based on the above amendment and the following remarks, Applicant respectfully requests that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Statement of the Substance of the Interview

Pursuant to 37 C.F.R. § 1.133(b), Applicant provides the following Statement of Substance of the Interview. Applicant expresses appreciation to Examiner Scott B. Geyer for the courtesy of a telephonic interview with Applicant's representative Feng Qian (Reg. No. 74,942) on November 13, 2023 ("Interview").

During the Interview, the parties discussed the outstanding Office Action and proposed new claims. The Examiner agreed that the new claim 22 presented above overcomes the rejections under 35 U.S.C. § 102 but that further search and consideration would be required.

Claim Objections

The claims are objected to because of the following informality: "The claim set submitted on September 13, 2021 skipped claim number 6, which violates 37 CFR 1.75 (f): If there are several claims, they shall be numbered consecutively in Arabic numerals." Applicant respectfully traverses.

Without acquiescing to the propriety of the objections and solely to expedite the prosecution, claims 1-5 and 7-8 are canceled without prejudice to or disclaimer of the subject matter therein. Accordingly, Applicant respectfully requests that the objections be withdrawn.

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Rejections under 35 U.S.C. § 112

Claims 5, 10, and 16 are rejected under 35 U.S.C. § 112(b) or 35 U.S.C. § 112 (pre-AIA), second paragraph, as allegedly being indefinite. Applicant respectfully traverses.

Without acquiescing to the propriety of the rejections and solely to expedite the prosecution, claims 10 and 16 are amended. Claim 5 is canceled without prejudice to or disclaimer of the subject matter therein. Accordingly, Applicant respectfully requests that the rejections be withdrawn.

Double Patenting Rejection

Claims 1-4, 7, 9, 12, and 14 are rejected on the grounds of non-statutory obviousness type double patenting as allegedly being unpatentable over claims 1-4 and 6 of U.S. Patent No. 11,145,666.

Without acquiescing to the propriety of the rejections and solely to expedite the prosecution, claims 1-4 and 7 are canceled without prejudice to or disclaimer of the subject matter therein, thus rendering their rejection moot.

While not conceding the basis for the rejection and solely to expedite prosecution, Applicant submits a Terminal Disclaimer concurrently herewith to overcome the double patenting rejection with respect to the claims 9, 12, and 14 presented above. The filing of this Terminal Disclaimer is not an admission of the propriety of the rejection. *Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991). Thus, Applicant respectfully requests favorable reconsideration of the nonstatutory double patenting rejection.

Allowable Subject Matter

Applicant thanks the Examiner for indicating that claims 10-11, 13, 15, and 17-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Based on the remarks above, Applicant believes the independent claims 9 and 16, as well as all of the dependent claims, are now allowable.

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Rejections under 35 U.S.C. § 102

Claims 1, 3-5, and 7-8 are rejected under 35 U.S.C. § 102(a)(1) as allegedly being anticipated by U.S. Patent Application Publication No. 2016/0218107 to Lee et al. ("Lee"). Reconsideration and withdrawal of these rejections are respectfully requested.

Without acquiescing to the propriety of the rejections and solely to expedite the prosecution, claims 1, 3-5, and 7-8 are canceled without prejudice to or disclaimer of the subject matter therein, thus rendering their rejection moot. Applicant respectfully requests favorable reconsideration and that the application be passed to allowance.

New claims 21-29

Without acquiescing to the propriety of the rejections and reserving the right to argue additional or different distinguishing features in the future, new claims 21-29 have been added.

Without acquiescing to the propriety of the rejections and reserving the right to argue additional or different distinguishing features in the future, independent claim 21 has been added to clarify its distinguishing features by adding the features of claim 9. Independent claim 21 now recites, inter alia: "a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer." Based on the remarks above, Applicant believes the independent claims 9 as well as all of the dependent claims, are now allowable. In addition, the Examiner indicated in the November 13, 2023 Interview that new claim 22 overcomes the applied reference.

Accordingly, claim 21 should be found allowable. Also, claims 22-29 depend from claim 21, and are allowable for the reasons stated above, as well as for their additional distinguishing features. Applicant respectfully requests favorable reconsideration and that the application be passed to allowance.

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Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

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November 29, 2023

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 5572
Art Unit: 2812
Attn: Mail Stop Amendment

Re: U.S. Utility Patent Application
Appl. No. 17/447,456; Filing Date: September 13, 2021
For: **Staircase Structure For Memory Device**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

Transmitted herewith for appropriate action are the following documents:

1. Online Credit Card Payment Authorization in the amount of $170.00 to cover the Terminal Disclaimer fee;

2. Terminal Disclaimer To Obviate A Double Patenting Rejection Over A "Prior" Patent; and

3. Amendment and Reply Under 37 C.F.R. § 1.111.

The above-listed documents are filed electronically. Fee payment is provided through online credit card payment. The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

DJF/R-Q:dxc
Enclosure(s)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

26111 7590 12/07/2023

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
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EXAMINER	
GEYER, SCOTT B	

ART UNIT	PAPER NUMBER
2812	

NOTIFICATION DATE	DELIVERY MODE
12/07/2023	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):

e-office@sternekessler.com

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Office Action Summary	Application No. 17/447,456	Applicant(s) Lu et al.	
	Examiner Scott B Geyer	Art Unit 2812	AIA (FITF) Status Yes

-- 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 29 November 2023.

☐ 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) 9-16 and 18-29 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☑ Claim(s) 9-16 and 18-20 is/are allowed.

7) ☑ Claim(s) 21 and 25 is/are rejected.

8) ☑ Claim(s) 22-24 and 26-29 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 13 September 2021 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: _____.

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DETAILED ACTION

Terminal Disclaimer

The terminal disclaimer filed on November 29, 2023 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. patent 11,145,666 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The filing of a terminal disclaimer by itself is not a complete reply to a nonstatutory double patenting (NSDP) rejection. A complete reply requires that the terminal disclaimer be accompanied by a reply requesting reconsideration of the prior Office action. Even where the NSDP rejection is provisional the reply must be complete. See MPEP § 804, subsection I.B.1. For a reply to a non-final Office action, see 37 CFR 1.111(a). For a reply to final Office action, see 37 CFR 1.113(c). A request for reconsideration while not provided for in 37 CFR 1.113(c) may be filed after final for consideration. See MPEP §§ 706.07(e) and 714.13.

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The actual filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal

Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/apply/applying-online/eterminal-disclaimer.

Claims 21 and 25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1, 3, and 6 of U.S. Patent No. 10,680,003. Although the claims at issue are not identical, they are not patentably distinct from each other because all of the limitations of claims 21 and 25 of the instant application are recited within claims 1, 3, and 6 of the '003 patent.

Specifically, for claim 21 of the instant application, see claims 1 and 3 of the '003 patent.

For claim 25 of the instant application, see claim 6 of the '003 patent.

Allowable Subject Matter

Claims 9-16 and 18-20 are allowable.

The following is an examiner's statement of reasons for allowability.

The applicant has filed a terminal disclaimer to overcome the rejection of claims under double patenting from the previous office action; the applicant has amended claim 16 to overcome the rejection under 35 USC 112(b) from the previous office action.

Claims 22 and 26-29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the

limitations of the base claim and any intervening claims. (Claims 23 and 24 are also objected to as being dependent upon an objected claim.)

Response to Arguments

Applicant's arguments with respect to the newly added claims (21-29) have been considered but are moot because the new ground of rejection does not rely on any reference applied in the prior rejection of record for any teaching or matter specifically challenged in the argument.

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.

Cited Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: see the attached form PTO-892 for pertinent cited art.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott B. Geyer (telephone: 571-272-1958). The examiner can normally be reached on Monday to Friday, 10AM - 4PM. 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, Charles D Garber (telephone: 571-272-2194). 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 U.S.A. or Canada) or 571-272-1000.

/SCOTT B GEYER/
Primary Examiner, Art Unit 2812

Notice of References Cited	Application/Control No. 17/447,456	Applicant(s)/Patent Under Reexamination Lu et al.	
	Examiner Scott B Geyer	Art Unit 2812	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Name	CPC Classification	US Classification
*	A	US-10680003-B2	2020-06-09	Lu; Zhenyu	H01L21/76895	1/1
*	B	US-20160276262-A1	2016-09-22	ISHIMURA; Munio	H01L21/76805	1/1
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Country	Name	CPC Classification
*	N	WO-2017034709-A1	2017-03-02	WO	HALLER G A	H01L23/528
*	O	CN-104810373-A	2015-07-29	CN	KIM J	B21B45/0275
	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 YYYY-MM-DD format are publication dates. Classifications may be US or foreign.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/447,456	Lu et al.
	Examiner	Art Unit
	Scott B Geyer	2812

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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
Parent Applications (16/126,956; 16/885,858) - references checked	08/24/2023	SBG
Text/Intersection searches: H01L23/528, H01L23/5283, H10B41/20, H10B41/40-50, H10B43/20, H10B43/40, H10B43/50	08/24/2023	SBG
PE2E-Search, details attached	08/24/2023	SBG
PE2E-Search updated, details attached	12/02/2023	SBG

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	("11145666" "10680003").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/23 05:52 PM
L2	718	((Yangtze WITH Memory).as. (Zhenyu WITH Lu).in. (Jun WITH Chen).in. (Xiaowang WITH Dai).in. (Jifeng WITH Zhu).in. (Qian WITH Tao).in. (Yu WITH Ru WITH Huang).in. (Si WITH Ping WITH Hu).in. (Lan WITH Yao).in. (Li WITH Hong WITH Xiao).in. (A WITH Man WITH Zheng).in. (Kun WITH Bao).in. (Haohao WITH Yang).in.) AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step) WITH memory)	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 11:34 AM
L4	16	("9006884" | "9331082" | "9343452" | "9373540" | "9419013" | "9478487" | "9741563" | "10002880" | "10403641" | "20110031630" | "20130270714" | "20150255385" | "20150255386" | "20170084532" | "20190081070").pn. OR ("10680003").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:36 AM
L5	27	("9006884" | "9331082" | "9343452" | "9373540" | "9419013" | "9478487" | "9520402" | "9711603" | "9741563" | "9941153" | "10002880" | "10395982" | "10403641" | "20110031630" | "20130043509" | "20130056818" | "20130270714" | "20150255385" | "20150255386" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:36 AM

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		"20170084532" | "20170271256" | "20180130701" | "20180166380" | "20180301460" | "20190006385" | "20190081070" | "20190280001").pn. OR ("11145666").urpn. AND (PGPB | USPT | USOC).dbnm.					
L6	27	(Artificial Intelligence) More like doc: US-10680003-B2 Text: (US-11145666-B2 OR US-20200295019-A1 OR US-20190081070-A1 OR US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR TW-201913972-A OR US-20200251381-A1 OR CN-113241350-A OR US-20200051983-A1 OR TW-I721303-B OR US-10896844-B2 OR US-11545388-B2 OR US-20210265203-A1 OR US-20210098288-A1 OR US-11361988-B2 OR US-20230102588-A1 OR CN-113241350-B OR CN-114207823-A OR WO-2020154997-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 11:36 AM
L7	25	(Artificial Intelligence) More like doc: US-11145666-B2 Text: (US-20200295019-A1 OR US-10680003-B2 OR US-20190081070-A1 OR US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR TW-201913972-A OR US-20200051983-A1 OR CN-113241350-A OR TW-I721303-B OR US-20200251381-A1 OR US-11114439-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 11:37 AM

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		CN-110121777-A OR US-11545388-B2 OR US-20210265203-A1 OR US-10896844-B2 OR CN-113241350-B OR US-20210098288-A1 OR US-11361988-B2 OR US-20230102588-A1).did.					
L8	41	(Artificial Intelligence) Similar to: 17/447,456 with 0 CPC Selections and 0 Text Selections Text: (US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR CN-113241350-B OR CN-113241350-A OR TW-201913972-A OR TW-I721303-B OR CN-110121777-A OR CN-107644876-B OR CN-110556383-A OR US-20190081070-A1 OR CN-107919361-A OR US-10727115-B2 OR TW-202137513-A OR CN-110098191-A OR CN-109309095-B OR US-10615124-B2 OR CN-109309095-A OR US-10396035-B2 OR JP-2022508779-A OR TW-I679750-B OR US-20190035733-A1 OR TW-202017150-A OR CN-111293119-B OR TW-I622132-B OR EP-3306664-A1 OR TW-201814839-A OR CN-109326606-A OR JP-2020198387-A OR CN-107017262-A OR US-20200194456-A1 OR TW-I739331-B OR TW-202046322-A OR CN-110634873-A OR CN-112038353-A OR CN-111326498-A OR KR-20200073455-A OR CN-114207821-A OR WO-2021030820-A1 OR TW-202121666-A OR CN-110323226-A	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2023/08/24 11:37 AM

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		OR EP-3827460-A1 OR US-10714492-B2 OR US-20230200064-A1 OR CN-114725064-A OR TW-I758789-B OR JP-7246500-B2 OR CN-111293119-A OR US-20230180477-A1 OR US-20210296346-A1).did.					
L9	28	L4 OR L5	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:38 AM
L10	2	("20140057429" "20170148805").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 11:40 AM
L11	24325	(H10B41/20 H10B41/35 H10B41/41).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L12	36494	(H10B43/20 H10B43/27 H10B43/35 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L13	48024	(H01L23/5283 H01L23/53209 H01L23/53242 H01L23/53257 H01L23/535).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L14	116443	(H01L21/0273 H01L21/31144 H01L21/76805 H01L21/76816 H01L21/76895).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:01 PM
L15	2	("9373540" "20110031630").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 01:16 PM
L18	6492	(H01L23/52-5389).cpc. AND (H10B41/40-50 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/08/24 01:32 PM

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			IBM_TDB)				
L19	7897	H10B$.cpc. AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:32 PM
L20	2086	L18 AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:32 PM
L21	757	L20 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:35 PM
L22	4101	(H01L23/528 H01L23/5283).cpc. AND (H10B41/20 H10B41/40-50 H10B43/20 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:54 PM
L23	2079	L22 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:55 PM
L24	1779	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:56 PM
L37	3	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 05:02 PM

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L38	1779	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 05:02 PM
L39	35	(Artificial Intelligence) More like doc: US-20150179564-A1 Text: (US-9331082-B2 OR US-20160218107-A1 OR US-9640542-B2 OR KR-20150073251-A OR CN-104733462-A OR US-10411029-B2 OR CN-104733462-B OR US-20180277558-A1 OR US-20160027730-A1 OR US-20160111433-A1 OR CN-109411478-A OR US-9524903-B2 OR US-9524975-B2 OR TW-I748002-B OR US-10014313-B1 OR US-9263368-B2 OR US-20220173121-A1 OR US-10283518-B2 OR KR-101533521-B1 OR US-20220173122-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:22 PM
L40	10	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:47 PM
L43	7430	(H10B43/50 OR H10B43/27 OR H10B41/27 OR H10B41/50 OR H10B43/35 OR H10B43/10 OR H10B43/20 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/08/24 06:49 PM

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		H10B43/30 OR H10B69/00 OR H10B99/00).cpc. AND (H01L23/528 OR H01L23/5226 OR H01L23/5283).cpc.	IBM_TDB)				
L45	7100	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:51 PM
L46	2476	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3) AND ((land$3 contact electrode) near4 pad)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:51 PM
L47	1038	L46 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:52 PM
L48	12	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1 OR US-20180053686-A1 OR US-20160172296-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:57 PM
L49	1	"20160218107".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 06:58 PM
L59	26562	(H10B41/20 H10B41/35 H10B41/41).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2023/12/02 10:13 AM

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			GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L60	40233	(H10B43/20 H10B43/27 H10B43/35 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L61	49781	(H01L23/5283 H01L23/53209 H01L23/53242 H01L23/53257 H01L23/535).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L62	118396	(H01L21/0273 H01L21/31144 H01L21/76805 H01L21/76816 H01L21/76895).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L64	7198	(H01L23/52-5389).cpc. AND (H10B41/40-50 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L65	8473	H10B$.cpc. AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L66	2238	L18 AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L67	771	L20 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2023/12/02 10:13 AM

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			DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L68	4538	(H01L23/528 H01L23/5283).cpc. AND (H10B41/20 H10B41/40-50 H10B43/20 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L69	2196	L22 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L70	1825	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L71	940	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L72	1825	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L75	8266	(H10B43/50 OR H10B43/27 OR H10B41/27 OR H10B41/50 OR H10B43/35 OR H10B43/10 OR H10B43/20 OR H10B43/30 OR H10B69/00 OR H10B99/00).cpc. AND (H01L23/528 OR H01L23/5226 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM

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		H01L23/5283).cpc.					
L76	7689	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L77	2661	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3) AND ((land$3 contact electrode) near4 pad)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L78	1071	L46 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L81	12	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1 OR US-20180053686-A1 OR US-20160172296-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:14 AM
L82	5	((US-20160276262-A1).did. AND PGPB.dbnm.) OR ((WO-2017034709-A1 OR CN-104810373-A OR KR-20170079309-A OR KR-20170107195-A).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:49 AM
L83	4	"10680003"	(USPAT)	OR	ON	ON	2023/12/02 12:16 PM

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IPR2025-00229

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Micron v. YMTC
IPR2025-00229

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 17/447,456	Filing Date 09/13/2021	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)			
FOR	NUMBER FILED	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 $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $480 =	
☐ 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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	01/05/2024	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	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

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ 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.	Program Support Specialist
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/CRYSTAL QUEEN/
*** 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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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**01/05/2024 01:02:40 PM Z ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Delain Crooks
PATENT CENTER #	63839962	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Donald Featherstone

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
petition-request.pdf	3	Terminal Disclaimer-Filed (Electronic)	48 KB
grantLetter.pdf	1	Terminal Disclaimer-Electronic-Approved	19 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
petition-request.pdf	D758EABF786123DE97E9AA0F53386A1FB97872690FAFB0E7A BAB2C6A3C6FD3AC360BD297C93F7BD4FA508E679F70E8BC9

CDE2801AF059E9B8F8C2068E2E28540

grantLetter.pdf

7F8255EF8DCCCF0C87FDD42CD0485C593DCEB77C32E8ECF
410FEB37C868C215C435F7A79E88A129B6CC5C3F5E10015D6
A95BAE977D6A4376EDD915F5C85CC2A2

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 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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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	01/05/2024 01:02:40 PM Z ET	4123.0460004

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
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PATENT CENTER #	63839962	AUTHORIZED BY	Donald Featherstone
CUSTOMER #	26111	FILING DATE	09/13/2021
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Zhenyu Lu

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 190036	E202415D03115986	Donald Featherstone

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1814	STATUTORY DISCLAIMER, INCLUDING TERMINAL DISCLAIMER	170.00	1	170.00
			TOTAL AMOUNT:	$170.00

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.

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New International Application Filed with the USPTO as a Receiving Office

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APPROVAL LETTER

APPLICATION #	FILING DATE	APPLICANT/PATENT UNDER REEXAMINATION
17/447,456	09/13/2021	Zhenyu Lu

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Electronic terminal disclaimer filed on 01/05/2024

☑ Approved

This patent is subject to a Terminal Disclaimer

Approved / Disapproved by: Electronic Terminal Disclaimer automatically approved

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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT

APPLICATION #	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET #
17447456	09/13/2021	Zhenyu Lu	4123.0460004

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

☑ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☑ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent interest
YANGTZE MEMORY TECHNOLOGIES CO., LTD.	100%
Total	100%

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Number(s)

Application #	Filing Date

as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the

instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that any such patent granted on the pending reference application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

Patent #
10680003

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.



Terminal disclaimer fee under 37 CFR 1.20(d) included with Electronic Terminal Disclaimer request.

Applicant claims the following entity status:
Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statemnts made 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 so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I certify, in accordance with 37 CFR 1.4(d)(4) that I am: An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Signature	Name	Registration #
/Donald J. Featherstone/	Donald Featherstone	33876

* Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP 324.

Amendment Under 37 C.F.R. § 1.116
Expedited Procedure – Art Unit 2812

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: 5572
Applicant: YANGTZE MEMORY TECHNOLOGIES CO., LTD.	Art Unit: 2812
Application No.: 17/447,456	Examiner: GEYER, Scott B.
Filed: September 13, 2021	Atty. Docket No.: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

Reply Under 37 C.F.R. § 1.116

Mail Stop AF

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

In reply to the Office Action dated December 7, 2023, Applicant submits the following Amendment and Remarks.

Listing of the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks and Arguments begin on page 6 of this paper.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims, or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

Listing of the Claims

1. (Cancelled)

2. (Cancelled)

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Original) A staircase structure of a memory device, comprising:

a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer.

10. (Previously Presented) The staircase structure of claim 9, further comprising a dielectric layer in contact with a bottom surface of the landing pad, the second side surface of the landing pad, and the side surface of the second portion of the conductive second material layer.

11. (Previously Presented) The staircase structure of claim 9, wherein a lateral distance between the second side surface and the side surface of the second portion of the second material layer is between 10 nm and 300 nm.

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12. (Original) The staircase structure of claim 9, wherein the landing pad comprises a conductive material.

13. (Original) The staircase structure of claim 12, wherein the conductive material comprises tungsten, silicide, nickel, titanium, platinum, aluminum, titanium nitride, tantalum nitride, tungsten nitride, or a combination thereof.

14. (Original) The staircase structure of claim 9, wherein the second material layer is disposed over a first portion of another first material layer, and wherein a side surface of a second portion of the another first material layer is laterally displaced from the second surface of the landing pad.

15. (Previously Presented) The staircase structure of claim 9, wherein the second material layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

16. (Previously Presented) A memory device, comprising:

a memory string disposed over a substrate; and

a staircase structure disposed adjacent to the memory string, wherein the staircase structure comprises:

a conductive layer comprising first and second portions;

an insulating layer disposed over the first portion of the conductive layer, wherein the insulating layer comprises a first thickness; and

a landing pad disposed on the second portion of the conductive layer and in contact with a side surface of the insulating layer, wherein the landing pad comprises a second thickness greater than the first thickness.

17. (Cancelled)

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18. (Original) The memory device of claim 16, wherein the conductive layer is disposed over a first portion of another insulating layer, wherein a second portion of the another insulating layer is laterally displaced from the conductive layer.

19. (Previously Presented) The memory device of claim 16, wherein the conductive layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

20. (Original) The memory device of claim 19, further comprising a dielectric layer in contact with a bottom surface of the landing pad, the side surface of the landing pad, and the side surface of the second portion of the conductive layer.

21. (Previously Presented) A memory device, comprising:

a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer.

22. (Previously Presented) The memory device of claim 21, wherein the first side surface comprises a curved side surface.

23. (Previously Presented) The memory device of claim 22, further comprising another second material layer disposed on the first material layer, wherein a first lateral distance between the first side surface and a side surface of the another second material layer is smaller than a second lateral distance between the second side surface and the side surface of the another second material layer.

24. (Previously Presented) The memory device of claim 22, wherein the second side surface is laterally displaced from the first side surface, and wherein a first lateral distance between the first

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side surface and the first portion of the second material layer is smaller than a second lateral distance between the second side surface and the first portion of the second material layer.

25. (Previously Presented) The memory device of claim 21, wherein the second material layer comprises tungsten, and titanium nitride.

26. (Previously Presented) The memory device of claim 21, wherein the second material layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

27. (Previously Presented) The memory device of claim 21, wherein a lateral distance between the second side surface and the side surface of the second portion of the second material layer is between 10 nm and 300 nm.

28. (Previously Presented) The memory device of claim 21, further comprising:

a dielectric layer disposed over the first material layer and the landing pad, wherein the first material layer comprises a first dielectric material and the dielectric layer comprises a second dielectric material, wherein the first dielectric material is substantially the same as the second dielectric material, and wherein the first dielectric material comprises silicon oxide.

29. (Previously Presented) The memory device of claim 21, wherein the second material layer is disposed over a first portion of another first material layer, and wherein a side surface of a second portion of the another first material layer is laterally displaced from the second surface of the landing pad.

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Remarks

Applicant respectfully requests these amendments be entered after final rejection as they either fail to require additional search or consideration, place the claims in conditions for allowance, or place the claims in better form for appeal. Additionally, Applicant respectfully submits that any additional search and/or consideration should be able to be completed within the time granted under the After Final Consideration Pilot Program 2.0 (AFCP 2.0), a request for which is submitted herewith. If the Office determines that this amendment does not place the application in condition for allowance, Applicant requests that the Office contact Applicant's representative and request an interview, as set forth by AFCP 2.0. Reconsideration of this Application is respectfully requested.

Claims 9-16 and 18-29 are pending in the application, with claims 9, 16, and 21 being the independent claims. No claim is amended. Claims 1-8 and 17 were previously canceled without prejudice of disclaimer to the subject matter therein. Based on the following remarks, Applicant respectfully requests that the Examiner reconsider all outstanding objections and rejections and that they be withdrawn.

Double Patenting

Claims 21 and 25 are rejected on the grounds of non-statutory obviousness type double patenting as allegedly being unpatentable over claims 1, 3, and 6 of U.S. Patent No. 10,680,003.

While not conceding the basis for the rejection and solely to expedite prosecution, Applicant submits a Terminal Disclaimer concurrently herewith to overcome the double patenting rejection with respect to the claims 21 and 25 presented above. The filing of this Terminal Disclaimer is not an admission of the propriety of the rejection. *Quad Environmental Technologies Corp. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991). Thus, Applicant respectfully requests favorable reconsideration of the nonstatutory double patenting rejection.

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Allowable Subject Matter

Applicant thanks the Examiner for indicating that claims 9-16 and 18-20 are allowed.

Applicant thanks the Examiner for indicating that claims 22-24 and 26-29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Based on the remarks above, Applicant believes the independent claim 21, as well as all of the dependent claims, are now allowable.

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Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

Date: 5 JAN 2024

1101 K Street, NW, 10th Floor
Washington, D.C. 20005
Main: 202-371-2600

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**01/05/2024 06:32:48 PM Z ET**	**4123.0460004**

Title of Invention

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CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Donald Featherstone

Documents

TOTAL DOCUMENTS: 5

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2024-01-05-Cover-Letter-4123-0460004.pdf		1	Transmittal Letter	190 KB
2024-01-05-Request-AFCP-4123-0460004.pdf		2	After Final Consideration Program Request	244 KB
2024-01-05-Reply-116-4123-0460004.pdf		8	-	141 KB
2024-01-05-Reply-116-4123-0460004-A.NE.pdf	(1-1)	1	Response After Final Action	103 KB
2024-01-05-Reply-116-4123-0460004-CLM.pdf	(2-5)	4	Claims	100 KB

2024-01-05-Reply-116-4123-0460004-REM.pdf	(6-8)	3	Applicant Arguments/Remarks Made in an Amendment	98 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2024-01-05-Cover-Letter-4123-0460004.pdf	748A4C5BB5DC84A04CE82EE3042369E708607D79B2D4CACA BBB56DF9C76FAAF7A43A236403229CC5E1922D1B199B3F340 9F2AC8AC5A6696881959CC0A1946DE6
2024-01-05-Request-AFCP-4123-0460004.pdf	0F4E97D21B55D89FF9444B63BD78707749A3CCA678BF299AE B1428F508AD9C7DA4BE5A4A8F7E13552DD51721CEEA7D9C7 36ED32930EE63C575B5CBE778FB04DE
2024-01-05-Reply-116-4123-0460004.pdf	5E7F24D560D001B2B91965B89B8DA0BCB7C4C61BA3AC01A7 BF0E54BC03D18D77BDDC59677E297BC02400A699311F57F28 81999AC86CD1576EA9A9E46719FD826
2024-01-05-Reply-116-4123-0460004-A.NE.pdf	AD482BBFCC6BCEF443DE3BCDD933154FBF2D76FCBD09A8F 173CC9645C3A0E16709EDEDC29822D73D2A0E3A04485DD214 EBDA48ECAADC195419A82A99E70A8989
2024-01-05-Reply-116-4123-0460004-CLM.pdf	F75A7CC1DA4639985D7E351706C23F8091D5594F305E951C32 FB7C223ABC9208CE6C3D9CAD40BAF9286DAED7F25CCE726 8C8E088CFF1D63CBA5467C6FD809972
2024-01-05-Reply-116-4123-0460004-REM.pdf	350208FEC38AE784EBEDCC47EFA6D52A8A8851DCE01A674C 83FACD4FF79CBF2B5FE7A53B4187D533E396146F86C35AC1C 5A31DCDF4FC65483AEC2D33FD57A106

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 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.

Doc Code: A.NE.AFCP
Document Description: After Final Consideration Program Request

PTO/SB/434 (3-22)

CERTIFICATION AND REQUEST FOR CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0

Practitioner Docket No.:	Application No.:	Filing Date:
4123.0460004	17/447,456	09/13/2021
First Named Inventor:	**Title:**	
Zhenyu LU	STAIRCASE STRUCTURE FOR MEMORY DEVICE	

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS CONSIDERATION UNDER THE AFTER FINAL CONSIDERATION PILOT PROGRAM 2.0 (AFCP 2.0) OF THE ACCOMPANYING RESPONSE UNDER 37 CFR 1.116.

1. The above-identified application is (i) an original utility, plant, or design nonprovisional application filed under 35 U.S.C. 111(a) [a continuing application (*e.g.*, a continuation or divisional application) is filed under 35 U.S.C. 111(a) and is eligible under (i)], or (ii) an international application that has entered the national stage in compliance with 35 U.S.C. 371(c).
2. The above-identified application contains an outstanding final rejection.
3. Submitted herewith is a response under 37 CFR 1.116 to the outstanding final rejection. The response includes an amendment to at least one independent claim, and the amendment does not broaden the scope of the independent claim in any aspect.
4. This certification and request for consideration under AFCP 2.0 is the only AFCP 2.0 certification and request filed in response to the outstanding final rejection.
5. Applicant is willing and available to participate in any interview requested by the examiner concerning the present response.
6. This certification and request is being filed electronically using the USPTO's patent electronic filing system.
7. Any fees that would be necessary consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, extension of time fees, are being concurrently filed herewith. [There is no additional fee required to request consideration under AFCP 2.0.]
8. By filing this certification and request, applicant acknowledges the following:

- Reissue applications and reexamination proceedings are not eligible to participate in AFCP 2.0.
- The examiner will verify that the AFCP 2.0 submission is compliant, *i.e.*, that the requirements of the program have been met (see items 1 to 7 above). For compliant submissions:
  - The examiner will review the response under 37 CFR 1.116 to determine if additional search and/or consideration (i) is necessitated by the amendment and (ii) could be completed within the time allotted under AFCP 2.0. If additional search and/or consideration is required but cannot be completed within the allotted time, the examiner will process the submission consistent with current practice concerning responses after final rejection under 37 CFR 1.116, *e.g.*, by mailing an advisory action.
  - If the examiner determines that the amendment does not necessitate additional search and/or consideration, or if the examiner determines that additional search and/or consideration is required and could be completed within the allotted time, then the examiner will consider whether the amendment places the application in condition for allowance (after completing the additional search and/or consideration, if required). If the examiner determines that the amendment does not place the application in condition for allowance, then the examiner will contact the applicant and request an interview.
    - The interview will be conducted by the examiner, and if the examiner does not have negotiation authority, a primary examiner and/or supervisory patent examiner will also participate.
    - If the applicant declines the interview, or if the interview cannot be scheduled within ten (10) calendar days from the date that the examiner first contacts the applicant, then the examiner will proceed consistent with current practice concerning responses after final rejection under 37 CFR 1.116.

Signature	Date	Practitioner Registration No.
/Donald J. Featherstone/	5 JAN 2024	33,876
Name (Print/Typed)	**Telephone Number**	
Donald J. Featherstone	(202) 371-2600	

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

☑ * Total of one (1) forms are submitted.

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.

DONALD J. FEATHERSTONE
DIRECTOR
202-772-8629
DONF@STERNEKESSLER.COM

January 5, 2024

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 5572
Art Unit: 2812
Attn: Mail Stop AF

Re: U.S. Utility Patent Application
Appl. No. 17/447,456; Filing Date: September 13, 2021
For: **Staircase Structure For Memory Device**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

Transmitted herewith for appropriate action are the following documents:

1. Online Credit Card Payment Authorization in the amount of $170.00 to cover the Terminal Disclaimer fee;

2. Terminal Disclaimer To Obviate A Double Patenting Rejection Over A "Prior" Patent;

3. Certification and Request for Consideration Under The After Final Consideration Pilot Program 2.0; and

4. Reply Under 37 C.F.R. § 1.116.

The above-listed documents are filed electronically. Fee payment is provided through online credit card payment. The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

DJF/R-Q:dxc
Enclosure(s)

Micron Ex. 1002, p. 245
Micron v. YMTC
IPR2025-00229

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

26111 7590 02/05/2024

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

EXAMINER
GEYER, SCOTT B

ART UNIT	PAPER NUMBER
2812	

DATE MAILED: 02/05/2024

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

TITLE OF INVENTION: STAIRCASE STRUCTURE FOR MEMORY DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	05/06/2024

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 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted 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. 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.

Micron Ex. 1002, p. 246
Micron v. YMTC
IPR2025-00229

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

26111 7590 02/05/2024

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

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 transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

TITLE OF INVENTION: STAIRCASE STRUCTURE FOR MEMORY DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	05/06/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
GEYER, SCOTT B	2812	257-774000

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/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or 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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). 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. Fees submitted: ❑Issue Fee ❑Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via the USPTO patent electronic filing system ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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 (11/23) Approved for use through 03/31/2026 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Micron Ex. 1002, p. 247
Micron v. YMTC
IPR2025-00229

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.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

26111 7590 02/05/2024

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

EXAMINER	
GEYER, SCOTT B	

ART UNIT	PAPER NUMBER
2812	

DATE MAILED: 02/05/2024

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.

PTOL-85 (Rev. 11/23)

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Micron v. YMTC
IPR2025-00229

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 30 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. The United States Patent and Trademark Office (USPTO) collects the information in this record under authority of 35 U.S.C. 2. The USPTO's system of records is used to manage all applicant and owner information including name, citizenship, residence, post office address, and other information with respect to inventors and their legal representatives pertaining to the applicant's/owner's activities in connection with the invention for which a patent is sought or has been granted. The applicable Privacy Act System of Records Notice for the information collected in this form is COMMERCE/PAT-TM-7 Patent Application Files, available in the Federal Register at 78 FR 19243 (March 29, 2013).
https://www.govinfo.gov/content/pkg/FR-2013-03-29/pdf/2013-07341.pdf

Routine uses of the information in this record may include disclosure to:

1) law enforcement, in the event that the system of records indicates a violation or potential violation of law;
2) a federal, state, local, or international agency, in response to its request;
3) a contractor of the USPTO having need for the information in order to perform a contract;
4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record;
5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record;
6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations;
7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals;
8) 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));
9) the Office of Personnel Management (OPM) for personnel research purposes; and
10) the Office of Management and Budget (OMB) for legislative coordination and clearance.

If you do not furnish the information requested on this form, the USPTO may not be able to process and/or examine your submission, which may result in termination of proceedings, abandonment of the application, and/or expiration of the patent.

Notice of Allowability	Application No. 17/447,456	Applicant(s) Lu et al.	
	Examiner Scott B Geyer	Art Unit 2812	AIA (FITF) Status Yes

-- 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 papers filed on January 5, 2024.
   ☐ 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 9-16 and 18-29 . 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 _____.
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 _____.

/SCOTT B GEYER/
Primary Examiner, Art Unit 2812

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DETAILED ACTION

Terminal Disclaimer

The terminal disclaimer filed on January 5, 2024 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Patent 10,680,003 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Allowable Subject Matter

Claims 9-16 and 18-29 are allowed.

The following is an examiner's statement of reasons for allowance: the applicant has filed terminal disclaimers to overcome the double patenting rejections from the previous office actions. 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."

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott B. Geyer (telephone: 571-272-1958). The examiner can normally be reached on Monday to Friday, 10AM - 4PM. 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, Charles D Garber (telephone: 571-272-2194). 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 U.S.A. or Canada) or 571-272-1000.

/SCOTT B GEYER/
Primary Examiner, Art Unit 2812

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/447,456	Lu et al.
	Examiner	**Art Unit**
	Scott B Geyer	2812

CPC						
Symbol					**Type**	**Version**
H10B	/	41	/	35	F	2023-02-01
H01L	/	21	/	0273	I	2013-01-01
H01L	/	21	/	31144	I	2013-01-01
H10B	/	41	/	41	I	2023-02-01
H10B	/	43	/	27	I	2023-02-01
H10B	/	43	/	35	I	2023-02-01
H10B	/	43	/	50	I	2023-02-01
H01L	/	21	/	76805	I	2013-01-01
H01L	/	21	/	76816	I	2013-01-01
H01L	/	21	/	76895	I	2013-01-01
H01L	/	23	/	5283	I	2013-01-01
H01L	/	23	/	53209	I	2013-01-01
H01L	/	23	/	53242	I	2013-01-01
H01L	/	23	/	53257	I	2013-01-01
H01L	/	23	/	535	I	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/SCOTT B GEYER/ Primary Examiner, Art Unit 2812	16 January 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

U.S. Patent and Trademark Office — Part of Paper No.: 20240116

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/447,456	Lu et al.
	Examiner	**Art Unit**
	Scott B Geyer	2812

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H10B41/35	/	41	/	35	

NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

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

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/SCOTT B GEYER/ Primary Examiner, Art Unit 2812	16 January 2024	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	8

U.S. Patent and Trademark Office — Part of Paper No.: 20240116

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/447,456	Lu et al.
	Examiner	**Art Unit**
	Scott B Geyer	2812

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

NONE		**Total Claims Allowed:**
(Assistant Examiner)	(Date)	20
/SCOTT B GEYER/ Primary Examiner, Art Unit 2812	16 January 2024	O.G. Print Claim(s): 1 / O.G. Print Figure: 8
(Primary Examiner)	(Date)	

U.S. Patent and Trademark Office — Part of Paper No.: 20240116

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/447,456	Lu et al.
	Examiner	Art Unit
	Scott B Geyer	2812

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* 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
Parent Applications (16/126,956; 16/885,858) - references checked	08/24/2023	SBG
Text/Intersection searches: H01L23/528, H01L23/5283, H10B41/20, H10B41/40-50, H10B43/20, H10B43/40, H10B43/50	08/24/2023	SBG
PE2E-Search, details attached	08/24/2023	SBG
PE2E-Search updated, details attached	12/02/2023	SBG
PE2E-Search updated, details attached	01/16/2024	SBG

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	see attached	01/16/2024	SBG

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	("11145666" "10680003").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/23 05:52 PM
L2	718	((Yangtze WITH Memory).as. (Zhenyu WITH Lu).in. (Jun WITH Chen).in. (Xiaowang WITH Dai).in. (Jifeng WITH Zhu).in. (Qian WITH Tao).in. (Yu WITH Ru WITH Huang).in. (Si WITH Ping WITH Hu).in. (Lan WITH Yao).in. (Li WITH Hong WITH Xiao).in. (A WITH Man WITH Zheng).in. (Kun WITH Bao).in. (Haohao WITH Yang).in.) AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step) WITH memory)	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 11:34 AM
L4	16	("9006884" | "9331082" | "9343452" | "9373540" | "9419013" | "9478487" | "9741563" | "10002880" | "10403641" | "20110031630" | "20130270714" | "20150255385" | "20150255386" | "20170084532" | "20190081070").pn. OR ("10680003").urpn. AND (PGPB | USPT | USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:36 AM
L5	27	("9006884" | "9331082" | "9343452" | "9373540" | "9419013" | "9478487" | "9520402" | "9711603" | "9741563" | "9941153" | "10002880" | "10395982" | "10403641" | "20110031630" | "20130043509" | "20130056818" | "20130270714" | "20150255385" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:36 AM

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		"20150255386" | "20170084532" | "20170271256" | "20180130701" | "20180166380" | "20180301460" | "20190006385" | "20190081070" | "20190280001").pn. OR ("11145666").urpn. AND (PGPB | USPT | USOC).dbnm.					
L6	27	(Artificial Intelligence) More like doc: US-10680003-B2 Text: (US-11145666-B2 OR US-20200295019-A1 OR US-20190081070-A1 OR US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR TW-201913972-A OR US-20200251381-A1 OR CN-113241350-A OR US-20200051983-A1 OR TW-I721303-B OR US-10896844-B2 OR US-11545388-B2 OR US-20210265203-A1 OR US-20210098288-A1 OR US-11361988-B2 OR US-20230102588-A1 OR CN-113241350-B OR CN-114207823-A OR WO-2020154997-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 11:36 AM
L7	25	(Artificial Intelligence) More like doc: US-11145666-B2 Text: (US-20200295019-A1 OR US-10680003-B2 OR US-20190081070-A1 OR US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR TW-201913972-A OR US-20200051983-A1 OR CN-113241350-A OR TW-I721303-B OR US-20200251381-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 11:37 AM

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		US-11114439-B2 OR CN-110121777-A OR US-11545388-B2 OR US-20210265203-A1 OR US-10896844-B2 OR CN-113241350-B OR US-20210098288-A1 OR US-11361988-B2 OR US-20230102588-A1).did.					
L8	41	(Artificial Intelligence) Similar to: 17/447,456 with 0 CPC Selections and 0 Text Selections Text: (US-20230083030-A1 OR US-20230084008-A1 OR WO-2019042091-A1 OR CN-113241350-B OR CN-113241350-A OR TW-201913972-A OR TW-I721303-B OR CN-110121777-A OR CN-107644876-B OR CN-110556383-A OR US-20190081070-A1 OR CN-107919361-A OR US-10727115-B2 OR TW-202137513-A OR CN-110098191-A OR CN-109309095-B OR US-10615124-B2 OR CN-109309095-A OR US-10396035-B2 OR JP-2022508779-A OR TW-I679750-B OR US-20190035733-A1 OR TW-202017150-A OR CN-111293119-B OR TW-I622132-B OR EP-3306664-A1 OR TW-201814839-A OR CN-109326606-A OR JP-2020198387-A OR CN-107017262-A OR US-20200194456-A1 OR TW-I739331-B OR TW-202046322-A OR CN-110634873-A OR CN-112038353-A OR CN-111326498-A OR KR-20200073455-A OR CN-114207821-A OR WO-2021030820-A1 OR TW-202121666-A	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN))	OR	ON	ON	2023/08/24 11:37 AM

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		OR CN-110323226-A OR EP-3827460-A1 OR US-10714492-B2 OR US-20230200064-A1 OR CN-114725064-A OR TW-I758789-B OR JP-7246500-B2 OR CN-111293119-A OR US-20230180477-A1 OR US-20210296346-A1).did.					
L9	28	L4 OR L5	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/08/24 11:38 AM
L10	2	("20140057429" "20170148805").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 11:40 AM
L11	24325	(H10B41/20 H10B41/35 H10B41/41).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L12	36494	(H10B43/20 H10B43/27 H10B43/35 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L13	48024	(H01L23/5283 H01L23/53209 H01L23/53242 H01L23/53257 H01L23/535).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:00 PM
L14	116443	(H01L21/0273 H01L21/31144 H01L21/76805 H01L21/76816 H01L21/76895).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 12:01 PM
L15	2	("9373540" "20110031630").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 01:16 PM
L18	6492	(H01L23/52-5389).cpc. AND (H10B41/40-50 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU,	OR	ON	ON	2023/08/24 01:32 PM

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			SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L19	7897	H10B$.cpc. AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:32 PM
L20	2086	L18 AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:32 PM
L21	757	L20 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:35 PM
L22	4101	(H01L23/528 H01L23/5283).cpc. AND (H10B41/20 H10B41/40-50 H10B43/20 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:54 PM
L23	2079	L22 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:55 PM
L24	1779	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 01:56 PM
L37	3	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO);	OR	ON	ON	2023/08/24 05:02 PM

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			FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L38	1779	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 05:02 PM
L39	35	(Artificial Intelligence) More like doc: US-20150179564-A1 Text: (US-9331082-B2 OR US-20160218107-A1 OR US-9640542-B2 OR KR-20150073251-A OR CN-104733462-A OR US-10411029-B2 OR CN-104733462-B OR US-20180277558-A1 OR US-20160027730-A1 OR US-20160111433-A1 OR CN-109411478-A OR US-9524903-B2 OR US-9524975-B2 OR TW-I748002-B OR US-10014313-B1 OR US-9263368-B2 OR US-20220173121-A1 OR US-10283518-B2 OR KR-101533521-B1 OR US-20220173122-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:22 PM
L40	10	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:47 PM
L43	7430	(H10B43/50 OR H10B43/27 OR H10B41/27 OR H10B41/50 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2023/08/24 06:49 PM

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		H10B43/35 OR H10B43/10 OR H10B43/20 OR H10B43/30 OR H10B69/00 OR H10B99/00).cpc. AND (H01L23/528 OR H01L23/5226 OR H01L23/5283).cpc.	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L45	7100	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:51 PM
L46	2476	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3) AND ((land$3 contact electrode) near4 pad)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:51 PM
L47	1038	L46 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:52 PM
L48	12	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1 OR US-20180053686-A1 OR US-20160172296-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/08/24 06:57 PM
L49	1	"20160218107".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/08/24 06:58 PM
L59	26562	(H10B41/20 H10B41/35	(US-PGPUB; USPAT;	OR	ON	ON	2023/12/02

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		H10B41/41).cpc.	USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				10:13 AM
L60	40233	(H10B43/20 H10B43/27 H10B43/35 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L61	49781	(H01L23/5283 H01L23/53209 H01L23/53242 H01L23/53257 H01L23/535).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L62	118396	(H01L21/0273 H01L21/31144 H01L21/76805 H01L21/76816 H01L21/76895).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L64	7198	(H01L23/52-5389).cpc. AND (H10B41/40-50 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L65	8473	H10B$.cpc. AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L66	2238	L18 AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM

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L67	771	L20 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L68	4538	(H01L23/528 H01L23/5283).cpc. AND (H10B41/20 H10B41/40-50 H10B43/20 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L69	2196	L22 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L70	1825	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L71	940	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L72	1825	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L75	8266	(H10B43/50 OR H10B43/27 OR H10B41/27 OR H10B41/50 OR H10B43/35 OR H10B43/10 OR H10B43/20 OR H10B43/30 OR H10B69/00 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM

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		H10B99/00).cpc. AND (H01L23/528 OR H01L23/5226 OR H01L23/5283).cpc.					
L76	7689	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L77	2661	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3) AND ((land$3 contact electrode) near4 pad)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L78	1071	L46 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:13 AM
L81	12	((US-20160358855-A1 OR US-20170338240-A1 OR US-20160093513-A1 OR US-20150179564-A1 OR US-20200035553-A1 OR US-20170194255-A1 OR US-20150206895-A1 OR US-20150287710-A1 OR US-20180053686-A1 OR US-20160172296-A1).did. AND PGPB.dbnm.) OR ((US-20160218107-A1 OR US-20180277558-A1).did. AND DWPI.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:14 AM
L82	5	((US-20160276262-A1).did. AND PGPB.dbnm.) OR ((WO-2017034709-A1 OR CN-104810373-A OR KR-20170079309-A OR KR-20170107195-A).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/12/02 10:49 AM

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L83	4	"10680003"	(USPAT)	OR	ON	ON	2023/12/02 12:16 PM
L93	27107	(H10B41/20 H10B41/35 H10B41/41).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L94	41405	(H10B43/20 H10B43/27 H10B43/35 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L95	50627	(H01L23/5283 H01L23/53209 H01L23/53242 H01L23/53257 H01L23/535).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L96	119249	(H01L21/0273 H01L21/31144 H01L21/76805 H01L21/76816 H01L21/76895).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L98	7480	(H01L23/52-5389).cpc. AND (H10B41/40-50 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L99	8736	H10B$.cpc. AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L100	2321	L18 AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU,	OR	ON	ON	2024/01/16 10:27 AM

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			SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L101	777	L20 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L102	4742	(H01L23/528 H01L23/5283).cpc. AND (H10B41/20 H10B41/40-50 H10B43/20 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L103	2221	L22 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L104	1837	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L105	952	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L106	1837	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L109	8575	(H10B43/50 OR H10B43/27 OR H10B41/27 OR H10B41/50 OR H10B43/35 OR H10B43/10 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO;	OR	ON	ON	2024/01/16 10:27 AM

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		H10B43/20 OR H10B43/30 OR H10B69/00 OR H10B99/00).cpc. AND (H01L23/528 OR H01L23/5226 OR H01L23/5283).cpc.	JPO; DERWENT; IBM_TDB)				
L110	7965	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L111	2747	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3) AND ((land$3 contact electrode) near4 pad)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L112	1081	L46 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L115	27107	(H10B41/20 H10B41/35 H10B41/41).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L116	41405	(H10B43/20 H10B43/27 H10B43/35 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L117	50627	(H01L23/5283 H01L23/53209 H01L23/53242 H01L23/53257 H01L23/535).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM

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L118	119249	(H01L21/0273 H01L21/31144 H01L21/76805 H01L21/76816 H01L21/76895).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L119	7480	(H01L23/52-5389).cpc. AND (H10B41/40-50 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L120	8736	H10B$.cpc. AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L121	2321	L18 AND (staircase stairstep stair-case stair-step (stair ADJ case) (stair ADJ step))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L122	777	L20 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L123	4742	(H01L23/528 H01L23/5283).cpc. AND (H10B41/20 H10B41/40-50 H10B43/20 H10B43/40 H10B43/50).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L124	2221	L22 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2024/01/16 10:27 AM

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			IBM_TDB)				
L125	1837	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L126	952	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L127	1837	L23 AND (staircase stairstep stair-case stair-step stair step$4)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L128	8575	(H10B43/50 OR H10B43/27 OR H10B41/27 OR H10B41/50 OR H10B43/35 OR H10B43/10 OR H10B43/20 OR H10B43/30 OR H10B69/00 OR H10B99/00).cpc. AND (H01L23/528 OR H01L23/5226 OR H01L23/5283).cpc.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L129	7965	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L130	2747	L43 AND (staircase stairstep stair-case stair-step stair$4 step$4 stack$3) AND ((land$3 contact electrode) near4 pad)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:27 AM
L131	1081	L46 NOT ("2023" "2022" "2021" "2020" "2019").ay.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2024/01/16 10:27 AM

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			DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L135	6	((US-20160276262-A1).did. AND PGPB.dbnm.) OR ((WO-2017034709-A1 OR CN-104810373-A OR KR-20170079309-A OR KR-20170107195-A).did. AND FTDB.dbnm.) OR ((US-10680003-B2).did. AND USPT.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2024/01/16 10:28 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Amendment Under 37 C.F.R. § 1.116
Expedited Procedure – Art Unit 2812

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: 5572
Applicant: YANGTZE MEMORY TECHNOLOGIES CO., LTD.	Art Unit: 2812
Application No.: 17/447,456	Examiner: GEYER, Scott B.
Filed: September 13, 2021	Atty. Docket No.: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

OK TO ENTER: /S.B.G/

Reply Under 37 C.F.R. § 1.116

Mail Stop AF

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Commissioner:

In reply to the Office Action dated December 7, 2023, Applicant submits the following Amendment and Remarks.

Listing of the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks and Arguments begin on page 6 of this paper.

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims, or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: 5572
Applicant: Yangtze Memory Technologies Co., Ltd.	Art Unit: 2812
Application No.: 17/447,456	Examiner: GEYER, Scott B.
Filing Date: September 13, 2021	Atty. Docket No.: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

Amendment Under 37 C.F.R. § 1.312

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Mail Stop Issue Fee

Commissioner:

Submitted herein is an Amendment Under 37 C.F.R. § 1.312. As payment of the issue fee has not yet been made or is filed herewith, Applicant respectfully submits that filing under 37 C.F.R. § 1.312 is proper. (M.P.E.P. § 714.16.)

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims, or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

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Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. – 8. (Canceled).

9. (Currently Amended) A staircase structure of a memory device, comprising:

a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, and wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer.

10. (Currently Amended) The staircase structure of claim 9, further comprising a dielectric layer in contact with a bottom surface of the landing pad, the second side surface of the landing pad, and the side surface of the second portion of the ~~conductive~~ second material layer.

11. (Previously Presented) The staircase structure of claim 9, wherein a lateral distance between the second side surface and the side surface of the second portion of the second material layer is between 10 nm and 300 nm.

12. (Original) The staircase structure of claim 9, wherein the landing pad comprises a conductive material.

13. (Original) The staircase structure of claim 12, wherein the conductive material comprises tungsten, silicide, nickel, titanium, platinum, aluminum, titanium nitride, tantalum nitride, tungsten nitride, or a combination thereof.

14. (Currently Amended) The staircase structure of claim 9, wherein the second material layer is disposed over a first portion of another first material layer, and wherein a side surface of a second

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portion of the another first material layer is laterally displaced from the second side surface of the landing pad.

15. (Previously Presented) The staircase structure of claim 9, wherein the second material layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

16. (Previously Presented) A memory device, comprising:

a memory string disposed over a substrate; and

a staircase structure disposed adjacent to the memory string, wherein the staircase structure comprises:

a conductive layer comprising first and second portions;

an insulating layer disposed over the first portion of the conductive layer, wherein the insulating layer comprises a first thickness; and

a landing pad disposed on the second portion of the conductive layer and in contact with a side surface of the insulating layer, wherein the landing pad comprises a second thickness greater than the first thickness.

17. (Canceled).

18. (Original) The memory device of claim 16, wherein the conductive layer is disposed over a first portion of another insulating layer, wherein a second portion of the another insulating layer is laterally displaced from the conductive layer.

19. (Previously Presented) The memory device of claim 16, wherein the conductive layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

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20. (Currently Amended) The memory device of claim 19, further comprising a dielectric layer in contact with a bottom surface of the landing pad, [[the]] a side surface of the landing pad, and [[the]] a side surface of the second portion of the conductive layer.

21. (Currently Amended) A memory device, comprising:

a first material layer and a second material layer, wherein the first material layer is disposed over a first portion of the second material layer; and

a landing pad disposed over a second portion of the second material layer, wherein the landing pad comprises a first side surface and a second side surface, and wherein the first side surface is in contact with the first material layer and the second side surface is laterally displaced from a side surface of the second portion of the second material layer.

22. (Previously Presented) The memory device of claim 21, wherein the first side surface comprises a curved side surface.

23. (Previously Presented) The memory device of claim 22, further comprising another second material layer disposed on the first material layer, wherein a first lateral distance between the first side surface and a side surface of the another second material layer is smaller than a second lateral distance between the second side surface and the side surface of the another second material layer.

24. (Previously Presented) The memory device of claim 22, wherein the second side surface is laterally displaced from the first side surface, and wherein a first lateral distance between the first side surface and the first portion of the second material layer is smaller than a second lateral distance between the second side surface and the first portion of the second material layer.

25. (Previously Presented) The memory device of claim 21, wherein the second material layer comprises tungsten, and titanium nitride.

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26. (Previously Presented) The memory device of claim 21, wherein the second material layer comprises a first conductive material and the landing pad comprises a second conductive material substantially the same as the first conductive material.

27. (Previously Presented) The memory device of claim 21, wherein a lateral distance between the second side surface and the side surface of the second portion of the second material layer is between 10 nm and 300 nm.

28. (Previously Presented) The memory device of claim 21, further comprising:

a dielectric layer disposed over the first material layer and the landing pad, wherein the first material layer comprises a first dielectric material and the dielectric layer comprises a second dielectric material, wherein the first dielectric material is substantially the same as the second dielectric material, and wherein the first dielectric material comprises silicon oxide.

29. (Currently Amended) The memory device of claim 21, wherein the second material layer is disposed over a first portion of another first material layer, and wherein a side surface of a second portion of the another first material layer is laterally displaced from the second side surface of the landing pad.

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Remarks

Claims 9 – 16 and 18 – 29 are pending. Claims 9, 10, 14, 20, 21, and 29 are sought to be amended to correct minor informalities. Claims 1 – 8 and 17 were previously canceled without prejudice to the subject matter therein. These amendments are not believed to add new matter. Accordingly, Applicant respectfully requests that these Amendments be entered.

Reconsideration of this application and entry of the above Amendments are respectfully requested.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

Date: March 8, 2024

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UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**03/08/2024 04:21:47 PM Z ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	Delain Crooks
PATENT CENTER #	64608271	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Donald Featherstone

Documents

TOTAL DOCUMENTS: 4

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
2024-03-08-Cover-Letter-4123-0460004.pdf		1	Transmittal Letter	176 KB
2024-03-08-Amendment-312-4123-0460004.pdf		6	-	106 KB
2024-03-08-Amendment-312-4123-0460004-A.NA.pdf	(1-1)	1	Amendment after Notice of Allowance (Rule 312)	94 KB
2024-03-08-Amendment-312-4123-0460004-CLM.pdf	(2-5)	4	Claims	76 KB
2024-03-08-Amendment-312-4123-0460004-REM.pdf	(6-6)	1	Applicant Arguments/Remarks Made in an Amendment	70 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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2024-03-08-Amendment-312-4123-0460004-CLM.pdf	6228AE055D8BA6980B67E32BD57C8B2CA2ED658507FDCA40 9A1158CAB66121D5F3F0225F566DEB96D2E24B53C06382CD6 7D718C276183321145D733861275522
2024-03-08-Amendment-312-4123-0460004-REM.pdf	CDF2B71DB4A3A62154CB2D2C137C70B276090B8A6BD52EAF 48E8FA10925BA919DFE6A6C0F466B0E46B5CAC022B334B67 D1671A166A7574D4926BC7068B992D27

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 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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Sterne Kessler
STERNE KESSLER GOLDSTEIN & FOX

March 8, 2024

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 5572
Attn: Mail Stop Issue Fee

Re: Allowed U.S. Utility Patent Application
Appl. No. 17/447,456; Filed: September 13, 2021
For: **Staircase Structure For Memory Device**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

Transmitted herewith for appropriate action is a document entitled: ***Amendment Under 37 C.F.R. § 1.312***, which is submitted electronically.

In the event that extensions of time are necessary to prevent abandonment of this patent application, then such extensions of time are hereby petitioned.

The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims, or forwarding to appeal), or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

DJF/R-Q:dxc
Enclosure(s)
21977712.1

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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
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

26111 7590 03/29/2024

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
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WASHINGTON, DC 20005

EXAMINER	
GEYER, SCOTT B	

ART UNIT	PAPER NUMBER
2812	

NOTIFICATION DATE	DELIVERY MODE
03/29/2024	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):

e-office@sternekessler.com

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Micron v. YMTC
IPR2025-00229

Response to Rule 312 Communication	Application No.	Applicant(s)	
	17/447,456	Lu et al.	
	Examiner	Art Unit	AIA (FITF) Status
	Scott B Geyer	2812	Yes

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

1. ☑ The amendment filed on 08 March 2024 under 37 CFR 1.312 has been considered, and has been:

a) ☐ entered.

b) ☑ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.

Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

f) ☐ not entered because the supplemental or corrected Application Data sheet (ADS)

☐ was not accompanied by a petition to accept an unintentionally delayed claim under 37 CFR 1.55 or 27 CFR 1.78;

☐ did not identify the information being changed in accordance with 37 CFR 1.76(c)(2);

☐ was not properly signed in accordance with 37 CFR 1.76(e) (or 37 CFR 1.33(b) for applications filed prior to September 16, 2012).

/SCOTT B GEYER/
Primary Examiner, Art Unit 2812

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: Zhenyu LU	Confirmation No.: 5572
Applicant: Yangtze Memory Technologies Co., Ltd.	Art Unit: 2812
Application No.: 17/447,456	Examiner: GEYER, Scott B.
Filing Date: September 13, 2021	Atty. Docket No.: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

OK TO ENTER: /S.B.G/

Amendment Under 37 C.F.R. § 1.312

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Mail Stop Issue Fee

Commissioner:

Submitted herein is an Amendment Under 37 C.F.R. § 1.312. As payment of the issue fee has not yet been made or is filed herewith, Applicant respectfully submits that filing under 37 C.F.R. § 1.312 is proper. (M.P.E.P. § 714.16.)

It is not believed that extensions of time are required beyond those that may otherwise be provided for in documents accompanying this paper. However, if additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and any additional fees required to continue prosecution or appeal of this application (including issue fee, fees for net addition of claims, or forwarding to appeal) are hereby authorized to be charged to our Deposit Account No. 19-0036.

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IPR2025-00229

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May 6, 2024

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Confirmation No. 5572
Attn: Mail Stop Issue Fee

Re: Allowed U.S. Utility Patent Application
Appl. No. 17/447,456; Filed: September 13, 2021
For: **Staircase Structure For Memory Device**
First Named Inventor: Zhenyu LU
Our Ref: 4123.0460004

Commissioner:

In response to the **Notice of Allowance and Fee(s) Due** dated **February 5, 2024**, the following documents are transmitted for appropriate action by the U.S. Patent and Trademark Office:

1. Online Credit Card Payment Authorization for $1,200.00 to cover the Issue Fee;

2. Issue Fee Transmittal (Form PTOL-85);

3. Comments on Statement of Reasons for Allowance.

The above-listed documents are filed electronically. Fee payment is provided through online credit card payment. The U.S. Patent and Trademark Office is hereby authorized to charge any fee deficiency, or credit any overpayment, to our Deposit Account No. 19-0036.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

DJF/R-Q:dxc
Enclosure(s)
21977492.1

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Micron v. YMTC
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UNITED STATES
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**05/06/2024 02:40:18 PM Z ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	LaTishia Tillman
PATENT CENTER #	65391484	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Feng Qian

Documents

TOTAL DOCUMENTS: 3

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2024-05-06-Comments-Reasons-Allowance-4123-0460004.pdf	1	Post Allowance Communication - Incoming	97 KB
2024-05-06-Cover-Letter-4123-0460004.pdf	1	Miscellaneous Incoming Letter	191 KB
2024-05-06-Issue-Fee-4123-0460004.pdf	1	Issue Fee Payment (PTO-85B)	194 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)

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2024-05-06-Cover-Letter-4123-0460004.pdf	B83ED2A50D3C343FD932D13FD00C0C45D454D76639742D94742DC5AD7EB51D6B81599F1807ACE94CDD7948FC690D649FBEC0C05F35375CEA149359E4D395DB5D
2024-05-06-Issue-Fee-4123-0460004.pdf	F8854AFCD8A6B95BAABD84CE2B130380F58B69979451C926F2EF5A531DBA4661704CCCF84397CB628B0A57451CC3A79209881742D7204207A7E47F3F7474FDDC

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 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

First Named Inventor: Zhenyu LU	Confirmation No.: 5572
Applicant: YANGTZE MEMORY TECHNOLOGIES CO., LTD.	Art Unit: 2812
Application No.: 17/447,456	Examiner: GEYER, Scott B.
Filing Date: September 13, 2021	Atty. Docket No.: 4123.0460004

Title: **STAIRCASE STRUCTURE FOR MEMORY DEVICE**

Comments on Statement of Reasons for Allowance

Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Mail Stop: Issue Fee

Commissioner:

Applicant thanks the Examiner for indicating the allowability of claims 9-16 and 18-29 in the Notice of Allowance dated February 5, 2024.

Comments on Statement of Reasons for Allowance

Applicant notes the Examiner's Statement of Reasons for Allowance presented on page 2 of the Notice of Allowance. Applicant reserves the right to demonstrate claims 9-16 and 18-29 are allowable over the art made of record for further reasons related to any of their recited features. Applicant further contends that reservation of this right does not give rise to any implication regarding whether the Applicant agrees with or acquiesces in the reasoning provided by the Examiner.

Respectfully submitted,

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.

/Donald J. Featherstone/

Donald J. Featherstone
Attorney for Applicant
Registration No. 33,876

Date: May 6, 2024

1101 K Street, NW, 10th Floor
Washington, D.C. 20005
Main: 202-371-2600

Micron Ex. 1002, p. 289
Micron v. YMTC
IPR2025-00229

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (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 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. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

26111 7590 02/05/2024
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

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 transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

TITLE OF INVENTION: STAIRCASE STRUCTURE FOR MEMORY DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	05/06/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
GEYER, SCOTT B	2812	257-774000

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/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or 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 Sterne, Kessler, Goldstein & Fox P.L.L.C.
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 must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Yangtze Memory Technologies Co., Ltd.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Wuhan, Hubei CHINA

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 19-0036

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 /Donald J. Featherstone/ Date May 6, 2024

Typed or printed name Donald J. Featherstone Registration No. 33,876

PTOL-85 Part B (11/23) Approved for use through 03/31/2026 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Micron Ex. 1002, p. 290
Micron v. YMTC
IPR2025-00229

UNITED STATES
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P.O. Box 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	05/06/2024 02:40:18 PM Z ET	4123.0460004

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	5572	FILED BY	LaTishia Tillman
PATENT CENTER #	65391484	AUTHORIZED BY	Feng Qian
CUSTOMER #	26111	FILING DATE	09/13/2021
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Zhenyu Lu

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1005	E202456E42059588	LaTishia Tillman

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
1501	UTILITY ISSUE FEE	1200.00	1	1200.00
			TOTAL AMOUNT:	$1,200.00

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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 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

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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

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	06/11/2024	12010838	4123.0460004	5572

26111 7590 05/22/2024

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

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 257 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 Center (https://patentcenter.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 Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

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IPR2025-00229

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Zhenyu Lu, Wuhan, CHINA;
Jun Chen, Wuhan, CHINA;
Xiaowang Dai, Wuhan, CHINA;
Jifeng Zhu, Wuhan, CHINA;
Qian Tao, Wuhan, CHINA;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

Yangtze Memory Technologies Co., Ltd., Wuhan, CHINA;

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.

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Micron v. YMTC
IPR2025-00229

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/447,456	09/13/2021	Zhenyu Lu	4123.0460004	5572

26111 7590 06/11/2024

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
10th Floor
WASHINGTON, DC 20005

EXAMINER	
GEYER, SCOTT B	

ART UNIT	PAPER NUMBER
2812	

NOTIFICATION DATE	DELIVERY MODE
06/11/2024	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):

eoffice@sternekessler.com

Micron Ex. 1002, p. 295
Micron v. YMTC
IPR2025-00229

APPLICATION NO.	ISSUE DATE	PATENT NO.
17/447,456	11-Jun-2024	12010838

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
1101 K Street, NW
WASHINGTON, DC 20005

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

Micron Ex. 1002, p. 296
Micron v. YMTC
IPR2025-00229

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
17/447,456	**07/03/2024 02:32:07 PM Z ET**	**4123.0460004**

Title of Invention

STAIRCASE STRUCTURE FOR MEMORY DEVICE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	12010838
CONFIRMATION #	5572	FILED BY	Andrew Stengel
PATENT CENTER #	66231982	FILING DATE	09/13/2021
CUSTOMER #	26111	FIRST NAMED INVENTOR	Zhenyu Lu
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Mark Zimmerman

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2017-00295-YMTC-PCT-US-CON1-CON1_POA.pdf	3	Power of Attorney	402 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2017-00295-YMTC-PCT-US-CON1-CON1_POA.pdf	D5971CD2F9836EB0EA4657BBCF6AAD2C7E9BFBB974B2D865C9A8357D891BCD26A98C69030894C937CCFEDD4F36EE5E7774AFCB3E9C9D95C5E1E91B8D14809024

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 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.

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	17447456
Filing Date	September 13, 2021
First Named Inventor	Zhenyu Lu
Title	STAIRCASE STRUCTURE FOR MEMORY DEVICE
Art Unit	2812
Examiner Name	SCOTT GEYER
Attorney Docket Number	2017-00295-YMTC-PCT-US-CON1-CON1

SIGNATURE of Applicant or Patent Practitioner

Signature	/Mark C. Zimmerman /	Date (Optional)	July 3, 2024
Name	Mark C. Zimmerman	Registration Number	44006
Title (if Applicant is a juristic entity)	Attorney for Applicant		
Applicant Name (if Applicant is a juristic entity)	Yangtze Memory Technologies Co., Ltd.		

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 _____ forms are submitted.

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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

(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: 34431

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.)

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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):

Yangtze Memory Technologies Co., Ltd.

☐ 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		Date (Optional)	
Name	Tuenlap Daniel Chan		
Title	Deputy General Counsel, Head of Intellectual Property Department		

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.

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Micron v. YMTC
IPR2025-00229

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Micron Ex. 1002, p. 301
Micron v. YMTC
IPR2025-00229