

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of New York on the following

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

DOCKET NO. 22cv1852(GRB)(ARL)	DATE FILED 4/1/2022	U.S. DISTRICT COURT Eastern District of New York
PLAINTIFF Slingshot Printing LLC		DEFENDANT Canon U.S.A., Inc. and Canon Solutions America, Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,484,823	2/3/2009	Holder: Slingshot Printing LLC
2 7,594,708	9/29/2009	Holder: Slingshot Printing LLC
3 7,290,864	11/6/2007	Holder: Slingshot Printing LLC
4		(See Attached Complaint and Exhibits)
5		

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

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

DECISION/JUDGEMENT

CLERK Brenna B. Mahoney	(BY) DEPUTY CLERK Laura Jakubowski	DATE 4/4/2022
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been
 filed in the U.S. District Court Western District of Texas - Waco Division on the following
 Trademarks or Patents. (the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 6:20-cv-00048	DATE FILED 1/23/2020	U.S. DISTRICT COURT Western District of Texas - Waco Division
PLAINTIFF Slingshot Printing LLC		DEFENDANT HP Inc
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,484,823	Feb. 3, 2009	Slingshot Printing LLC
2 7,594,708	Sept. 29, 2009	Slingshot Printing LLC
3		
4		
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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

See attached

CLERK <i>Jeannette J. Clack</i>	(BY) DEPUTY CLERK <i>CDiaz</i>	DATE <i>2/19/20</i>
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
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IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

SLINGSHOT PRINTING LLC,

Plaintiff.

v.

HP INC.,

Defendant.

Civil Action No. 6:20-cv-00048-ADA

ORDER TRANSFERRING CASE TO AUSTIN DIVISION

The Court, having reviewed and considered the Joint Stipulation to Transfer Venue to the Austin Division, does hereby ORDER that the above-captioned action be TRANSFERRED to the Austin Division but remain on the docket of United States District Judge Alan D Albright.

SIGNED this 19th day of February, 2020.



HONORABLE ALAN D ALBRIGHT
UNITED STATES DISTRICT COURT JUDGE

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas, Austin Division on the following

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

DOCKET NO. 1:20-CV-189-ADA	DATE FILED 2/19/2020	U.S. DISTRICT COURT Western District of Texas, Austin Division
PLAINTIFF Slingshot Printing LLC		DEFENDANT HP Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,484,823		Slingshot Printing LLC
2 7,594,708		Slingshot Printing LLC
3		
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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

DECISION/JUDGEMENT ORDER OF DISMISSAL WITH PREJUDICE signed on 3/24/2021

CLERK Jeannette J. Clack	(BY) DEPUTY CLERK <i>Christina Cordero</i>	DATE 4/7/2021
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**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

SLINGSHOT PRINTING LLC,

Plaintiff,

v.

HP INC.,

Defendant.

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CIVIL ACTION NO. 1:20-CV-189-ADA

ORDER OF DISMISSAL WITH PREJUDICE

The Court is of the opinion that the Stipulated Dismissal with Prejudice agreed to by Slingshot Printing LLC ("Slingshot") and HP Inc. ("HP") should be GRANTED.

IT IS THEREFORE ORDERED that the above-entitled cause and all claims made by Slingshot against HP therein are hereby DISMISSED WITH PREJUDICE to the re-filing of same. All costs and expenses relating to this litigation (including attorney and expert fees and expenses) shall be borne solely by the party incurring the same.

IT IS FURTHER ORDERED that this Court shall retain jurisdiction over this action and the parties for purposes of enforcing the terms of the Settlement, Release and License Agreement entered into by and between the parties.

This is a final judgment.

SIGNED this 24th day of March, 2021


HONORABLE ALAN D ALBRIGHT
UNITED STATES DISTRICT JUDGE

AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been
 filed in the U.S. District Court Western District of Texas, Austin Division on the following

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

DOCKET NO. 1:20-CV-187-ADA	DATE FILED 2/19/2020	U.S. DISTRICT COURT Western District of Texas, Austin Division
PLAINTIFF Slingshot Printing LLC		DEFENDANT HP Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 6,213,587		Slingshot Printing LLC
2 6,575,563		Slingshot Printing LLC
3 6,676,246		Slingshot Printing LLC
4 6,786,575		Slingshot Printing LLC
5 7,018,012		Slingshot Printing LLC

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1 7,195,341		Slingshot Printing LLC	
2 7,290,864		Slingshot Printing LLC	
3 7,410,246		Slingshot Printing LLC	
4 7,484,823		Slingshot Printing LLC	
5 7,559,629		Slingshot Printing LLC	

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

DECISION/JUDGEMENT Order of dismissal attached.
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CLERK Jeannette J. Clack	(BY) DEPUTY CLERK 	DATE 4/1/21
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 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas - Waco Division on the following Trademarks or Patents. (the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 6:20-cv-00048	DATE FILED 1/23/2020	U.S. DISTRICT COURT Western District of Texas - Waco Division
PLAINTIFF Slingshot Printing LLC		DEFENDANT HP Inc
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,484,823	Feb. 3, 2009	Slingshot Printing LLC
2 7,594,708	Sept. 29, 2009	Slingshot Printing LLC
3		
4		
5		

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

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

CLERK	(BY) DEPUTY CLERK	DATE
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Copy 2' Upon filing document adding patent(s), mail this copy to Director Copy 4' Case file copy



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
11/324,167	12/30/2005	Lucas David Barkley	35968/929

1912
AMSTER, ROTHSTEIN & EBENSTEIN LLP
90 PARK AVENUE
NEW YORK, NY 10016

CONFIRMATION NO. 6156
POWER OF ATTORNEY NOTICE



OC000000118777407

Date Mailed: 07/29/2020

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/25/2020.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/nrhayden/



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
11/324,167	12/30/2005	Lucas David Barkley	

133676
Goldberg Segalla LLP
711 3rd Avenue, Suite 1900
New York, NY 10017

CONFIRMATION NO. 6156
POA ACCEPTANCE LETTER



OC000000118777442

Date Mailed: 07/29/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/25/2020.

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.

/nrhayden/

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 - POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Patent Number	see attached Exhibit A
	Issue Date	see attached Exhibit A
	First Named Inventor	see attached Exhibit A
	Title	see attached Exhibit A
	Attorney Docket No.	

I hereby revoke all previous powers of attorney given in the above-identified patent.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the Customer Number identified in the box at right as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

133676

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified patent to:

☐ The address associated with the above-identified Customer Number.

OR

☐ The address associated with the Customer Number identified in the box at right:

OR

☒ Firm or Individual Name

Goldberg Segalla LLP

Address

711 3rd Avenue, Suite 1900

City

New York

State

New York

Zip

10017

Country

USA

Telephone

314-446-3359

Email

ipdocket@goldbergsegalla.com

I am the:

☐ Applicant.

OR

☒ Patent owner.

Statement under 37 CFR 3.73(c) (Form PTO/AIA/96) submitted herewith or filed on see attached Exhibit A

SIGNATURE of Applicant or Patent Owner

Signature

Keith Machen

Date

July 14, 2020

Name

Keith Machen

Telephone

239-776-1596

Title and Company

President Slingshot Printing LLC

NOTE: Signatures of all the applicants or patent owners of the entire interest or their representative(s) are required. If more than one signature is required, submit multiple forms, check the box below, and identify the total number of forms submitted in the blank below.

☒ A total of 2 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 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.

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.

Patent No.	Application No	First Named Inventor	Title	3.73 date	Issue Date
US-7784917	11866585	Byron Vencent Bell	Process For Making A Micro-Fluid Ejection Head Structure	July 25, 2020	August 31, 2010
US-7673973	11752551	John G. Edelen	Micro-Fluid Ejecting Device Having Embedded Memory Devices	July 25, 2020	March 9, 2010
US-7594708	11323809	Lucas David Barkley	Methods And Apparatuses For Sensing Temperature Of Multi-Via Heater Chips	July 25, 2020	September 29, 2009
US-7364268	11239799	Brian C. Hart	Nozzle Members, Compositions And Methods For Micro-Fluid Ejection Heads	July 25, 2020	April 29, 2008
US-8844137	13925424	Xiaorong Cai	Ejection Devices For Inkjet Printers And Method For Fabricating Ejection Devices	July 25, 2020	Sep 30, 2014
US-8313168	12775530	Sam Norasak	Wind Baffles For Micro-Fluid Ejection Devices	July 25, 2020	Nov 20, 2012
US-8328330	12131953	Richard Louis Goin	Nozzle Plate For Improved Post-Bonding Symmetry	July 25, 2020	Dec 11, 2012
US-7954929	11858611	John Glenn Edelen	Micro-Fluid Ejecting Device Having Embedded Memory In Communication With An External Controller	July 25, 2020	Jun 07, 2011
US-7766455	11556246	David Christopher Graham	Flexible Adhesive Materials For Micro-Fluid Ejection Heads And Methods Relating Thereto	July 25, 2020	Aug 03, 2010
US-7413289	11317575	Robert W. Cornell	Low Energy, Long Life Micro-Fluid Ejection Device	July 25, 2020	Aug 19, 2008
US-7559629	11238559	David G. King	Methods And Apparatuses For Implementing Multi-Via Heater Chips	July 25, 2020	Jul 14, 2009
US-8678557	13187755	Jiandong Fang	Substrate Structure For Ejection Chip And Method For Fabricating Substrate Structure	July 25, 2020	Mar 25, 2014
US-8172369	12346189	Steven Wayne Bergstedt	Inkjet Printhead Substrate With Distributed Heater Elements	July 25, 2020	May 08, 2012
US-7841712	12006190	Robert Muyskens	Automatic Printhead And Tank Install Positioning	July 25, 2020	Nov 30, 2010
US-7815289	11848246	David Laurier Bernard	Micro-Fluid Ejection Heads And Methods For Bonding Substrates To Supports	July 25, 2020	Oct 19, 2010
US-7690760	11466674	Colin G. Maher	High Resolution Ink Jet Printhead	July 25, 2020	Apr 06, 2010
US-7445323	11314296	James Daniel Anderson	Ink Cartridge Venting	July 25, 2020	Nov 04, 2008
US-7484823	11208815	Lucas David Barkley	Methods And Apparatuses For Regulating The Temperature Of Multi-Via Heater Chips	July 25, 2020	Feb 03, 2009
US-8657411	13160568	Frank E. Anderson	Fluid Ejection Device And Method For Fabricating Fluid Ejection Device	July 25, 2020	Feb 25, 2014
US-8235518	12337488	Robert Lee Cornell	Uv-Curable Coatings And Methods For Applying Uv-Curable Coatings Using Thermal Micro-Fluid Ejection Heads	July 25, 2020	Aug 07, 2012
US-7819498	11959593	Jason Todd McCreynolds	Methods And Systems Using Printhead Tank Memory To Determine Printhead Tank Configuration	July 25, 2020	Oct 26, 2010
US-7850284	11779085	David L. Bernard	Method For Dry Etching Fluid Feed Slots In A Silicon Substrate	July 25, 2020	Dec 14, 2010
US-7452058	11427453	Robert Wilson Cornell	Substantially Planar Ejection Actuators And Methods Relating Thereto	July 25, 2020	Nov 18, 2008
US-7559630	11277161	Byron Vencent Bell	Substantially Planar Fluid Ejection Actuators And Methods Related Thereto	July 25, 2020	Jul 14, 2009
US-7635174	11208682	Steven W. Bergstedt	Heater Chip Test Circuit And Methods For Using The Same	July 25, 2020	Dec 22, 2009
US-8491107	12948122	Neal D. McFarland	Fluid Container Having Mixing Chambers For Micro-Fluid Applications	July 25, 2020	Jul 23, 2013
US-7918015	12336767	Byron V. Bell	Micro-Fluid Ejection Device Having High Resistance Heater Film	July 25, 2020	Apr 05, 2011
US-7597419	11948346	Marc Alan Herwald	Directionally Dependent Carrier Isolator For An Imaging Apparatus	July 25, 2020	Oct 06, 2009
US-7850286	11767568	John Glenn Edelen	Micro-Fluid Ejector Pattern For Improved Performance	July 25, 2020	Dec 14, 2010
US-7571979	11361731	Girish S. Patil	Thick Film Layers And Methods Relating Thereto	July 25, 2020	Aug 11, 2009
US-7244015	11269311	George Keith Parish	Inkjet Printhead Heater Chip With Asymmetric Ink Vias	July 25, 2020	Jul 17, 2007
US-7438397	11001433	James Daniel Anderson	Methods And Devices For Purging Gases From An Ink Reservoir	July 25, 2020	Oct 21, 2008
US-8113618	12909912	Jason Todd McCreynolds	Methods And Systems Using Printhead Tank Memory To Determine Printhead Tank Configuration	July 25, 2020	Feb 14, 2012
US-8882221	12195451	David Laurier Bernard	Modular Micro-Fluid Ejection Head Assembly	July 25, 2020	Nov 11, 2014
US-7938523	11762101	Charles Stanley Aldrich	Fluid Supply Tank Ventilation For A Micro-Fluid Ejection Head	July 25, 2020	May 10, 2011
US-7484823	11324167	Lucas David Barkley	Methods And Apparatuses For Regulating The Temperature Of Multi-Via Heater Chips	July 25, 2020	Feb 03, 2009
US-7290864	11241079	David G. King	Heater Chips With A Reduced Number Of Bondpads	July 25, 2020	Nov 06, 2007
US-7178904	10986338	Frank E. Anderson	Ultra-Low Energy Micro-Fluid Ejection Device	July 25, 2020	Feb 20, 2007
US-8826502	12786457	David Laurier Bernard	Micro-Fluid Ejection Heads And Methods For Bonding Substrates To Supports	July 25, 2020	Sep 09, 2014
US-7784918	12145606	Robert W. Cornell	Low Energy, Long Life Micro-Fluid Ejection Device	July 25, 2020	Aug 31, 2010

STATEMENT UNDER 37 CFR 3.73(c)Applicant/Patent Owner: Slingshot Printing, LLCApplication No./Patent No.: 7484823Filed/Issue Date: February 3, 2009Titled: Methods And Apparatuses For Regulating The Temperature Of Multi-Via Heater ChipsSlingshot Printing, LLC, 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 048745, Frame 0551, 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.

[Page 1 of 2]

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.**

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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

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6. From: _____ To: _____

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

/Lynn Lehnert/

July 25, 2020

Signature

Date

Lynn Lehnert

54678

Printed or Typed Name

Title or Registration Number

[Page 2 of 2]

Privacy Act Statement

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

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

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

Electronic Acknowledgement Receipt	
EFS ID:	40104731
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	1912
Filer:	Lynn Ann Lehnert
Filer Authorized By:	
Attorney Docket Number:	35968/929
Receipt Date:	25-JUL-2020
Filing Date:	30-DEC-2005
Time Stamp:	14:59:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	Slingshot_POA.pdf	2555101	no	3
			df5cd9bfe8579edf0848b57b61bd4dca349ed9d9		
Warnings:					

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	7484823_3_73_Statement.pdf	199950 ee82026bbb124c11f9fd6fa27a411c32dbcf b73a	no	3
Warnings:					
Information:					
Total Files Size (in bytes):			2755051		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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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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
11/324,167	12/30/2005	Lucas David Barkley	35968/929

1912
AMSTER, ROTHSTEIN & EBENSTEIN LLP
90 PARK AVENUE
NEW YORK, NY 10016

CONFIRMATION NO. 6156
IMPROPER CPOA LETTER



Date Mailed: 07/22/2020

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 07/19/2020. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney is from an assignee and the statement required by 37 CFR 3.73(c) has not been received.

/cnguyen/

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

Goldberg Segalla LLP
711 3rd Avenue, Suite 1900
New York, NY 10017

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 - POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Patent Number	see attached Exhibit A
	Issue Date	see attached Exhibit A
	First Named Inventor	see attached Exhibit A
	Title	see attached Exhibit A
	Attorney Docket No.	

I hereby revoke all previous powers of attorney given in the above-identified patent.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the Customer Number identified in the box at right as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

133676

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Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified patent to:

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☒ Firm or Individual Name

Goldberg Segalla LLP

Address

711 3rd Avenue, Suite 1900

City

New York

State

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Zip

10017

Country

USA

Telephone

314-446-3359

Email

ipdocket@goldbergsegalla.com

I am the:

☐ Applicant.

OR

☒ Patent owner.

Statement under 37 CFR 3.73(c) (Form PTO/AIA/96) submitted herewith or filed on see attached Exhibit A

SIGNATURE of Applicant or Patent Owner

Signature

Keith Machen

Date

July 14, 2020

Name

Keith Machen

Telephone

239-776-1596

Title and Company

President Slingshot Printing LLC

NOTE: Signatures of all the applicants or patent owners of the entire interest or their representative(s) are required. If more than one signature is required, submit multiple forms, check the box below, and identify the total number of forms submitted in the blank below.

☒ A total of 2 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 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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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.
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Patent Number	Issue Date	First Named Inventor	Title
US-5926195	Jul 20, 1999	Joseph E. Domhoff	Ink Jet Printhead Cartridge
US-6010208	Jan 04, 2000	James Harold Powers	Nozzle Array For Printhead
US-6027199	Feb 22, 2000	William Henry Reed	Ink Jet Cartridge System And Method Of Printing Using Plurality Of Same Color Inks With Different Intensities
US-6039439	Mar 21, 2000	Steven Robert Komplin	Ink Jet Heater Chip Module
US-6109719	Aug 29, 2000	Robert Wilson Cornell	Printhead Thermal Compensation Method And Apparatus
US-6137502	Oct 24, 2000	Frank Edward Anderson	Dual Droplet Size Printhead
US-6164762	Dec 26, 2000	Carl E. Sullivan	Heater Chip Module And Process For Making Same
US-6172692	Jan 09, 2001	Xuan-Chao Huang	Multilevel Ink Mixing Device And Method Using Diluted And Saturated Color Inks For Inkjet Printers
US-6213587	Apr 10, 2001	Charles S. Whitman	Ink Jet Printhead Having Improved Reliability
US-6217150	Apr 17, 2001	Scott Michael Heydinger	Method Of Printing With An Ink Jet Printer Using Multiple Carriage Speeds
US-6243115	Jun 05, 2001	Ronald Willard Baker	Pressurized Ink Supply And Delivery System For An Ink Jet Printer
US-6286924	Sep 11, 2001	Adam Jude Ahne	Apparatus And Method For Heating Ink Jet Printhead
US-6296350	Oct 02, 2001	Robert Wilson Cornell	Ink Jet Printer Having Driver Circuit For Generating Warming And Firing Pulses For Heating Elements
US-6299292	Oct 09, 2001	Mark Joseph Edwards	Driver Circuit With Low Side Data For Matrix Inkjet Printhead, And Method Therefor
US-6357863	Mar 19, 2002	Frank Edward Anderson	Linear Substrate Heater For Ink Jet Print Head Chip
US-6357870	Mar 19, 2002	Bradley Leonard Beach	Intermediate Transfer Medium Coating Solution And Method Of Ink Jet Printing Using Coating Solution
US-6361162	Mar 26, 2002	Michael Adam Penrod	Method And Apparatus For Fixing Ink To A Print Receiving Medium
US-6394593	May 28, 2002	Steven Robert Komplin	Vent System For Ink Jet Pen Having Internal Pressure Regulator
US-6398346	Jun 04, 2002	Frank Edward Anderson	Dual-Configurable Print Head Addressing
US-6412894	Jul 02, 2002	Benjamin Alan Askren	Ink Cartridge And Method For Determining Ink Volume In Said Ink Cartridge
US-6426801	Jul 30, 2002	William Henry Reed	Printer Apparatuses And Methods For Using The Same
US-6425655	Jul 30, 2002	Girish Shivaji Patil	Dual Curable Encapsulating Material
US-6431677	Aug 13, 2002	Frank Edward Anderson	Print Head Drive Scheme
US-6485124	Nov 26, 2002	Dave Golman King	Optical Alignment Method And Detector
US-6540334	Apr 01, 2003	Jim Michael Mrvos	Method For Making Ink Jet Printheads
US-6575563	Jun 10, 2003	Robert Wilson Cornell	Power/Volume Regime For Ink Jet Printers
US-6601934	Aug 05, 2003	Eric Todd Debusschere	Storage Of Total Ink Drop Fired Count In An Imaging Device
US-6629747	Oct 07, 2003	David G. King	Method For Determining Ink Drop Velocity Of Carrier-Mounted Printhead
US-6637866	Oct 28, 2003	Robert Wilson Cornell	Energy Efficient Heater Stack Using Dlc Island

Patent Number	Issue Date	First Named Inventor	Title
US-6665092	Dec 16, 2003	William Henry Reed	Printer Apparatuses And Methods For Using The Same
US-6666449	Dec 23, 2003	Stephen Francis Defosse	Star Wheel Surface Enhancement And Process Of Manufacture
US-6676246	Jan 13, 2004	Frank Edward Anderson	Heater Construction For Minimum Pulse Time
US-6704996	Mar 16, 2004	Jim Michael Mrvos	Method For Making Ink Jet Printheads
US-6709096	Mar 23, 2004	Bradley Leonard Beach	Method Of Printing And Layered Intermediate Used In Inkjet Printing
US-6712442	Mar 30, 2004	Peter Brown Pickett	Method Of Image Rasterization And Imaging An Address Space An Ink Jet Printers
US-6719405	Apr 13, 2004	James H. Powers	Inkjet Printhead Having Convex Wall Bubble Chamber
US-6739698	May 25, 2004	Michael James Benson	Off-Carrier Tubing Layout
US-6764163	Jul 20, 2004	Frank Edward Anderson	Heater Configuration For Tri-Color Heater Chip
US-6773088	Aug 10, 2004	Charles Stanley Aldrich	Double Lipped Printhead Maintenance Cap
US-6786575	Sep 07, 2004	Frank Edward Anderson	Ink Jet Heater Chip And Method Therefor
US-6796636	Sep 28, 2004	Kin-Ming Kwan	Two Shot Molded Inkjet Printhead Lid For Laser Welding
US-6805431	Oct 19, 2004	Frank Edward Anderson	Heater Chip With Doped Diamond-Like Carbon Layer And Overlying Cavitation Layer
US-6817707	Nov 16, 2004	John R. Fowler	Pressure Controlled Ink Jet Printhead Assembly
US-6834941	Dec 28, 2004	Byron Vencent Bell	Heater Chip Configuration For An Inkjet Printhead And Printer
US-6863381	Mar 08, 2005	George Keith Parish	Inkjet Printhead Heater Chip With Asymmetric Ink Vias
US-6890062	May 10, 2005	Byron Vencent Bell	Heater Chip Configuration For An Inkjet Printhead And Printer
US-6890065	May 10, 2005	Paul Timothy Spivey	Heater Chip For An Inkjet Printhead
US-6935795	Aug 30, 2005	Mark Walter Fagan	Method For Reducing The Effects Of Printhead Carrier Disturbance During Printing With An Imaging Apparatus
US-6951384	Oct 04, 2005	Frank Edward Anderson	Ink Jet Heater Chip And Method Therefor
US-6959979	Nov 01, 2005	Richard L. Goin	Multiple Drop-Volume Printhead Apparatus And Method
US-7014299	Mar 21, 2006	George Keith Parish	Inkjet Printhead Heater Chip With Asymmetric Ink Vias
US-7018012	Mar 28, 2006	J. Glenn Edelen	Microfluid Ejection Device Having Efficient Logic And Driver Circuitry
US-7041226	May 09, 2006	Karthik Vaideeswaran	Methods For Improving Flow Through Fluidic Channels
US-7077509	Jul 18, 2006	George Keith Parish	Inkjet Printhead Heater Chip With Asymmetric Ink Vias
US-7080896	Jul 25, 2006	Byron V. Bell	Micro-Fluid Ejection Device Having High Resistance Heater Film
US-7086713	Aug 08, 2006	Edward Lynn Triplett	Media Detack From An Intermediate Printing Member
US-7152951	Dec 26, 2006	Colin G. Maher	High Resolution Ink Jet Printhead
US-7159974	Jan 09, 2007	Trevor D. Gray	Semipermeable Membrane For An Ink Reservoir And Method Of Attaching The Same
US-7163272	Jan 16, 2007	George K. Parish	Inkjet Print Head
US-7178904	Feb 20, 2007	Frank E. Anderson	Ultra-Low Energy Micro-Fluid Ejection Device

Patent Number	Issue Date	First Named Inventor	Title
US-7195348	Mar 27, 2007	Jeffery J. Buchanan	Laser Welded Inkjet Printheads Having Non-Uniformly Thick Printhead Lids
US-7195341	Mar 27, 2007	David G. King	Power And Ground Buss Layout For Reduced Substrate Size
US-7207652	Apr 24, 2007	Bruce D. Gibson	Balanced Satellite Distributions
US-7222936	May 29, 2007	Frederick Charles Griesemer	Printhead Carrier Positioning Apparatus And Method
US-7244015	Jul 17, 2007	George Keith Parish	Inkjet Printhead Heater Chip With Asymmetric Ink Vias
US-7258434	Aug 21, 2007	Brian D. Smith	Inkjet Printheads Having Multiple Label Placement Positions For Air Diffusion Vents
US-7289243	Oct 30, 2007	Mark W. Fagan	Apparatus And Method For Data Compression Optimized By Print Head Architecture
US-7290864	Nov 06, 2007	David G. King	Heater Chips With A Reduced Number Of Bondpads
US-7311385	Dec 25, 2007	John G. Edelen	Micro-Fluid Ejecting Device Having Embedded Memory Device
US-7350888	Apr 01, 2008	Lucas D. Barkley	Composite Printhead Fire Signals
US-7364268	Apr 29, 2008	Brian C. Hart	Nozzle Members, Compositions And Methods For Micro-Fluid Ejection Heads
US-7364261	Apr 29, 2008	Marc Alan Herwald	Directionally Dependent Carrier Isolator For An Imaging Apparatus
US-7401875	Jul 22, 2008	Stuart M. Jacobsen	Inkjet Printhead Incorporating A Memory Array
US-7410246	Aug 12, 2008	Byron Vencent Bell	Heater Chip Configuration For An Inkjet Printhead And Printer
US-7413289	Aug 19, 2008	Robert W. Cornell	Low Energy, Long Life Micro-Fluid Ejection Device
US-7438397	Oct 21, 2008	James Daniel Anderson	Methods And Devices For Purging Gases From An Ink Reservoir
US-7445323	Nov 04, 2008	James Daniel Anderson	Ink Cartridge Venting
US-7452058	Nov 18, 2008	Robert Wilson Cornell	Substantially Planar Ejection Actuators And Methods Relating Thereto
US-7479203	Jan 20, 2009	David L. Bernard	Lamination Of Dry Film To Micro-Fluid Ejection Head Substrates
US-7484823	Feb 03, 2009	Lucas David Barkley	Methods And Apparatuses For Regulating The Temperature Of Multi-Via Heater Chips
US-7559629	Jul 14, 2009	David G. King	Methods And Apparatuses For Implementing Multi-Via Heater Chips
US-7559630	Jul 14, 2009	Byron Vencent Bell	Substantially Planar Fluid Ejection Actuators And Methods Related Thereto
US-7571979	Aug 11, 2009	Girish S. Patil	Thick Film Layers And Methods Relating Thereto
US-7594708	Sep 29, 2009	Lucas David Barkley	Methods And Apparatuses For Sensing Temperature Of Multi-Via Heater Chips
US-7597419	Oct 06, 2009	Marc Alan Herwald	Directionally Dependent Carrier Isolator For An Imaging Apparatus
US-7635174	Dec 22, 2009	Steven W. Bergstedt	Heater Chip Test Circuit And Methods For Using The Same
US-7673973	Mar 09, 2010	John G. Edelen	Micro-Fluid Ejecting Device Having Embedded Memory Devices
US-7690760	Apr 06, 2010	Colin G. Maher	High Resolution Ink Jet Printhead

Patent Number	Issue Date	First Named Inventor	Title
US-7766455	Aug 03, 2010	David Christopher Graham	Flexible Adhesive Materials For Micro-Fluid Ejection Heads And Methods Relating Thereto
US-7784918	Aug 31, 2010	Robert W. Cornell	Low Energy, Long Life Micro-Fluid Ejection Device
US-7784917	Aug 31, 2010	Byron Vencent Bell	Process For Making A Micro-Fluid Ejection Head Structure
US-7815289	Oct 19, 2010	David Laurier Bernard	Micro-Fluid Ejection Heads And Methods For Bonding Substrates To Supports
US-7819498	Oct 26, 2010	Jason Todd Mcreynolds	Methods And Systems Using Printhead Tank Memory To Determine Printhead Tank Configuration
US-7841712	Nov 30, 2010	Robert Muyskens	Automatic Printhead And Tank Instant Positioning
US-7850286	Dec 14, 2010	John Glenn Edelen	Micro-Fluid Ejector Pattern For Improved Performance
US-7850284	Dec 14, 2010	David L. Bernard	Method For Dry Etching Fluid Feed Slots In A Silicon Substrate
US-7918015	Apr 05, 2011	Byron V. Bell	Micro-Fluid Ejection Device Having High Resistance Heater Film
US-7938523	May 10, 2011	Charles Stanley Aldrich	Fluid Supply Tank Ventilation For A Micro-Fluid Ejection Head
US-7954929	Jun 07, 2011	John Glenn Edelen	Micro-Fluid Ejecting Device Having Embedded Memory In Communication With An External Controller
US-8113618	Feb 14, 2012	Jason Todd Mcreynolds	Methods And Systems Using Printhead Tank Memory To Determine Printhead Tank Configuration
US-8172369	May 08, 2012	Steven Wayne Bergstedt	Inkjet Printhead Substrate With Distributed Heater Elements
US-8235518	Aug 07, 2012	Robert Lee Cornell	Uv-Curable Coatings And Methods For Applying Uv-Curable Coatings Using Thermal Micro-Fluid Ejection Heads
US-8313168	Nov 20, 2012	Sam Norasak	Wind Baffles For Micro-Fluid Ejection Devices
US-8328330	Dec 11, 2012	Richard Louis Goin	Nozzle Plate For Improved Post-Bonding Symmetry
US-8491107	Jul 23, 2013	Neal D. Mcfarland	Fluid Container Having Mixing Chambers For Micro-Fluid Applications
US-8657411	Feb 25, 2014	Frank E. Anderson	Fluid Ejection Device And Method For Fabricating Fluid Ejection Device
US-8678557	Mar 25, 2014	Jiandong Fang	Substrate Structure For Ejection Chip And Method For Fabricating Substrate Structure
US-8826502	Sep 09, 2014	David Laurier Bernard	Micro-Fluid Ejection Heads And Methods For Bonding Substrates To Supports
US-8844137	Sep 30, 2014	Xiaorong Cai	Ejection Devices For Inkjet Printers And Method For Fabricating Ejection Devices
US-8882221	Nov 11, 2014	David Laurier Bernard	Modular Micro-Fluid Ejection Head Assembly

Electronic Acknowledgement Receipt	
EFS ID:	40041189
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	1912
Filer:	Lynn Ann Lehnert
Filer Authorized By:	
Attorney Docket Number:	35968/929
Receipt Date:	19-JUL-2020
Filing Date:	30-DEC-2005
Time Stamp:	11:21:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment		no			
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA_Slingshot.pdf	5022502	no	6
			32e252eb2c63fe9d621d8eb8405b5102590be2ee		
Warnings:					

Information:	
Total Files Size (in bytes):	5022502
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.	

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

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

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

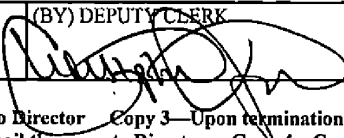
DOCKET NO. 1:20-CV-189-ADA	DATE FILED 2/19/2020	U.S. DISTRICT COURT Western District of Texas, Austin Division
PLAINTIFF Slingshot Printing LLC		DEFENDANT HP Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,484,823		Slingshot Printing LLC
2 7,594,708		Slingshot Printing LLC
3		
4		
5		

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

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

DECISION/JUDGEMENT

CLERK Jeannette J. Clack	(BY) DEPUTY CLERK 	DATE February 19, 2020
------------------------------------	---	----------------------------------

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

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

SLINGSHOT PRINTING LLC,

Plaintiff.

v.

HP INC.,

Defendant.

Civil Action No. 6:20-cv-00048-ADA

ORDER TRANSFERRING CASE TO AUSTIN DIVISION

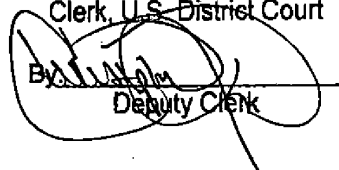
The Court, having reviewed and considered the Joint Stipulation to Transfer Venue to the Austin Division, does hereby ORDER that the above-captioned action be TRANSFERRED to the Austin Division but remain on the docket of United States District Judge Alan D Albright.

SIGNED this 19th day of February, 2020.



HONORABLE ALAN D ALBRIGHT
UNITED STATES DISTRICT COURT JUDGE

A true copy of the original, I certify.
Clerk, U.S. District Court



By _____
Deputy Clerk

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

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

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

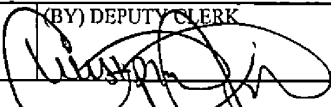
DOCKET NO. 1:20-CV-187-ADA	DATE FILED 2/19/2020	U.S. DISTRICT COURT Western District of Texas, Austin Division
PLAINTIFF Slingshot Printing LLC		DEFENDANT HP Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 6,213,587		Slingshot Printing LLC
2 6,575,563		Slingshot Printing LLC
3 6,676,246		Slingshot Printing LLC
4 6,786,575		Slingshot Printing LLC
5 7,018,012		Slingshot Printing LLC

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,195,341		Slingshot Printing LLC
2 7,290,864		Slingshot Printing LLC
3 7,410,246		Slingshot Printing LLC
4 7,484,823		Slingshot Printing LLC
5 7,559,629		Slingshot Printing LLC

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

DECISION/JUDGEMENT

CLERK Jeannette J. Clack	(BY) DEPUTY CLERK 	DATE February 19, 2020
------------------------------------	---	----------------------------------

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

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

SLINGSHOT PRINTING LLC,

Plaintiff.

v.

HP INC.,

Defendant.

Civil Action No. 6:19-cv-00549-ADA

ORDER TRANSFERRING CASE TO AUSTIN DIVISION

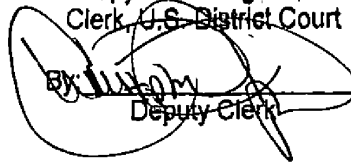
The Court, having reviewed and considered the Joint Stipulation to Transfer Venue to the Austin Division, does hereby ORDER that the above-captioned action be TRANSFERRED to the Austin Division but remain on the docket of United States District Judge Alan D Albright.

SIGNED this 19th day of February, 2020.



HONORABLE ALAN D ALBRIGHT
UNITED STATES DISTRICT COURT JUDGE

A true copy of the original, I certify.
Clerk, U.S. District Court



Deputy Clerk

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

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

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

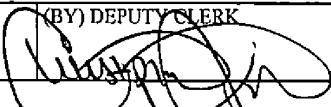
DOCKET NO. 1:20-CV-187-ADA	DATE FILED 2/19/2020	U.S. DISTRICT COURT Western District of Texas, Austin Division
PLAINTIFF Slingshot Printing LLC		DEFENDANT HP Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 6,213,587		Slingshot Printing LLC
2 6,575,563		Slingshot Printing LLC
3 6,676,246		Slingshot Printing LLC
4 6,786,575		Slingshot Printing LLC
5 7,018,012		Slingshot Printing LLC

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,195,341		Slingshot Printing LLC
2 7,290,864		Slingshot Printing LLC
3 7,410,246		Slingshot Printing LLC
4 7,484,823		Slingshot Printing LLC
5 7,559,629		Slingshot Printing LLC

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

DECISION/JUDGEMENT

CLERK Jeannette J. Clack	(BY) DEPUTY CLERK 	DATE February 19, 2020
------------------------------------	---	----------------------------------

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

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

SLINGSHOT PRINTING LLC,

Plaintiff.

v.

HP INC.,

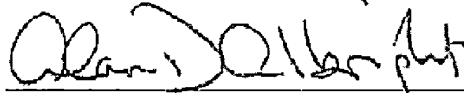
Defendant.

Civil Action No. 6:19-cv-00549-ADA

ORDER TRANSFERRING CASE TO AUSTIN DIVISION

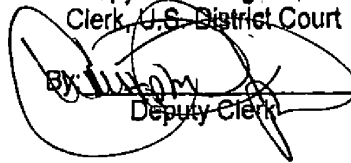
The Court, having reviewed and considered the Joint Stipulation to Transfer Venue to the Austin Division, does hereby ORDER that the above-captioned action be TRANSFERRED to the Austin Division but remain on the docket of United States District Judge Alan D Albright.

SIGNED this 19th day of February, 2020.



HONORABLE ALAN D ALBRIGHT
UNITED STATES DISTRICT COURT JUDGE

A true copy of the original, I certify.
Clerk, U.S. District Court



Deputy Clerk

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas - Waco Division on the following

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

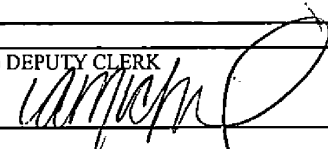
DOCKET NO. 6:19-cv-549	DATE FILED 9/20/2019	U.S. DISTRICT COURT Western District of Texas - Waco Division
PLAINTIFF Slingshot Printing, LLC		DEFENDANT HP, Inc.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 ~~See Attached~~		
2 6,213,587		
3 6,575,563		
4 6,676,246		
5 6,786,575		

7,018,012

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

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 7,195,341		
2 7,290,864		
3 7,410,246		
4 7,484,823		
5 7,559,629		

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

DECISION/JUDGEMENT		
CLERK Jeannette J. Clack	(BY) DEPUTY CLERK 	DATE 9/20/2019

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



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
11/324,167	12/30/2005	Lucas David Barkley	35968/929

1912
AMSTER, ROTHSTEIN & EBENSTEIN LLP
90 PARK AVENUE
NEW YORK, NY 10016

CONFIRMATION NO. 6156
POA ACCEPTANCE LETTER



Date Mailed: 07/23/2014

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/03/2014.

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.

/rmtturner myles/

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



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
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02

CONFIRMATION NO. 6156

POWER OF ATTORNEY NOTICE



OC000000069748807

21972
LEXMARK INTERNATIONAL, INC.
INTELLECTUAL PROPERTY LAW DEPARTMENT
740 WEST NEW CIRCLE ROAD
BLDG. 004-1
LEXINGTON, KY 40550-0999

Date Mailed: 07/23/2014

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/03/2014.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

/rmtturner myles/

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

PATENT - POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS	Patent Number	7,484,823
	Issue Date	February 3, 2009
	First Named Inventor	Lucas David Barkley
	Title	METHODS AND APPARATUS FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS
	Attorney Docket Number	35968/929

I hereby revoke all previous powers of attorney given in the above-identified patent.

☐ A Power of Attorney is submitted herewith.

OR

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith: 01912

OR

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) with respect to the patent identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

Practitioner(s) Name	Registration Number

Please recognize or change the correspondence address for the above-identified patent to:

☒ The address associated with the above-mentioned Customer Number.

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name			
Address			
City	State	Zip	
Country			
Telephone	Email		

I am the:

☐ Inventor, having ownership of the patent.

OR

☒ Patent owner.
Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on _____

SIGNATURE of Inventor or Patent Owner

Signature	Date
	June 9, 2013
Name	Telephone
Yoshinisa SHIMIZU	81-72-870-4353
Title and Company	
Senior General Manager of Intellectual Property Div., Funai Electric Co., Ltd.	

NOTE: Signatures of all the inventors or patent owners of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☒ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 5 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-0199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: FUNAI ELECTRIC CO., LTD.

Application No./Patent No.: 7,484,823

Filed/Issue Date: February 3, 2009

Titled: METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS

FUNAI ELECTRIC CO., LTD.

, a Corporation

(Name of Assignee)

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

states that it is:

1. ☒ the assignee of the entire right, title, and interest in;
2. ☐ an assignee of less than the entire right, title, and interest in
(The extent (by percentage) of its ownership interest is _____ %); or
3. ☐ the assignee of an undivided interest in the entirety of (a complete assignment from one of the joint inventors was made)

the patent application/patent identified above, by virtue of either:

- 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 _____, Frame _____, or for which a copy therefore is attached.

OR

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

1. From: Lucas David Barkley, et al. To: LEXMARK INTERNATIONAL, INC.

The document was recorded in the United States Patent and Trademark Office at
Reel 017386, Frame 0528, or for which a copy thereof is attached.

2. From: LEXMARK INTERNATIONAL, INC. To: FUNAI ELECTRIC CO., LTD

The document was recorded in the United States Patent and Trademark Office at
Reel 030416, Frame 0001, or for which a copy thereof is attached.

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.

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

- ☒ As required by 37 CFR 3.73(b)(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.

/Benjamin M. Halpern/

6/12/2014 (929)

Signature

Date

Benjamin M. Halpern

46494

Printed or Typed Name

Title

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.

Privacy Act Statement

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

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

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

Electronic Acknowledgement Receipt	
EFS ID:	19489296
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Benjamin M. Halpern/Jennifer Doran
Filer Authorized By:	Benjamin M. Halpern
Attorney Docket Number:	2005-0547.02
Receipt Date:	03-JUL-2014
Filing Date:	30-DEC-2005
Time Stamp:	12:31:24
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	1poa.pdf	104073 8867ca89097a8681c46894df2e62d34b1e324cb3	no	1
Warnings:					
Information:					

2	Assignee showing of ownership per 37 CFR 3.73.	2statement.pdf	774612 7ea534df8a3f7147d60eb7d2396b9472e9a a0a3f	no	2
Warnings:					
Information:					
Total Files Size (in bytes):				878685	
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	02/03/2009	7484823	2005-0547.02	6156

21972 7590 01/14/2009
LEXMARK INTERNATIONAL, INC.
INTELLECTUAL PROPERTY LAW DEPARTMENT
740 WEST NEW CIRCLE ROAD
BLDG. 082-1
LEXINGTON, KY 40550-0999

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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

The Patent Term Adjustment is 152 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

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

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

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

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

Lucas David Barkley, Lexington, KY;
Bruce David Gibson, Lexington, KY;
Eric Spencer Hall, Lexington, KY;
David G. King, Shelbyville, KY;
George K. Parish, Winchester, KY;



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
21972 7590 12/24/2008 LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999			EXAMINER NGUYEN, LAM S	
			ART UNIT 2853	PAPER NUMBER
			MAIL DATE 12/24/2008	DELIVERY MODE PAPER

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

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



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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
11324167	12/30/05	BARKLEY ET AL.	2005-0547.02

LEXMARK INTERNATIONAL, INC.
INTELLECTUAL PROPERTY LAW DEPARTMENT
740 WEST NEW CIRCLE ROAD
BLDG. 082-1
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EXAMINER

LAM S. NGUYEN

ART UNIT	PAPER
2853	20081222

DATE MAILED:

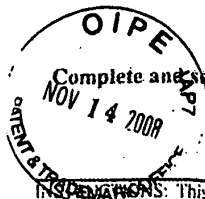
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Commissioner for Patents

The Information Disclosure Statement dated 09/22/2008 is entered.

/LAM S NGUYEN/
Examiner, Art Unit 2853

PTO-90C (Rev.04-03)



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21972 7590 08/25/2008

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

11/18/2008 SSANDARI 00000001 121213 11324167

01 FC:8001 3.00 DA

02 FC:1501 APPLICATION NO 300.00 DAFILING DATE

FIRST NAMED INVENTOR

ATTORNEY DOCKET NO.

CONFIRMATION NO.

11/24/167

12/30/2005

Lucas David Barkley

2005-0547.02

6156

TITLE OF INVENTION: METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEES DUE	DATE DUE
nonprovisional	NO	\$1440	\$300	\$0	\$1740	11/25/2008
EXAMINER	ART UNIT	CLASS-SUBCLASS	11/17/2008 SSANDARI 00000016 121213 11324167			
NGUYEN, LAM S	2853	347-017000	01 FC:1501 1510.00 DA			

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

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

2. For printing on the patent front page, list

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

Sutherland, Asbill & Brennan LLP

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

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(A) NAME OF ASSIGNEE

Lexmark International, Inc.

(B) RESIDENCE (CITY AND STATE OR COUNTRY)

Lexington, Kentucky

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

4a. The following fee(s) are submitted:

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- ☐ A check is enclosed.
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- ☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 12-1213 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant, a registered attorney or agent, or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature:

Date

11/13/2008

Typed or printed name

Neil R. Kahle, Jr.

Registration No.

50,383

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

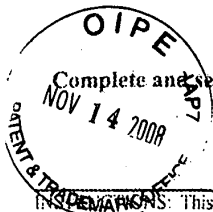
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Electronic Acknowledgement Receipt	
EFS ID:	4288162
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Neill R. Kahle./Lori Woods
Filer Authorized By:	Neill R. Kahle.
Attorney Docket Number:	2005-0547.02
Receipt Date:	14-NOV-2008
Filing Date:	30-DEC-2005
Time Stamp:	07:57:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no				
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	2005-0547-02IssueFee.pdf	1075707 52c1f78eaf601584867593ed433f4a82eb5d8b5	no	1
Warnings:					
Information:					

Total Files Size (in bytes):	1075707
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21972 7590 08/25/2008

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

11/18/2008 SSANDAR1 00000001 121213 11324167

01 FC:8001 3.00 DA
02 FC:1500 300.00 DAFILING DATE

REGISTRATION NO.	DAFILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324.167	12/30/2005	Lucas David Barkley	2005-0547.02	6156

TITLE OF INVENTION: METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1440	\$300	\$0	\$1740	11/25/2008
EXAMINER	ART UNIT	CLASS-SUBCLASS	11/17/2008 SSANDAR1 00000016 121213 11324167			
NGUYEN, LAM S	2853	347-017000	01 FC:1501 1510.00 DA			

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☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

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(A) NAME OF ASSIGNEE

Lexmark International, Inc.

(B) RESIDENCE (CITY and STATE OR COUNTRY):

Lexington, Kentucky

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

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- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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Neill R. Kahle, Jr.

Date

11/13/2008

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Registration No.

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(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156

TITLE OF INVENTION: METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1440	\$300	\$0	\$1740	11/25/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, LAM S	2853	347-017000

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Lexington, Kentucky

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Authorized Signature

Neil R. Kahle, Jr.

Date

11/13/2008

Typed or printed name

Neil R. Kahle, Jr.

Registration No.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
7590 09/24/2008 LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999 EXAMINER NGUYEN, LAM S				
			ART UNIT	PAPER NUMBER
			2853	
			MAIL DATE	DELIVERY MODE
			09/24/2008	PAPER

NOTICE OF NON-COMPLIANT INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement (IDS) filed 09-22-08 in the above-identified application fails to meet the requirements of 37 CFR 1.97(d) for the reason(s) specified below. Accordingly, the IDS will be placed in the file, but the information referred to therein has not been considered.

The IDS is not compliant with 37 CFR 1.97(d) because:

- ☐ The IDS lacks a statement as specified in 37 CFR 1.97(e).
- ☒ The IDS lacks the fee set forth in 37 CFR 1.17(p).
- ☐ The IDS was filed after the issue fee was paid. Applicant may wish to consider filing a petition to withdraw the application from issue under 37 CFR 1.313(c) to have the IDS considered. See MPEP 1308.

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

Electronic Patent Application Fee Transmittal				
Application Number:		11324167		
Filing Date:		30-Dec-2005		
Title of Invention:		METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS		
First Named Inventor/Applicant Name:		Lucas David Barkley		
Filer:		Neill R. Kahle./Lori Woods		
Attorney Docket Number:		2005-0547.02		
Filed as Large Entity				
Utility under 35 USC 111(a) Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
Total in USD (\$)				180

Electronic Acknowledgement Receipt	
EFS ID:	4087219
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Neill R. Kahle./Lori Woods
Filer Authorized By:	Neill R. Kahle.
Attorney Docket Number:	2005-0547.02
Receipt Date:	09-OCT-2008
Filing Date:	30-DEC-2005
Time Stamp:	14:36:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$180
RAM confirmation Number	8809
Deposit Account	121213
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

- Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)
- Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)					
Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)					
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	2005-0547-02NoticeNoncompl DS.pdf	495298 155c9add4205f2d029035d5e03d41ba7163d6619	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-06)	fee-info.pdf	30608 cd03f451319ee513052dce9b19145ce33059a5e4	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			525906		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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

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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
7590 09/24/2008 LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999			EXAMINER NGUYEN, LAM S	
			ART UNIT 2853	PAPER NUMBER
			MAIL DATE 09/24/2008	DELIVERY MODE PAPER

NOTICE OF NON-COMPLIANT INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement (IDS) filed 09-22-08 in the above-identified application fails to meet the requirements of 37 CFR 1.97(d) for the reason(s) specified below. Accordingly, the IDS will be placed in the file, but the information referred to therein has not been considered.

The IDS is not compliant with 37 CFR 1.97(d) because:

- ☐ The IDS lacks a statement as specified in 37 CFR 1.97(e).
- ☒ The IDS lacks the fee set forth in 37 CFR 1.17(p).
- ☐ The IDS was filed after the issue fee was paid. Applicant may wish to consider filing a petition to withdraw the application from issue under 37 CFR 1.313(c) to have the IDS considered. See MPEP 1308.

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

Electronic Acknowledgement Receipt	
EFS ID:	3978125
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Neill R. Kahle./Lori Woods
Filer Authorized By:	Neill R. Kahle.
Attorney Docket Number:	2005-0547.02
Receipt Date:	22-SEP-2008
Filing Date:	30-DEC-2005
Time Stamp:	10:29:38
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	Information Disclosure Statement Letter	2005-0547-02IDSLTR.pdf	462613 f5ef667db8fd8ab5ab07da1aa5f833a05b13 dcc2	no	1
Warnings:					
Information:					

2	Information Disclosure Statement (IDS) Filed (SB/08)	2005-0547-02IDS.pdf	1005531 61a5bd7d18eec6703d284c605656e69f56db8fe	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
Total Files Size (in bytes):				1468144	
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.					

Practitioner's Docket No. 2005-0547.02

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Lucas David Barkley

Application No.: 11/324,167

Group No.: 2853

Filed: December 30, 2005

Examiner: NGUYEN, LAM S

Entitled: **Methods and Apparatuses for Regulating the Temperature of Multi-via Heater Chips**

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

STATEMENT FOR INFORMATION DISCLOSURE
UNDER 37 C.F.R. § 1.97(e)

IDENTIFICATION OF INFORMATION DISCLOSURE STATEMENT
FOR WHICH THIS STATEMENT IS BEING MADE

1. This statement is being made for the Information Disclosure Statement filed September 22, 2008.

STATEMENT

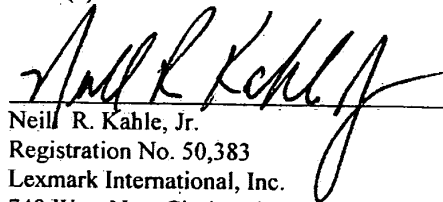
2. I, the person signing below, state that each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. 37 C.F.R. § 1.97(e)(1).

IDENTIFICATION OF PERSON MAKING THIS STATEMENT

3. The person making this certification is:
 - (a) the practitioner who signs below on the basis of the information supplied by an individual designated in section 1.56(c).

Date:

9/22/08



Neill R. Kahle, Jr.
Registration No. 50,383
Lexmark International, Inc.
740 West New Circle Rd.
Intellectual Property Law Dept.
Lexington, KY 40550
US
859-232-7892
Customer No. 21972

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Substitute for form 1449A/PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known

Application Number	11/324,167
Filing Date	12/30/2005
First Named Inventor	Lucas David Barkley
Art Unit	2853
Examiner Name	Nguyen, Lam S
Attorney Docket Number	2005-0547.02

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number Number-Kind Code ² (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 4791435 A	12/13/1988	Smith et al.	
		US- 20050041049 A1	02/24/2005	Masuda	
		US- 20020075343 A1	06/20/2002	Classens et al.	
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FOREIGN PATENT DOCUMENTS

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

Examiner Signature	Date Considered
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*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, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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



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NOTICE OF ALLOWANCE AND FEE(S) DUE

21972 7590 08/25/2008

LEXMARK INTERNATIONAL, INC.
INTELLECTUAL PROPERTY LAW DEPARTMENT
740 WEST NEW CIRCLE ROAD
BLDG. 082-1
LEXINGTON, KY 40550-0999

EXAMINER

NGUYEN, LAM S

ART UNIT

PAPER NUMBER

2853

DATE MAILED: 08/25/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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11/324,167

12/30/2005

Lucas David Barkley

2005-0547.02

6156

TITLE OF INVENTION: METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1440	\$300	\$0	\$1740	11/25/2008

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 SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

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

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

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

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

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

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

21972 7590 08/25/2008

LEXMARK INTERNATIONAL, INC.
 INTELLECTUAL PROPERTY LAW DEPARTMENT
 740 WEST NEW CIRCLE ROAD
 BLDG. 082-1
 LEXINGTON, KY 40550-0999

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

Certificate of Mailing or Transmission

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

11/324,167 12/30/2005 Lucas David Barkley 2005-0547.02 6156

TITLE OF INVENTION: METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1440	\$300	\$0	\$1740	11/25/2008

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, LAM S	2853	347-017000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

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

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (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. 2 _____
- 3 _____

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

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

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY AND STATE OR COUNTRY)

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

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
21972	7590	08/25/2008	EXAMINER	
LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999			NGUYEN, LAM S	
			ART UNIT	PAPER NUMBER
			2853	
			DATE MAILED: 08/25/2008	

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

The Patent Term Adjustment to date is 246 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 246 day(s).

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

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

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

Notice of Allowability	Application No.		Applicant(s)	
	11/324,167		BARKLEY ET AL.	
	Examiner		Art Unit	
	LAM S. NGUYEN		2853	

-- 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 RCE dated 7/30/08.

2. ☒ The allowed claim(s) is/are 1-7,9-17 and 20.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some* c) ☐ None of 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.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 (b) ☐ 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. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948) 3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date <u>7/29/08, 7/14/08</u> 4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material	5. ☐ Notice of Informal Patent Application 6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____. 7. ☒ Examiner's Amendment/Comment 8. ☐ Examiner's Statement of Reasons for Allowance 9. ☐ Other _____.
---	---

/LAM S NGUYEN/ Examiner, Art Unit 2853	
---	--

CLAIM REJOINDER

Claims 1 and 12 are generic and allowable. Accordingly, the restriction requirement as to the encompassed species is hereby withdrawn and claims 2-4 and 14-15 are no longer withdrawn from consideration since all of the claims to these species depend from or otherwise include each of the limitations of an allowed generic claim.

In view of the above noted withdrawal of the restriction requirement as to the linked species, applicant(s) are advised that if any claim(s) depending from or including all the limitations of the allowable generic linking claim(s) be presented in a continuation or divisional application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 44 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended to correct the dependence of claim 9, which currently depends on claim 8 being cancelled. As a result, claim 9 is corrected to depend on claim 1, which claim 8 previously depended on.

In the claims:

Claim 9: Replaced "8" in "The chip of claim 8" to --1--.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/LAM S NGUYEN/
Examiner, Art Unit 2853



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CONFIRMATION NO. 6156

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.		
11/324,167	12/30/2005	347	2853	2005-0547.02		
RULE						
APPLICANTS Lucas David Barkley, Lexington, KY; Bruce David Gibson, Lexington, KY; Eric Spencer Hall, Lexington, KY; David G. King, Shelbyville, KY; George K. Parish, Winchester, KY;						
** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 02/14/2006						
Foreign Priority claimed ☐ Yes ☒ No 35 USC 119(a-d) conditions met ☐ Yes ☒ No Verified and Acknowledged <u>/LAM S NGUYEN/</u> Examiner's Signature		☐ Met after Allowance Initials	STATE OR COUNTRY KY	SHEETS DRAWINGS 5	TOTAL CLAIMS 17 LN 20*	INDEPENDENT CLAIMS 2
ADDRESS LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999 UNITED STATES						
TITLE Methods and apparatuses for regulating the temperature of multi-via heater chips						
FILING FEE RECEIVED 1130	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:			☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

EAST Search History

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L1	299	lexmark.as. and (barkley.in. or gibson.in. or hall.in. or king.in. or parish.in.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 13:29
L2	0	1 and (tempearture)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 13:29
L3	171	1 and (temperature or heat\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 13:29
L4	62	3 and (temperature or heat\$4) and (sens\$4 or monitor\$4 or detec\$4 or measur\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 13:30
L5	47	4 and ((temperature or heat\$4) same (sens\$4 or monitor\$4 or detec\$4 or measur\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 13:30
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L8	109	3 not 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 13:39
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L11	128	1 not 3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 13:46

8/ 14/ 08 1:48:44 PM

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L5	5	("5644343" "5648805" "6276777").PN. OR ("6565178").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/08/14 14:07
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8/ 14/ 08 2:09:56 PM

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L2	883	347/12.CCLS.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 22:10
L3	2	11/324167 11/323809	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 22:12
L4	13	("4066918" "4313124" "4345262" "4459600" "4463359" "4558333" "4723129" "4740796" "5083137" "5371395" "5389953" "6302504").PN. OR ("6945622"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/08/14 22:26
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L8	28	("3648340" "4250384" "4751530" "4782350" "5038184" "5166646" "5389956").PN. OR ("5589864"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/08/14 22:36
L9	2	JP-11245409-\$. DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/14 22:39

8/14/08 10:40:54 PM

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L3	8	("20010004263" "20020027574" "20020052932" "20030081034" "20030142159" "6382773" "6612673" "6634731").PN. OR ("7163272").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/08/14 23:01
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8/ 14/ 08 11:23:37 PM

Issue Classification 	Application/Control No.		Applicant(s)/Patent under Reexamination	
	11/324,167		BARKLEY ET AL.	
	Examiner		Art Unit	
	LAM S. NGUYEN		2853	

ISSUE CLASSIFICATION											
ORIGINAL					CROSS REFERENCE(S)						
CLASS		SUBCLASS			CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
347		17			347	12	14				
INTERNATIONAL CLASSIFICATION											
B	4	1	J	29/38							
				/							
				/							
				/							
				/							
_____ (Assistant Examiner) (Date)					/LAM S NGUYEN/ 08/16/08 (Primary Examiner) (Date)					Total Claims Allowed: 17	
_____ (Legal Instruments Examiner) (Date)										O.G. Print Claim(s) 1	

☐ Claims renumbered in the same order as presented by applicant				☐ CPA				☒ T.D.				☐ R.1.47			
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original		
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EAST Search History

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8/ 14/ 08 11:25:41 PM

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L4	183	3 and ((heat\$4 or thermal or resistance or resistor\$1) same array\$4 same (via or slot\$1)) and (temperature same (sens\$4 or measur\$4 or detect\$4 or monitor\$4) same (within or between or central\$4)) and ((extend\$4 or length\$4) same (array\$1)) and (adjacent\$4) and (regulat\$4 same heat\$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/15 23:22
L5	49	4 and "347"/\$.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/15 23:23
L6	2	5 and "347"/17.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/08/15 23:23
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L19	8	("20010004263" "20020027574" "20020052932" "20030081034" "20030142159" "6382773" "6612673" "6634731").PN. OR ("7163272").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/08/15 23:48
L20	12	("4791435" "4910528" "5045870" "5107276" "5168284" "5175565" "5211812" "5475405" "5635968" "5734391" "5736995").PN. OR ("6382773").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/08/15 23:49
L21	5	("5644343" "5648805" "6276777").PN. OR ("6565178").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2008/08/15 23:50
L22	13	("5644343").URPN.	USPAT	OR	OFF	2008/08/15 23:50

8/ 15/ 08 11:51:55 PM

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PTO/SB/08a (05-07)

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167
	Filing Date		2005-12-30
	First Named Inventor	Lucas David Barkley, et al.	
	Art Unit	2853	
	Examiner Name	Lam S. Nguyen	
	Attorney Docket Number	2005-0547-02	

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
/L.N./	1	6357863		2002-03-19	Anderson, et al.	
/L.N./	2	6601941		2003-08-05	Jones, et al.	
/L.N./	3	6382773		2002-05-05	Chang, et al.	
/L.N./	4	6641242		2003-08-05	Canti, et al.	
/L.N./	5	6644774		2003-11-11	Burger, et al.	
/L.N./	6	6764163		2004-07-20	Anderson, et al.	
/L.N./	7	6808243		2004-10-26	Markham, et al.	
/L.N./	8	6871929		2005-03-29	Crivelli, et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167	
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	Art Unit	2853		
	Examiner Name	Lam S. Nguyen		
Attorney Docket Number		2005-0547-02		

/L.N./	9	6883904		2005-04-26	Jeanmarie, et al.	
/L.N./	10	6951378		2005-10-04	Yamada, et al.	

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/L.N./	1	20050052500		2005-03-10	Edelen, et al	

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/L.N./	1	11-254409	JP		1999-09-14	Uenishi		☐

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	11324167
	Filing Date	2005-12-30
	First Named Inventor	Lucas David Barkley, et al.
	Art Unit	2853
	Examiner Name	Lam S. Nguyen
	Attorney Docket Number	2005-0547-02

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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/GB-08a (03-08)

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167
	Filing Date		2005-12-30
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	Examiner Name	Lam S. Nguyen	
	Attorney Docket Number	2005-0547.02	

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LN	1	5594488		1997-01-14	Taushima, et al.	
LN	2	5646600		1997-07-08	Murray	
LN	3	5731828		1998-03-24	Ishinaga, et al.	
LN	4	5812182		1998-09-22	Silverbrook	
LN	5	6260952		2001-07-17	Feint, et al.	
LN	6	6386674		2002-05-14	Corngan, et al.	
LN	7	6398347		2002-08-04	Torgerson, et al.	
LN	8	6474782		2002-11-05	Furukawa	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	11324167
Filing Date	2005-12-30
First Named Inventor	Lucas Barkley
Art Unit	2853
Examiner Name	Lam S. Nguyen
Attorney Docket Number	2005-0547.02

LN	9	6488363		2005-05-10	Torgerson, et al.	
LN	10	6498834		2002-12-31	Takizawa	
LN	11	6863227		2003-12-16	Yamamoto, et al.	
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LN	1	20070153045		2007-07-05	Barkley, et al.	

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**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Not for submission under 37 CFR 1.99)

Application Number	11324167
Filing Date	2005-12-30
First Named Inventor	Lucas Barkley
Art Unit	2853
Examiner Name	Lam S. Nguyen
Attorney Docket Number	2005-0547.02

LN	1	Disclosure Under § 1.56 filed July 14, 2008.	☐
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Examiner Signature	/LAM S NGUYEN/		Date Considered 08/14/08
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Primer

Applicant(s)/Patent under
Reexamination

BARKLEY ET AL.

4355

253

SEARCHED			
Class	Subclass	Date	Examiner
347	14.17.19	12/19/2007	LN
~~347~~	~~5, 9, 12~~	~~08/15/08~~	~~LW~~
~~Updated search~~			
~~LW~~			
~~08/15/08~~			

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
347	17, 14, 12	08/15/08	LW
PGPUB text & class search in the search note print out.			

[illegible]

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL Address to: MAIL STOP RCE Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Application Number</td> <td>11/324,167</td> </tr> <tr> <td>Filing Date</td> <td>December 30, 2005</td> </tr> <tr> <td>First Named Inventor</td> <td>Lucas David Barkley</td> </tr> <tr> <td>Group Art Unit</td> <td>2853</td> </tr> <tr> <td>Examiner Name:</td> <td>Lam S. Nguyen</td> </tr> <tr> <td>Attorney Docket Number</td> <td>2005-0547.02</td> </tr> </table>	Application Number	11/324,167	Filing Date	December 30, 2005	First Named Inventor	Lucas David Barkley	Group Art Unit	2853	Examiner Name:	Lam S. Nguyen	Attorney Docket Number	2005-0547.02
Application Number	11/324,167												
Filing Date	December 30, 2005												
First Named Inventor	Lucas David Barkley												
Group Art Unit	2853												
Examiner Name:	Lam S. Nguyen												
Attorney Docket Number	2005-0547.02												

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

1. **Submission required under 37 C.F.R. § 1.114** Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request nonentry of such amendment(s).
 - a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.
 - i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
 - ii. ☐ Other _____
 - b. ☒ Enclosed
 - i. ☒ Amendment/Reply
 - ii. ☐ Affidavit(s)/Declaration(s)
 - iii. ☐ Information Disclosure Statement (IDS)
 - iv. ☐ Other _____
2. **Miscellaneous**
 - a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of 2 months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) **required**)
 - b. ☐ Other _____
3. **Fees** The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1.114 when the RCE is filed.
 - a. ☒ The Director is hereby authorized to charge the following fees, or credit any overpayments to Deposit Account No. **19-5029**. Enclosed is a duplicate copy of this sheet for fee processing.
 - i. ☒ RCE fee (\$810) under 37 C.F.R. § 1.17(e), **REQUIRED** when filing the RCE.
 - ii. ☐ Extension of time fee (120.00) under 37 C.F.R. 1.136 and 1.17.
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SIGNATURE OF APPLICANT, ATTORNEY OR AGENT REQUIRED		
Type Name	Christopher J. Chan	Reg. No. 44,070
Signature	/Christopher J. Chan/	Date: July 30, 2008

Electronic Patent Application Fee Transmittal				
Application Number:		11324167		
Filing Date:		30-Dec-2005		
Title of Invention:		Methods and apparatuses for regulating the temperature of multi-via heater chips		
First Named Inventor/Applicant Name:		Lucas David Barkley		
Filer:		Christopher Chan/Carla Key		
Attorney Docket Number:		2005-0547.02		
Filed as Large Entity				
Utility Filing Fees				
Description		Fee Code	Quantity	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Request for continued examination	1801	1	810	810
Total in USD (\$)				810

Electronic Acknowledgement Receipt	
EFS ID:	3704559
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	Methods and apparatuses for regulating the temperature of multi-via heater chips
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Christopher Chan/Carla Key
Filer Authorized By:	Christopher Chan
Attorney Docket Number:	2005-0547.02
Receipt Date:	30-JUL-2008
Filing Date:	30-DEC-2005
Time Stamp:	18:08:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 810
RAM confirmation Number	3364
Deposit Account	195029
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment After Final	19403-0066_Response_FinalOA.pdf	260779 c3869be745041d998cd3dbf1503a99ec7e8c8a49	no	9
Warnings:					
Information:					
2	Request for Continued Examination (RCE)	19403-0066_RCE.pdf	42227 c6d150093c5ec3c82f6adab0bef540e139e74442	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
3	Fee Worksheet (PTO-06)	fee-info.pdf	8204 db9b642f1b3a8bf6bb0cee43b875fd809c94ef8c	no	2
Warnings:					
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Total Files Size (in bytes):			311210		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	Customer No.: 29052
Lucas David Barkley, et al.	)	
	)	Confirmation No.: 6156
Serial No.: 11/324,167	)	
	)	Art Unit: 2853
Filing Date: December 30, 2005	)	
	)	Examiner: Lam S. Nguyen
For: METHODS AND APPARATUSES FOR	)	
REGULATING THE TEMPERATURE OF	)	
MULTI-VIA HEATER CLIPS	)	
	)	

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION

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

Sir:

Responsive to the final Office Action dated May 12, 2008, and the Advisory Action dated July 18, 2008, Applicants submit the following amendments, remarks, and Request for Continued Examination (RCE). Applicants respectfully assert that all of the claims of the patent application are patentable, and that the application be allowed.

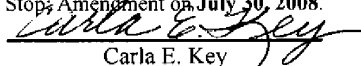
Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 6 of this paper.

Conclusion begins on page 9 of this paper.

Certificate of Electronic Delivery

I hereby certify that this correspondence is being electronically filed with the Commissioner for Patents, Mail Stop, Amendment on July 30, 2008.


 Carla E. Key

7983115.1

Amendments to the Claims

Please enter the following amendments to the claims:

Listing of Claims:

1. (Currently Amended) A chip for use with a printing device, comprising:
 - a first heater array positioned substantially adjacent a first via;
 - a second heater array positioned substantially adjacent a second via;
 - a region, positioned between the first heater array and the second heater array, and also positioned substantially adjacent to the first heater array and the second heater array; and
 - a temperature sensing element operable to sense a temperature of the region, the temperature being representative of the region, wherein the temperature sensing element is substantially centrally disposed with respect to the region and substantially adjacent to both the first heater array and second heater array, and further extends substantially the length of the first heater array and second heater array,

wherein the first heater array and the second heater array are operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region;

 - a third heater array, positioned substantially adjacent the second via;
 - a fourth heater array, positioned substantially adjacent a third via;
 - a second region, positioned between the third heater array and the fourth heater array, and also positioned substantially immediately adjacent to the third heater array and the fourth heater array; and
 - a second temperature sensing element operable to sense the temperature of the second region, wherein the temperature sensing element is substantially centrally disposed with respect to the second region and substantially adjacent to both the third heater array and fourth heater array,
 - wherein the third heater array and the fourth heater array are operable to receive heating responsive to the temperature of the second region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region.

2. (Withdrawn) The chip of claim 1, wherein the temperature sensing element comprises a temperature sensing resistor.
3. (Withdrawn) The chip of claim 2, wherein the temperature sensing element comprises a thermal sense resistor.
4. (Withdrawn) The chip of claim 3, wherein the temperature sensing element comprises an n-type implant donor thermal sensing resistor.
5. (Original) The chip of claim 1, wherein the temperature sensing element is positioned at least 300 microns from each of the first heater array and the second heater array.
6. (Original) The chip of claim 5, wherein the temperature sensing element is positioned substantially planar to each of the first heater array and the second heater array.
7. (Original) The chip of claim 1, further comprising at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.
8. (Cancelled) The chip of claim 1, further comprising:
 - a third heater array, positioned substantially adjacent the second via;
 - a fourth heater array, positioned substantially adjacent a third via;
 - a second region, positioned between the third heater array and the fourth heater array; and
 - a second temperature sensing element operable to sense the temperature of the second region, wherein the temperature sensing element is substantially centrally disposed with respect to the second region,wherein the third heater array and the fourth heater array are operable to receive heating responsive to the temperature of the second region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region.
9. (Original) The chip of claim 8, wherein the temperature sensing element positioned between the first heater array and the second heater array is different than the second temperature sensing element positioned between the third heater array and the fourth heater array.
10. (Original) The chip of claim 1, wherein the first heater array and the second heater array are operable to receive non-nucleating heating responsive to the temperature of the region sensed

by the temperature sensing element.

11. (Original) The chip of claim 10, wherein the non-nucleating heating is of a short duration such that ink will not be ejected from the first via or the second via during the non-nucleating heating.

12. (Currently Amended) A method of fabricating chips for use with a printing device, comprising:

providing a first heater array, positioned substantially adjacent a first via;

providing a second heater array, positioned substantially adjacent a second via;

positioning a temperature sensing element in a region adjacent to and immediately between the first heater array and the second heater array and substantially adjacent to both the first heater array and second heater array, wherein the temperature sensing element is operable to sense a temperature of the region, the temperature being representative of the region, and wherein the temperature sensing element extends substantially the length of the first heater array and second heater array; and

responsive to the temperature of the region sensed by the temperature sensing element, heating the first heater array and the second heater array to regulate the temperature of the region;

providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array;

providing a third heater array substantially adjacent the second via;

providing a fourth heater array substantially adjacent a third via; and

positioning a second temperature sensing element in a second region located between the third heater array and the fourth heater array, wherein the temperature sensing element is operable to sense the temperature of the second region, and wherein the temperature sensing element is substantially centrally disposed with respect to the second region and is substantially adjacent to both the third heater array and fourth heater array.

13. (Original) The method of claim 12, wherein positioning a temperature sensing element in the region comprises positioning a temperature sensing element in substantially the center of the region.

14. (Withdrawn) The method of claim 12, wherein positioning a temperature sensing element in the region comprises positioning a thermal sense resistor in the region.
15. (Withdrawn) The method of claim 14, wherein positioning a temperature sensing element in the region comprises positioning an n-type implant donor thermal sensing resistor in the region.
16. (Original) The method of claim 12, wherein positioning a temperature sensing element in the region between the first heater array and the second heater array comprises positioning the temperature sensing element at least 300 microns from each of the first heater array and the second heater array.
17. (Original) The method of claim 16, wherein positioning a temperature sensing element in the region between the first heater array and the second heater array comprises positioning the temperature sensing element substantially planar to each of the first heater array and the second heater array.
18. (Cancelled) The method of claim 12, further comprising providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.
19. (Cancelled) The method of claim 18, further comprising:
 - providing a third heater array substantially adjacent the second via;
 - providing a fourth heater array substantially adjacent a third via; and
 - positioning a second temperature sensing element in a second region located between the third heater array and the fourth heater array, wherein the temperature sensing element is operable to sense the temperature of the second region, and wherein the temperature sensing element is substantially centrally disposed with respect to the second region.
20. (Original) The method of claim 12, wherein heating the first heater array and the second heater array to regulate the temperature of the region comprises heating the first heater array and the second heater array using non-nucleating heating.

Serial No. 11/324,167
Response to final Office Action mailed May 12, 2008 and
Advisory Action mailed July 18, 2008
Page 6 of 9

REMARKS

Claims 1, 5-13, and 16-20 are currently under examination and have been rejected by the prior Office Action. Claims 2-4, 14 and 15 have been withdrawn by prior response, without prejudice to filing a divisional or continuation application. After entry of the present amendment, claims 1, 5-7, 9-13, and 16-17, and 19-20 remain pending in the application. The present amendment amends independent claims 1 and 12 to clarify the scope of the claimed invention, and incorporates the subject-matter of dependent claims 8, 18, and 19 into the respective independent claims. Claims 8, 18, and 19 are cancelled by the present amendment. The Office Action acknowledged acceptance of a prior filed terminal disclaimer with respect to copending Application No. 11/323,809, for which claims 1, 5-6, 8-9, 12-13, 16-17, and 19 had been provisionally rejected for nonstatutory obviousness-type double patenting. No new matter is introduced by way of the present amendment. Reconsideration of the application in view of the present amendment and following remarks is respectfully requested.

Claim Rejections Under 35 U.S.C. § 102

In the present Office Action, claims 12, 18, and 20 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by the applicant's admission as prior art in FIGs. 1-2. Independent claim 12 has been amended by the present response to incorporate the subject-matter of dependent claims 18 and 19. The present Office Action acknowledged acceptance of a prior filed terminal disclaimer with respect to copending Application No. 11/323,809, for which claim 19 had been provisionally rejected for nonstatutory obviousness-type double patenting. Amended independent claim 12 is believed to be allowable over the cited references, and in condition for allowance.

Dependent claim 20 is ultimately dependent on independent claim 1, for which arguments of patentability have been provided above. If the underlying independent claim is in condition for allowance, then the respective dependent claims should also be in condition for allowance.

Serial No. 11/324,167

Response to final Office Action mailed May 12, 2008 and

Advisory Action mailed July 18, 2008

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Claim Rejections Under 35 U.S.C. § 103

Claims 1, 5-7, 10-11, 12-13, and 16-17 were rejected under 35 U.S.C. §103(a) as being unpatentable over the applicant's admission as prior art (FIGs. 1-2) and in view of Askeland, et al., U.S. Patent Publication No. 2003/0142159 ("*Askeland*"). Independent claims 1 and 12 have been amended by the present response to respectively incorporate the subject-matter of dependent claims 8, 18, and 19. The present Office Action acknowledged acceptance of a prior filed terminal disclaimer with respect to copending Application No. 11/323,809, against which claims 8 and 19 had been provisionally rejected for nonstatutory obviousness-type double patenting.

Furthermore, Applicants' alleged admission of FIGs. 1 and 2 does not teach or suggest each and every element of the Applicant's amended independent claims 1 and 12. For instance, Applicants' amended claim 1 includes the amended element, "a temperature sensing element operable to sense a temperature of the region, the temperature being representative of the region, wherein the temperature sensing element is substantially centrally disposed with respect to the region and substantially adjacent to both the first heater array and second heater array" (Underlining supplied). Claim 12 has been similarly amended to include the element "positioning a temperature sensing element in a region adjacent to and immediately between the first heater array and the second heater array and substantially adjacent to both the first heater array and second heater array" (Underlining supplied). The temperature sense resistor 222 shown in FIG. 2 is not substantially adjacent to the cyan heater array 208. Because the cyan ink via 202 is disposed between the temperature sense resistor 222 and the cyan heater array 208, the temperature sense resistor 222 is not substantially adjacent to both the cyan heater array 208 and the magenta heater array 210. Neither Applicants' FIGs. 1 and 2, or *Askeland*, either alone or in combination with each other, teaches or suggests at least the above elements of Applicants' amended claims 1 and 12.

For at least the reasons provided above, the amended independent claims 1 and 12 are believed to be allowable over the cited references, and in condition for allowance.

7983115.1

Serial No. 11/324,167

Response to final Office Action mailed May 12, 2008 and

Advisory Action mailed July 18, 2008

Page 8 of 9

Dependent claims 5-7, 10-11, 13, and 16-17 are ultimately dependent on at least one of independent claims 1 or 12, for which arguments of patentability have been provided above. If the underlying independent claims are in condition for allowance, then the respective dependent claims should also be in condition for allowance.

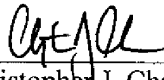
7983115.1

Serial No. 11/324,167
Response to final Office Action mailed May 12, 2008 and
Advisory Action mailed July 18, 2008
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CONCLUSION

It is not believed that extensions of time or fees for addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 19-5029.

Respectfully submitted,



Christopher J. Chan
Attorney for the Assignee
Reg. No. 44,070

DATE: 30 JULY 2008

SUTHERLAND ASBILL & BRENNAN LLP
999 Peachtree Street NE
Atlanta, Georgia 30309-3996
Telephone: (404) 853-8049
Facsimile: (404) 853-8806
(SAB Ref. No.: 19403-0066)

Attorney Docket No.: 2005-0547.02

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 11/324,167		Filing Date 12/30/2005		☐ To be Mailed			
APPLICATION AS FILED – PART I												
(Column 1)			(Column 2)		SMALL ENTITY ☐		OR		OTHER THAN SMALL ENTITY			
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), (l), 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 \$ =				OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$ =				OR		
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).										
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))												
* If the difference in column 1 is less than zero, enter "0" in column 2.												
APPLICATION AS AMENDED – PART II												
(Column 1)			(Column 2)		(Column 3)		SMALL ENTITY		OR		OTHER THAN SMALL ENTITY	
AMENDMENT	07/30/2008		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))		* 18		Minus ** 20		= 0		X \$ =		OR	
	Independent (37 CFR 1.16(h))		* 2		Minus *** 3		= 0		X \$ =		OR	
	☐ Application Size Fee (37 CFR 1.16(s))											
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
	TOTAL ADD'L FEE											
(Column 1) (Column 2) (Column 3)												
AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)		OR	
	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))											
	TOTAL ADD'L FEE											
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.												
Legal Instrument Examiner: /THERESA I. OKON/												

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

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

Doc code :IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (03-08)

Approved for use through 07/31/2008. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167
	Filing Date		2005-12-30
	First Named Inventor	Lucas Barkley	
	Art Unit	2853	
	Examiner Name	Lam S. Nguyen	
	Attorney Docket Number	2005-0547.02	

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5594488		1997-01-14	Tsushima, et al.	
	2	5646660		1997-07-08	Murray	
	3	5731828		1998-03-24	Ishinaga, et al.	
	4	5812162		1998-09-22	Silverbrook	
	5	6260952		2001-07-17	Feinn, et al.	
	6	6386674		2002-05-14	Corrigan, et al.	
	7	6398347		2002-06-04	Torgerson, et al.	
	8	6474782		2002-11-05	Furukawa	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167
	Filing Date		2005-12-30
	First Named Inventor	Lucas Barkley	
	Art Unit	2853	
	Examiner Name	Lam S. Nguyen	
	Attorney Docket Number	2005-0547.02	

	9	6488363		2005-05-10	Torgerson, et al.	
	10	6499834		2002-12-31	Takizawa	
	11	6663227		2003-12-16	Yamamoto, et al.	
	12	6890064		2005-05-10	Torgerson, et al.	

If you wish to add additional U.S. Patent citation information please click the Add button.

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U.S. PATENT APPLICATION PUBLICATIONS

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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20070153045		2007-07-05	Barkley, et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button.

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1							☐

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NON-PATENT LITERATURE DOCUMENTS

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Examiner Initials*	Cite No	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, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167
	Filing Date		2005-12-30
	First Named Inventor	Lucas Barkley	
	Art Unit	2853	
	Examiner Name	Lam S. Nguyen	
	Attorney Docket Number	2005-0547.02	

1	Disclosure Under § 1.56 filed July 14, 2008.	☐
If you wish to add additional non-patent literature document citation information please click the Add button Add		
EXAMINER SIGNATURE		
Examiner Signature		Date Considered
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.		
¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.		

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	11324167
	Filing Date	2005-12-30
	First Named Inventor	Lucas Barkley
	Art Unit	2853
	Examiner Name	Lam S. Nguyen
	Attorney Docket Number	2005-0547.02

CERTIFICATION STATEMENT			
Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):			
☐ That each item of information contained in the 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 the information disclosure statement. See 37 CFR 1.97(e)(1).			
OR			
☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).			
☒ See attached certification statement.			
☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.			
☐ None			
SIGNATURE			
A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.			
Signature	/Christopher J. Chan/	Date (YYYY-MM-DD)	2008-07-29
Name/Print	Christopher J. Chan	Registration Number	44070
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 1 hour 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.			

Privacy Act Statement

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

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

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

Electronic Patent Application Fee Transmittal				
Application Number:		11324167		
Filing Date:		30-Dec-2005		
Title of Invention:		Methods and apparatuses for regulating the temperature of multi-via heater chips		
First Named Inventor/Applicant Name:		Lucas David Barkley		
Filer:		Christopher Chan/Carla Key		
Attorney Docket Number:		2005-0547.02		
Filed as Large Entity				
Utility Filing Fees				
Description		Fee Code	Quantity	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
Total in USD (\$)				180

Electronic Acknowledgement Receipt	
EFS ID:	3694756
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	Methods and apparatuses for regulating the temperature of multi-via heater chips
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Christopher Chan
Filer Authorized By:	
Attorney Docket Number:	2005-0547.02
Receipt Date:	29-JUL-2008
Filing Date:	30-DEC-2005
Time Stamp:	15:52:28
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 180
RAM confirmation Number	1218
Deposit Account	195029
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement Letter	19403-0066_SupplIDS_Transmittal.pdf	36373	no	2
			18b5fecf258d8153a07dedf5cfb00fd26a1c8197		
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Filed	19403-0066_Supplemental IDS.pdf	869720	no	5
			397cb1a46160180ed58c55c0dac31df3a04d665e		
Warnings:					
Information:					
3	NPL Documents	19403-0066_NPL_Disclosure-07-14-2008.pdf	70390	no	2
			e8d1cb5cbeacec96276b4bb5a2e70656f614859b		
Warnings:					
Information:					
4	Fee Worksheet (PTO-06)	fee-info.pdf	8206	no	2
			4be1d32e57049f834ad4f84212bd31732886d19d		
Warnings:					
Information:					
Total Files Size (in bytes):			984689		
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
Lucas Barkley, et al.	)	Confirmation No.: 6156
	)	
Serial No.: 11/324,167	)	Art Unit: 2853
	)	
Filed: December 30, 2005	)	Examiner: Lam S. Nguyen
	)	
For: METHODS AND APPARATUSES FOR	)	
REGULATING THE TEMPERATURE OF MULTI-	)	
VIA HEATHER CHIPS	)	
	)	
Attorney Docket No. 2005-0547.02	)	

SUBMISSION OF SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

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

Dear Sir:

The citation of information on the attached Form PTO/SB/08A, "Information Disclosure Statement by Applicant" is made pursuant to 37 C.F.R. §§ 1.56, 1.97, and 1.98.

Pursuant to the Office's waiver of the requirement for submitting a copy of each cited U.S. patent and each U.S. patent application publication for all U.S. national patent applications, no copy of any cited U.S. patent or U.S. patent application publication is provided herewith.

The citation of this information does not constitute an admission of priority or that any cited item is available as a reference, or a waiver of any right applicant may have under applicable statutes, Rules of Practice in patent cases, or otherwise.

Applicant: Lucas Barkley, et al.
Application No.: 11/324,167
Filed: December 30, 2005
Page 2 of 2

This Statement is submitted under 37 C.F.R. § 1.97(c). Accordingly, the Commissioner is hereby authorized to charge the fee of \$180.00 required for consideration of this Statement to Deposit Account No. 19-5029. No additional fees are believed due; however, any additional fee required is hereby authorized to be charged to Deposit Account No. 19-5029.

Respectfully submitted,



Christopher J. Chan
Attorney for Assignee
Registration No. 44,070

Date: 29 JULY 2008

SUTHERLAND ASBILL & BRENNAN LLP
999 Peachtree Street, NE
Atlanta, GA 30309
Telephone: 404-853-8000
Facsimile: 404-853-8806
(SAB Reference No. 19403-0066)

Attorney Docket No.: 2005-0547.02



UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
21972 7590 07/18/2008 LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999			EXAMINER NGUYEN, LAM S	
			ART UNIT 2853	PAPER NUMBER
			MAIL DATE 07/18/2008	DELIVERY MODE PAPER

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

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

Advisory Action Before the Filing of an Appeal Brief	Application No. 11/324,167	Applicant(s) BARKLEY ET AL.	
	Examiner LAM S. NGUYEN	Art Unit 2853	

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

THE REPLY FILED 14 July 2008 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☒ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

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

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

Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

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

NOTICE OF APPEAL

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

AMENDMENTS

3. ☒ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because

(a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);

(b) ☐ They raise the issue of new matter (see NOTE below);

(c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

(d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

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

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

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

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

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

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

Claim(s) allowed: _____.

Claim(s) objected to: _____.

Claim(s) rejected: _____.

Claim(s) withdrawn from consideration: _____.

AFFIDAVIT OR OTHER EVIDENCE

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

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

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

REQUEST FOR RECONSIDERATION/OTHER

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

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

13. ☐ Other: _____.

/LAM S NGUYEN/
Primary Examiner, Art Unit 2853

Continuation of 3. NOTE: Claims 1 and 12 are amended to raise new issues that require further consideration and/or search.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
) Customer No.: 29052
 Lucas David Barkley, et al.)
) Confirmation No.: 6156
 Serial No.: 11/324,167)
) Art Unit: 2853
 Filing Date: December 30, 2005)
) Examiner: Lam S. Nguyen
 For: METHODS AND APPARATUSES FOR)
 REGULATING THE TEMPERATURE OF)
 MULTI-VIA HEATER CLIPS)
)

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTIONVIA EFSBox AF

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

Sir:

Responsive to the final Office Action dated May 12, 2008, Attorney for the Assignee submits the following amendments and remarks. In light of these amendments and remarks, Attorney for the Assignee respectfully asserts that all of the claims of the patent application are patentable, and that the application be allowed.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 6 of this paper.

Conclusion begins on page 9 of this paper.

DO NOT ENTER: /L.N./

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Stop: Amendment on July 14, 2008.


Theresa Camp

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)
Lucas David Barkley, et al.	) Customer No.: 29052
Serial No.: 11/324,167	) Confirmation No.: 6156
Filing Date: December 30, 2005	) Art Unit: 2853
For: METHODS AND APPARATUSES FOR	) Examiner: Lam S. Nguyen
REGULATING THE TEMPERATURE OF	)
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Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

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Stop: Amendment on July 14, 2008.


Theresa Camp

7922558.1

Amendments to the Claims

Please enter the following amendments to the claims:

Listing of Claims:

1. (Currently Amended) A chip for use with a printing device, comprising:
 - a first heater array positioned substantially adjacent a first via;
 - a second heater array positioned substantially adjacent a second via;
 - a region, positioned between the first heater array and the second heater array, and also positioned substantially adjacent to the first heater array and the second heater array; and
 - a temperature sensing element operable to sense a temperature of the region, the temperature being representative of the region, wherein the temperature sensing element is substantially centrally disposed with respect to the region and substantially adjacent to both the first heater array and second heater array, and further extends substantially the length of the first heater array and second heater array,
 - wherein the first heater array and the second heater array are operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region;
 - a third heater array, positioned substantially adjacent the second via;
 - a fourth heater array, positioned substantially adjacent a third via;
 - a second region, positioned between the third heater array and the fourth heater array, and also positioned substantially immediately adjacent to the third heater array and the fourth heater array; and
 - a second temperature sensing element operable to sense the temperature of the second region, wherein the temperature sensing element is substantially centrally disposed with respect to the second region and substantially adjacent to both the third heater array and fourth heater array,
 - wherein the third heater array and the fourth heater array are operable to receive heating responsive to the temperature of the second region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region.

2. (Withdrawn) The chip of claim 1, wherein the temperature sensing element comprises a temperature sensing resistor.
3. (Withdrawn) The chip of claim 2, wherein the temperature sensing element comprises a thermal sense resistor.
4. (Withdrawn) The chip of claim 3, wherein the temperature sensing element comprises an n-type implant donor thermal sensing resistor.
5. (Original) The chip of claim 1, wherein the temperature sensing element is positioned at least 300 microns from each of the first heater array and the second heater array.
6. (Original) The chip of claim 5, wherein the temperature sensing element is positioned substantially planar to each of the first heater array and the second heater array.
7. (Original) The chip of claim 1, further comprising at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.
8. (Cancelled) The chip of claim 1, further comprising:
 - a third heater array, positioned substantially adjacent the second via;
 - a fourth heater array, positioned substantially adjacent a third via;
 - a second region, positioned between the third heater array and the fourth heater array; and
 - a second temperature sensing element operable to sense the temperature of the second region, wherein the temperature sensing element is substantially centrally disposed with respect to the second region,wherein the third heater array and the fourth heater array are operable to receive heating responsive to the temperature of the second region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region.
9. (Original) The chip of claim 8, wherein the temperature sensing element positioned between the first heater array and the second heater array is different than the second temperature sensing element positioned between the third heater array and the fourth heater array.
10. (Original) The chip of claim 1, wherein the first heater array and the second heater array are operable to receive non-nucleating heating responsive to the temperature of the region sensed by the temperature sensing element.

11. (Original) The chip of claim 10, wherein the non-nucleating heating is of a short duration such that ink will not be ejected from the first via or the second via during the non-nucleating heating.

12. (Currently Amended) A method of fabricating chips for use with a printing device, comprising:

- providing a first heater array, positioned substantially adjacent a first via;
- providing a second heater array, positioned substantially adjacent a second via;
- positioning a temperature sensing element in a region adjacent to and immediately between the first heater array and the second heater array and substantially adjacent to both the first heater array and second heater array, wherein the temperature sensing element is operable to sense a temperature of the region, the temperature being representative of the region, and wherein the temperature sensing element extends substantially the length of the first heater array and second heater array; and

- responsive to the temperature of the region sensed by the temperature sensing element, heating the first heater array and the second heater array to regulate the temperature of the region;

- providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array;

- providing a third heater array substantially adjacent the second via;

- providing a fourth heater array substantially adjacent a third via; and

- positioning a second temperature sensing element in a second region located between the third heater array and the fourth heater array, wherein the temperature sensing element is operable to sense the temperature of the second region, and wherein the temperature sensing element is substantially centrally disposed with respect to the second region and is substantially adjacent to both the third heater array and fourth heater array.

13. (Original) The method of claim 12, wherein positioning a temperature sensing element in the region comprises positioning a temperature sensing element in substantially the center of the region.

14. (Withdrawn) The method of claim 12, wherein positioning a temperature sensing element in the region comprises positioning a thermal sense resistor in the region.

15. (Withdrawn) The method of claim 14, wherein positioning a temperature sensing element in the region comprises positioning an n-type implant donor thermal sensing resistor in the region.
16. (Original) The method of claim 12, wherein positioning a temperature sensing element in the region between the first heater array and the second heater array comprises positioning the temperature sensing element at least 300 microns from each of the first heater array and the second heater array.
17. (Original) The method of claim 16, wherein positioning a temperature sensing element in the region between the first heater array and the second heater array comprises positioning the temperature sensing element substantially planar to each of the first heater array and the second heater array.
18. (Cancelled) The method of claim 12, further comprising providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.
19. (Cancelled) The method of claim 18, further comprising:
providing a third heater array substantially adjacent the second via;
providing a fourth heater array substantially adjacent a third via; and
positioning a second temperature sensing element in a second region located between the third heater array and the fourth heater array, wherein the temperature sensing element is operable to sense the temperature of the second region, and wherein the temperature sensing element is substantially centrally disposed with respect to the second region.
20. (Original) The method of claim 12, wherein heating the first heater array and the second heater array to regulate the temperature of the region comprises heating the first heater array and the second heater array using non-nucleating heating.

REMARKS

Claims 1, 5-13, and 16-20 are currently under examination and have been rejected by the prior Office Action. Claims 2-4, 14 and 15 have been withdrawn by prior response, without prejudice to filing a divisional or continuation application. After entry of the present amendment, claims 1, 5-7, 9-13, and 16-17, and 19-20 remain pending in the application. The present amendment amends independent claims 1 and 12 to clarify the scope of the claimed invention, and incorporates the subject-matter of dependent claims 8, 18, and 19 into the respective independent claims. Claims 8, 18, and 19 are cancelled by the present amendment. The Office Action acknowledged acceptance of a prior filed terminal disclaimer with respect to copending Application No. 11/323,809, for which claims 1, 5-6, 8-9, 12-13, 16-17, and 19 had been provisionally rejected for nonstatutory obviousness-type double patenting. No new matter is introduced by way of the present amendment. Reconsideration of the application in view of the present amendment and following remarks is respectfully requested.

Claim Rejections Under 35 U.S.C. § 102

In the present Office Action, claims 12, 18, and 20 were rejected under 35 U.S.C. §102(b) as allegedly being anticipated by the applicant's admission as prior art in FIGs. 1-2. Independent claim 12 has been amended by the present response to incorporate the subject-matter of dependent claims 18 and 19. The present Office Action acknowledged acceptance of a prior filed terminal disclaimer with respect to copending Application No. 11/323,809, for which claim 19 had been provisionally rejected for nonstatutory obviousness-type double patenting. Amended independent claim 12 is believed to be allowable over the cited references, and in condition for allowance.

Dependent claim 20 is ultimately dependent on independent claim 1, for which arguments of patentability have been provided above. If the underlying independent claim is in condition for allowance, then the respective dependent claims should also be in condition for allowance.

Claim Rejections Under 35 U.S.C. § 103

Claims 1, 5-7, 10-11, 12-13, and 16-17 were rejected under 35 U.S.C. §103(a) as being unpatentable over the applicant's admission as prior art (FIGs. 1-2) and in view of Askeland, et al., U.S. Patent Publication No. 2003/0142159 ("*Askeland*"). Independent claims 1 and 12 have been amended by the present response to respectively incorporate the subject-matter of dependent claims 8, 18, and 19. The present Office Action acknowledged acceptance of a prior filed terminal disclaimer with respect to copending Application No. 11/323,809, against which claims 8 and 19 had been provisionally rejected for nonstatutory obviousness-type double patenting.

Furthermore, Applicants' alleged admission of FIGs. 1 and 2 does not teach or suggest each and every element of the Applicant's amended independent claims 1 and 12. For instance, Applicants' amended claim 1 includes the amended element, "a temperature sensing element operable to sense a temperature of the region, the temperature being representative of the region, wherein the temperature sensing element is substantially centrally disposed with respect to the region and substantially adjacent to both the first heater array and second heater array" (Underlining supplied). Claim 12 has been similarly amended to include the element "positioning a temperature sensing element in a region adjacent to and immediately between the first heater array and the second heater array and substantially adjacent to both the first heater array and second heater array" (Underlining supplied). The temperature sense resistor 222 shown in FIG. 2 is not substantially adjacent to the cyan heater array 208. Because the cyan ink via 202 is disposed between the temperature sense resistor 222 and the cyan heater array 208, the temperature sense resistor 222 is not substantially adjacent to both the cyan heater array 208 and the magenta heater array 210. Neither Applicants' FIGs. 1 and 2, or *Askeland*, either alone or in combination with each other, teaches or suggests at least the above elements of Applicants' amended claims 1 and 12.

For at least the reasons provided above, the amended independent claims 1 and 12 are believed to be allowable over the cited references, and in condition for allowance.

Dependent claims 5-7, 10-11, 13, and 16-17 are ultimately dependent on at least one of independent claims 1 or 12, for which arguments of patentability have been provided above. If

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Response to final Office Action mailed May 12, 2008
Page 8 of 9

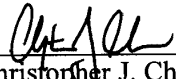
the underlying independent claims are in condition for allowance, then the respective dependent claims should also be in condition for allowance.

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CONCLUSION

It is not believed that extensions of time or fees for addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 19-5029.

Respectfully submitted,



Christopher J. Chan
Attorney for the Assignee
Reg. No. 44,070

DATE: 14 JULY 2008

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(Sutherland Ref. No.: 19403-0066)

Attorney Docket No.: 2005-0547.02

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.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167
	Filing Date		2005-12-30
	First Named Inventor	Lucas David Barkley, et al.	
	Art Unit	2853	
	Examiner Name	Lam S. Nguyen	
	Attorney Docket Number	2005-0547-02	

U.S.PATENTS						Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	6357863		2002-03-19	Anderson, et al.	
	2	6601941		2003-08-05	Jones, et al.	
	3	6382773		2002-05-05	Chang, et al.	
	4	6641242		2003-08-05	Canti, et al.	
	5	6644774		2003-11-11	Burger, et al.	
	6	6764163		2004-07-20	Anderson, et al.	
	7	6808243		2004-10-26	Markham, et al.	
	8	6871929		2005-03-29	Crivelli, et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		11324167	
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	Art Unit	2853		
	Examiner Name	Lam S. Nguyen		
	Attorney Docket Number	2005-0547-02		

	9	6883904		2005-04-26	Jeanmarie, et al.	
	10	6951378		2005-10-04	Yamada, et al.	

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	1	11-254409	JP		1999-09-14	Uenishi		☐

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	11324167
	Filing Date	2005-12-30
	First Named Inventor	Lucas David Barkley, et al.
	Art Unit	2853
	Examiner Name	Lam S. Nguyen
	Attorney Docket Number	2005-0547-02

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	
*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.			
¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.			

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	11324167
Filing Date	2005-12-30
First Named Inventor	Lucas David Barkley, et al.
Art Unit	2853
Examiner Name	Lam S. Nguyen
Attorney Docket Number	2005-0547-02

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the 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 the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Christopher J. Chan/	Date (YYYY-MM-DD)	2008-07-14
Name/Print	Christopher J. Chan	Registration Number	44,070

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 1 hour 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.**

Privacy Act Statement

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

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

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

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平11-245409

(43) 公開日 平成11年(1999) 9月14日

(51) Int. Cl.⁴

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B 4 1 J 3/04

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(71) 出願人 000001443

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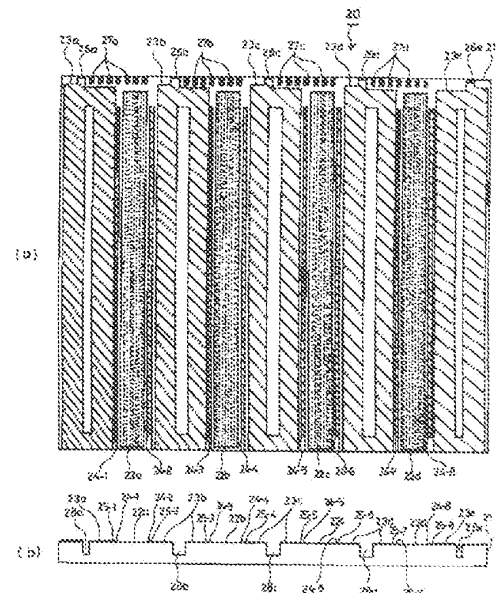
(74) 代理人 弁理士 大曾 義之

(54) 【発明の名称】 サーマルインクジェットヘッド

(57) 【要約】

【課題】 高解像度、小容積で且つ部材の安定した積層が可能なサーマルインクジェットヘッドを提供する。

【解決手段】 シリコン基板21上のサーマルインクジェットヘッド20には4つの駆動回路22a、22b、22c及び22dが形成される。共通電極23aには共通電極23aとの間に個別配線電極24-1を介して第1のオリフィス列の抵抗25-1及び共通電極23bとの間に個別配線電極24-2を介して第2のオリフィス列の抵抗25-2が接続され、第1及び第2のオリフィス列のインク吐出が時分割で制御される。駆動回路22b、22c及び22dも同様に左右の2列のオリフィス列の抵抗を時分割で駆動する。第1及び第8のオリフィス列にはインク通路28a、28cから黒インク、第2と第3、第4と第5、第6と第7のオリフィス列には夫々Mインク、Mインク、Cインクが供給される。同色の2列のオリフィスの配置は1/2間隔ずれて配置される。



1/17/2008, EAST Version: 2.2.1.0

【特許請求の範囲】

【請求項1】 複数の発熱素子をアレー状に配設した発熱ヘッドを複数設け、前記発熱素子上に供給されるインクを前記発熱素子にて加熱し、前記インクと前記発熱素子の界面に気泡を発生させることにより該発熱素子に対応するオリフィスからインク滴を吐出するサーマルインクジェットヘッドであって、

隣接する発熱ヘッド間に設けられ、該両側の発熱ヘッドの発熱素子に対し共通に前記インクを供給する単一のインク供給路、

を有することを特徴とするサーマルインクジェットヘッド、

【請求項2】 複数の発熱素子をアレー状に配設した発熱ヘッドを複数設け、

前記発熱素子上に供給されるインクを前記発熱素子にて加熱し、前記インクと前記発熱素子の界面に気泡を発生させることにより該発熱素子に対応するオリフィスからインク滴を吐出するサーマルインクジェットヘッドであって、

第1の発熱ヘッドと第2の発熱ヘッド間に設けられ、前記第1の発熱ヘッド内の第n番目の発熱素子と前記第2の発熱ヘッド内の第m番目の発熱素子とに共通に駆動信号を供給する駆動手段と、

該駆動手段による前記駆動信号の供給と、前記第1の発熱ヘッドの共通電極と前記第2の発熱ヘッドの共通電極とを、時分割に選択することにより前記第1の発熱ヘッドの発熱素子と前記第2の発熱ヘッドの発熱素子とを時分割駆動するよう前記駆動手段を制御する制御手段と、を有することを特徴とするサーマルインクジェットヘッド、

【請求項3】 複数の発熱素子をアレー状に配設した発熱ヘッドを複数設け、前記発熱素子上に供給されるインクを前記発熱素子にて加熱し、前記インクと前記発熱素子の界面に気泡を発生させることにより該発熱素子に対応するオリフィスからインク滴を吐出するサーマルインクジェットヘッドであって、

nを整数とし、第n+1列目の発熱ヘッドと第n+2列目の発熱ヘッドの共通電極を単一の共通電極で構成し、第n+3列目の発熱ヘッドと第n+4列目の発熱ヘッドの共通電極を他の単一の共通電極で構成し、

前記第n+2列目の発熱ヘッド内の発熱素子と前記第n+3列目の発熱ヘッド内の発熱素子を時分割駆動する駆動手段を有することを特徴とするサーマルインクジェットヘッド、

【請求項4】 mを整数とし、第m+1列目の発熱ヘッド内の発熱素子と第m+2列目の発熱ヘッド内の発熱素子とは、同一ピッチで且つ1/2ピッチだけ位置をずらして配置されることを特徴とする請求項1、2又は3記載のサーマルインクジェットヘッド、

【請求項5】 mを整数とし、第m+1列目の発熱ヘッ

ドと第m+2列目の発熱ヘッドは、同色のインクを吐出することを特徴とする請求項4記載のサーマルインクジェットヘッド、

【請求項6】 第1列目の発熱ヘッドと最終列の発熱ヘッドからは黒インクを吐出させ、他の発熱ヘッドからはカラーインクを吐出させ、該カラーインクの吐出されるドット密度は前記黒インクの吐出されるドット密度の2倍に構成されることを特徴とする請求項3記載のサーマルインクジェットヘッド、

10 【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、サーマルインクジェットヘッドに関する。

【0002】

【従来の技術】近年、サーマルインクジェット方式を用いたプリンタが主流を占めてきている。このサーマルインクジェット方式は、印字のために射出するインクの液滴形成過程において、①ヒータを熱してヒータ面上に核気泡を発生させる。②この核気泡が合体して膜気泡が生まれる。③この膜気泡が断熱膨張して成長する。④その成長した膜気泡が周囲のインクに熱を取られて収縮する。⑤ついには膜気泡が消滅し、次のヒータ加熱を待つ、という一連の工程を瞬時に行うことによって成り立っている。そして、上記の①～⑤の工程には膜沸騰現象が利用されている。

【0003】膜沸騰現象は、例えば鉄の焼き入れのように高温に加熱された物体を液体中に漬けた場合と、液体と接する物体の表面温度を急激に上げた場合とに発現するが、サーマルインクジェットプリンタに用いられる膜沸騰現象は後者の「液体と接する物体の表面温度を急激に上げる」方法によっている。

【0004】また、このように膜沸騰現象を利用し、三原色のインクを吐出して、フルカラー印刷を行うインクジェットプリンタの印字ヘッド（サーマルインクジェットヘッド）は、一般に、シリコンLSIと薄膜技術を利用して製造される。

【0005】そして、その製造方法では、例えば解像度が360dpi（ドット／インチ）の印字ヘッドであれば128個のインク吐出ノズルを、それぞれ個々に駆動回路を対応させて一括して製造する方法が知られている。また、解像度が720dpiの場合であれば256個のインク吐出ノズルが個々の駆動回路と共に形成される。

【0006】これを簡単に説明すると、まず、工程1として、4インチ以上のシリコン基板にLSI形成処理により駆動回路とその端子を形成する。次に、工程2として、薄膜技術によりNiなどによる電極、Ta-Si-SiOなどの微細抵抗を形成する。続いて、工程3として、ウェットエッチングまたはサンドブラスト法などにより上記シリコン基板にインク供給路とインク供給孔を

形成する。更に、工程4として、感光性ポリイミドなどの有機材料を用いて個々のインク吐出口に対応するインク溝を形成すべく隔壁を積層する。そして、工程5として、エポキシ樹脂接着剤などのついた銅薄板またはポリイミド等によりなる薄板部材をシリコン基板に張り付けて上記隔壁によって形成されたインク溝に蓋をして個別の微細通路（インク案内路）を形成する。また更に、工程6として、上記薄板部材の上記微細抵抗に対応する部分にエキシマレーザなどにより $40\mu\text{m}\sim 20\mu\text{m}$ の孔を空けて、多数のノズル孔（オリフィスともいう）を一括形成する。ここまでは、ウェハの状態での処理される。そして、最後に、工程7として、グイッシングソーなどを用いてカツピングして、単位毎に個別に分割する。尚、オリフィスは、一般には導波管等の終端または壁面に形成されたエネルギー伝達用の孔又は窓の意である。

【0007】図6(a)、(b)、(c)及び図7(a)、(b)、(c)は、上記のサーマルインクジェットヘッドの発熱ヘッドの製造方法を工程順に示す図である。図6(a)、(b)、(c)はそれぞれ概略の平面図と断面図を示しており、図7(a)、(b)、(c)はそれぞれ上段に図6(a)、(b)、(c)の詳細拡大部分図、中段に上段のA-A'断面矢視図、下段に上段のB-B'断面矢視図を示している。

【0008】尚、これらの図では、説明の便宜上、いずれも1個の発熱ヘッドのみを示しているが、実際にはこのような発熱ヘッドが複数個連なっており、1枚のシリコン基板上に形成される。また、図6(a)、(b)、(c)のそれぞれ下段に示している断面図は、図7(a)、(b)、(c)のそれぞれ中段に示すA-A'断面矢視図と同一のものである。

【0009】上記の図6(a)及び図7(a)は、上述した工程1～工程3が終了した直後の状態を示している。すなわち、シリコン基板1上には、共通電極2、共通電極給電端子3（図6(a)参照）、個別配線電極4、抵抗5、駆動回路6、駆動回路端子7（図6(a)参照）、インク供給路8、及びインク供給孔10（図7(a)参照）が形成されている。

【0010】次に図6(b)及び図7(b)は、上述の工程4が終了した直後の状態を示している。すなわち、共通電極2のインク供給路8の左側に位置する部分と、個別配線電極4が配設されている部分、及び各抵抗5と抵抗5の間に、隔壁部材9が積層されている。隔壁部材9の上述各抵抗5間に積層される部分は、個別配線電極4上の部分9-1を楕円の洞とすれば、各抵抗5間に伸び出す部分9-2は櫛の歯に相当する形状をなしている。これにより、この櫛の歯を隔壁として、その歯と歯の間の付け根部分に抵抗5が位置する微細なインク案内溝が、抵抗5の数だけ形成される。この隔壁部材9は、 $10\mu\text{m}$ 以上の厚さを有している。

【0011】そして、図6(c)及び図7(c)は、上述した工程5と工程6が終了した直後の状態を示している。すなわち、薄板部材11が駆動回路6と給電端子3及び

7の部分を除く全領域を覆っており、上記のインク案内溝も上を覆われて隔壁部材9の厚さ $10\mu\text{m}$ に対応する高さのインク案内路12を形成している。そして、抵抗5に対応する部分にノズル孔13が形成されており、これにより、1列のノズル孔13を備えた発熱ヘッド14が完成する。

【0012】通常フルカラー印字においては、減法混色の三原色であるイエロー（Y）、マゼンタ（M）、シアン（C）の3色に、文字や画像の黒部分に専用されるブラック（Bk）を加えて合計4色のインクを必要とする。したがって、最低でも4列のノズル列が必要である。そして、上述した製造方法によれば4列の素子をモノリシックに構成することは可能であり、各列の位置関係も今日の半導体の製造技術により正確に配置することが可能である。

【0013】図8は、上述の図6及び図7に示したシリコン基板1、共通電極2、共通電極給電端子3、個別配線電極4、抵抗5、駆動回路6、駆動回路端子7、インク供給路8、隔壁部材9、インク供給孔10、薄板部材11、ノズル孔13の各部を1組としてなる素子（発熱ヘッド）14を4列並べてフルカラーのサーマルインクジェットヘッドを構成した状態を示す図である。尚、同図は、発熱ヘッド14が4列並んだ構成を分かり易く示すため、図6(a)に示した工程1～工程3まで終了した状態のものを示している。

【0014】同図に示すように、サーマルインクジェットヘッド15は、4個の発熱ヘッド14（14a、14b、14c、14d）が並んで配置され、例えばインク供給路8aからYインクが発熱ヘッド14aのインク案内路12（図6(c)及び図7(c)参照）に供給され、インク供給路8bからMインクが発熱ヘッド14bのインク案内路12に供給され、インク供給路8cからCインクが発熱ヘッド14cのインク案内路12に供給され、そして、インク供給路8dからはBkインクが発熱ヘッド14dのインク案内路12に供給される。

【0015】印字に際しては、抵抗5が印字情報に応じて選択的に通電され、瞬時に発熱して膜沸騰現象を発生させ、その抵抗5に対応するノズル孔13からインク滴が吐出される。このようなインクジェット方式ではインク滴はノズル孔13の径に対応する大きさの球状で吐出され、紙面上には略その倍の径の大きさとなって印字される。

【0016】このようにして得られるフルカラーのサーマルインクジェットヘッドは、解像度が 360dpi の場合であれば $128\text{ノズル}/4\text{列}=640\text{ノズル}$ を備えることになり、概略 $8.5\text{mm}\times 19.0\text{mm}$ の大きさに形成される。また解像度が 720dpi の場合であれば、 $256\text{ノズル}/4\text{列}=1280\text{ノズル}$ が、ほぼ $8.5\text{mm}\times 19.0\text{mm}$ の大きさの中に形成される。

【0017】

【発明が解決しようとする課題】ところで、ノズル孔の径やその配置間隔は、印字の分解能（画像の解像度）によって設計される。上述したように、ノズル孔の径に対応する大きさの球形状で吐出されたインク滴は紙面上では略倍の大きさの径に広がるから、ノズル孔の径は印字するドットピッチの1/2の大きさに設計される。例えば解像度が360 dpiの場合であれば、ドットピッチは約70 μm であり、したがって、ノズル孔の径は30～40 μm に形成される。また、例えば720 dpiの場合では、ドットピッチは約35 μm であり、したがって、ノズル孔の径は15～20 μm となる。

【0018】このように、ピッチが微細になると、シリコン基板1へオリフィス板（薄板部材11）を張り付ける際の積層される相手側（隔壁部材9の端の歯相当部分9-2）との接着面が減少し、安定した接着を実現することが困難になるという問題が発生する。

【0019】ところが、他方では、印字分解能を上げるために、一色を2列以上の発熱ヘッドで印字するような多列化が望まれ、ますます多ノズル化と高精細化の要求が高まってきている。

【0020】上述したように、フルカラー用のサーマルインクジェットヘッドは最低4列の発熱ヘッドを必要とするが、これらの発熱ヘッドは、図8に示したように、個別に独立の駆動回路6を持ち、これらには駆動回路端子7が配設されている。また、各発熱素子（抵抗5）に共通の電極への給電線も各発熱ヘッド毎に持っている。したがって、このサーマルインクジェットヘッドと外部回路との接続においては多数の接続部が発生し、この接続にはより高度な技術が要求される。

【0021】また、そればかりでなく、このように各発熱ヘッド毎に独立に積層される回路、電極、接続端子数等が多いため、これらを積層されるシリコンチップに大きな面積を必要とし、したがって、モノリシック（monolithic）に形成される発熱ヘッドの量産化が阻害される。

【0022】例えば、図6(a), (b), (c) に示した例では、1列のノズル孔13を有する発熱ヘッドを構成するために略2mmの幅を必要とする。そして、フルカラーのサーマルインクジェットヘッドでは、上記の発熱ヘッドを4列連設するから、前述したように、およそ8、5mm×19、0mmの大きさになる。したがって、例えば4インチのシリコンウエハ上には上記8、5mm×19、0mmのチップは30個程度、5インチのシリコンウエハでは55個程度しか形成できない。このように、1枚のウエハから取れるフルカラー用のサーマルインクジェットヘッドの数は非常に少ないため、製造コストの上昇を招くという問題も有していた。

【0023】本発明の課題は、上記従来の実情に鑑み、高解像度、小容積で且つ素子部材の安定した積層が可能でサーマルインクジェットヘッドを提供することであ

る。

【0024】

【課題を解決するための手段】以下に、本発明のサーマルインクジェットヘッドの構成を述べる。先ず、請求項1記載の発明のサーマルインクジェットヘッドは、複数の発熱素子をアレー状に配設した発熱ヘッドを複数設け、上記発熱素子上に供給されるインクを上記発熱素子にて加熱し、上記インクと上記発熱素子の界面に気泡を発生させることにより該発熱素子に対応するオリフィスからインク滴を吐出するサーマルインクジェットヘッドであって、隣接する発熱ヘッド間に設けられ、該両側の発熱ヘッドの発熱素子に対し共通に上記インクを供給する単一のインク供給路を有して構成される。

【0025】次に、請求項2記載の発明のサーマルインクジェットヘッドは、複数の発熱素子をアレー状に配設した発熱ヘッドを複数設け、上記発熱素子上に供給されるインクを上記発熱素子にて加熱し、上記インクと上記発熱素子の界面に気泡を発生させることにより該発熱素子に対応するオリフィスからインク滴を吐出するサーマルインクジェットヘッドであって、第1の発熱ヘッドと第2の発熱ヘッド間に設けられ、上記第1の発熱ヘッド内の第n番目の発熱素子と上記第2の発熱ヘッド内の第m番目の発熱素子とに共通に駆動信号を供給する駆動手段と、該駆動手段による上記駆動信号の供給と、上記第1の発熱ヘッドの共通電極と上記第2の発熱ヘッドの共通電極とを、時分割に選択することにより上記第1の発熱ヘッドの発熱素子と上記第2の発熱ヘッドの発熱素子とを時分割駆動するよう上記駆動手段を制御する制御手段とを有して構成される。

【0026】更に、請求項3記載の発明のサーマルインクジェットヘッドは、複数の発熱素子をアレー状に配設した発熱ヘッドを複数設け、上記発熱素子上に供給されるインクを上記発熱素子にて加熱し、上記インクと上記発熱素子の界面に気泡を発生させることにより該発熱素子に対応するオリフィスからインク滴を吐出するサーマルインクジェットヘッドであって、nを整数とし、第n+1列目の発熱ヘッドと第n+2列目の発熱ヘッドの共通電極を単一の共通電極で構成し、第n+3列目の発熱ヘッドと第n+4列目の発熱ヘッドの共通電極を他の単一の共通電極で構成し、上記第n+2列目の発熱ヘッド内の発熱素子と上記第n+3列目の発熱ヘッド内の発熱素子を時分割駆動する駆動手段を有して構成される。

【0027】そして、mを整数として、例えば請求項4記載のように、上記第m+1列目の発熱ヘッド内の発熱素子と第m+2列目の発熱ヘッドの内の発熱素子とは、同一ピッチで且つ1/2ピッチだけ位置をずらして配置される。また、例えば請求項5記載のように、第m+1列目の発熱ヘッドと第m+2列目の発熱ヘッドは、同色のインクを吐出するように構成される。また、例えば請求項6記載のように、第1列目の発熱ヘッドと最終列の

発熱ヘッドからは黒インクを吐出させ、他の発熱ヘッドからはカラーインクを吐出させ、該カラーインクの吐出されるドット密度は上記黒インクの吐出されるドット密度の2倍に構成される。

【0028】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照しながら説明する。図1(a)は、一実施の形態におけるサーマルインクジェットヘッドの構成を示す平面図であり、同図(b)は、その断面図である。尚、同図(a),(b)に示すサーマルインクジェットヘッド20は、構成を分かり易く示すため、図6及び図7に示した従来の発熱ヘッドと同様の製作工程において、シリコン基板に駆動回路とその端子を形成し、薄膜技術により電極と抵抗を形成し、ウェットエッチングまたはサンドブラスト法等によりインク供給路を形成したところまでの状態を示しており、シリコンウエハにモノリシックに形成されたものの中から1個のみを切り出して示している。

【0029】このサーマルインクジェットヘッド20は、図1(a),(b)に示すように、シリコン基板21に、4つの駆動回路22a、22b、22c及び22dが形成されている。第1の駆動回路22aには、一方では第1の共通電極23aとの間に個別配線電極24-1を介して抵抗25-1が接続されて形成され、他方では第2の共通電極23bとの間に個別配線電極24-2を介して抵抗25-2が接続されて形成される。

【0030】第2の駆動回路22bには、一方では上記第2の共通電極23bとの間に個別配線電極24-3を介して抵抗25-3が接続されて形成され、他方では第3の共通電極23cとの間に個別配線電極24-4を介して抵抗25-4が接続されて形成される。

【0031】同様に、第3の駆動回路22cには、一方では上記第3の共通電極23cとの間に個別配線電極24-5を介して抵抗25-5が接続されて形成され、他方では第4の共通電極23dとの間に個別配線電極24-6を介して抵抗25-6が接続されて形成される。

【0032】そして、第4の駆動回路22dには、一方では上記第4の共通電極23dとの間に個別配線電極24-7を介して抵抗25-7が接続されて形成され、他方では第5の共通電極23eとの間に個別配線電極24-8を介して抵抗25-8が接続されて形成されている。

【0033】上記5個の共通電極23a~23eには、それぞれ給電端子26a~26eが接続して形成され、4個の駆動回路22a~22dには、それぞれ駆動回路端子27a~27dが接続して形成されている。

【0034】そして、共通電極23a~23eは、それぞれ長手方向に沿って中央部が切り欠かれ、その下方にインク供給路28a~28dが形成されている。このインク供給路28a~28dには、特には図示しないが、シリコン基板21を貫通するインク供給孔が連通してそ

れぞれ形成される。

【0035】そのインク供給孔からは、この例では、第1のインク供給路28a及び第5のインク供給路28eにBkインクが供給される。そして、第2のインク供給路28bにYインクが供給され、第3のインク供給路28cにMインクが供給され、第4のインク供給路28dにはCインクが供給される。

【0036】図2(a)は、上記の状態から更に、図6及び図7に示した従来の発熱ヘッドと同様の製作工程において、各抵抗25(25-1、25-2、...、25-7、25-8)に対応するインク溝を形成する隔壁を積層し、オリフィス板を貼りつけてインク案内路を形成し、エキシマレーザによりノズル孔を一括形成して、単体として切り出したフルカラー用サーマルインクジェットヘッドの完成品を示す平面図であり、同図(b)は、その断面図である。上述した図1(a),(b)に示した状態における共通電極23(23a~23e)の一部と個別配線電極24(24-1~24-8)の部分に重ねて、図2(b)に示すように、隔壁部材31が積層され、その上に、駆動回路22(22a~22d)の配線部を除いた部分に、5枚のオリフィス板32(32a、32b、32c、32d、32e)が、同図(a),(b)に示すように貼り合わせられる。

【0037】オリフィス板32aには、抵抗25-1に対応する位置に、所定の径(このサーマルインクジェットヘッド20の解像度が360dpiであれば、本例においては15~20μmφ、これについては後述する)のノズル孔33(33-1、33-2、...、33-7、33-8)が所定の間隔(約70μm)で一括してそれぞれ形成されている。

【0038】上述した第1のインク供給路28aのBkインクは、オリフィス板32aのノズル孔33-1のノズル列に供給され、第5のインク供給路28eのBkインクは、オリフィス板32eのノズル孔33-8のノズル列に供給される。

【0039】そして、第2のインク供給路28bのYインクは、オリフィス板32bのノズル孔33-2のノズル列及びノズル孔33-3のノズル列に供給され、第3のインク供給路28cのMインクは、オリフィス板32cのノズル孔33-4のノズル列及びノズル孔33-5のノズル列に供給され、第4のインク供給路28dのCインクは、オリフィス板32dのノズル孔33-6のノズル列及びノズル孔33-7のノズル列に供給される。

【0040】このように、各色毎に2列のノズル列、つまり4色分合計で8列のノズル列を備え、それらのノズル孔33にインクを供給するインク供給路28は、ノズル列の数よりも3本少ない5本で構成されて、共通電極32も5個である。また、それらのノズル列に対応する抵抗25を発熱駆動する駆動回路22は4個であり、駆動回路端子27(27a~27d)も4組である。

【0041】このように、4個の駆動回路22で、その倍の列数のノズル孔33の抵抗25の発熱駆動を時分割で制御するように構成される。このように時分割駆動が可能であるのは、サーマルインクジェットヘッドでは、インクの吐出のための抵抗（発熱素子）への通電パルス幅は1μ秒であり、同じノズル孔から次の信号でインクを吐出させるための周期、つまり吐出繰り返し周波数は1kHz～10kHz（1m秒～100μ秒間隔）である。したがって、数拾mHz又はそれ以上の周期で動作可能な駆動回路としては時間的な余裕が充分にあり、この時間的余裕を利用して、時分割で2列のノズル列の抵抗を駆動するようにしたものである。

【0042】また、上記のように同一の抵抗に対する最初の発熱駆動と次の発熱駆動との間には充分な時間的余裕があるから、例えばベタ印字の場合に考慮される発熱ヘッドの最大許容電流の関係も加味して（やや時間的間隔を空けて）上記の時分割駆動を行っても、この時分割駆動が印字速度を低下させる要因とはならない。

【0043】そして、このサーマルインクジェットヘッド20は、各色毎に2列のノズル列、合計8列のノズル列を備えておりながら、全体の大きさは、図8に示した従来の4列のノズル列のものと大差のない寸法で構成されている。

【0044】図3(a)は、上記のサーマルインクジェットヘッド20の、1列のノズル列によるベタ印字を模式的に示したものである。本来であれば360dpiのドット配列では70、6μmのピッチで、ノズル孔の大きさは30～40μmであり、インク滴が倍に広がって、上記のベタ印字では各印字ドットは密着していなければならない。しかし、本実施の形態においては、ノズル孔配置の2倍の解像度で印字を行うために、ノズル孔の径は、720dpiのドット配列の場合に相当する15～20μmに形成されている。そして、同一色の2列のノズル列のノズル孔の配置を1/2ピッチずらして形成している。

【0045】図3(b)は、そのような同一色の2列のノズル孔の配置関係を示している。同図(b)は、1/2ピッチのずれを示すために、2列のノズル列で印字タイミングをずらして印字した場合を示しているが、実際の印字では2列のノズル列で紙面の同一印字領域に印字するようにタイミングをとって、図3(c)に示すように、1列のノズル孔配列の1/2ピッチのドット密度で印字が行われる。このように、小さなオリフィス（ノズル孔）を形成し、1/2ピッチずらした2列のオリフィス列を用いることで、オリフィス列が1列の構成の場合の2倍の解像度を実現することができる。

【0046】このように、本実施の形態においては、駆動回路、給電回路、インク供給路を2列のオリフィス列に共通化することによって、チップの小型化が図れ、サーマルインクジェットヘッドのサイズを大きくすること

なく殆ど従来同様のサイズのままで、従来の2倍のノズル列を構成することができる。また、従来の微細加工の技術水準で2倍の解像度を有する高精細のサーマルインクジェットヘッドを実用的に構成することができる。

【0047】尚、カラー画像は常にきめの細かな高解像度が要求されるが、文字等の黒印字ではそれほど高解像度は要求されない。また、一般に、プリンタは、事務用に限らず個人用に使用されるものであっても、文字（文章）の印字に用いられる場合が多い。したがって、主として文字印字に専用されるBkインクのノズル列のノズル孔配列を、他の色のノズル孔配列の2倍のピッチで且つ2倍の孔径で形成するようにしてもよい。

【0048】図4(a)は、そのような構成のサーマルインクジェットヘッドのYインク、Mインク及びCインクの印字ドット（図3(a)に示した印字ドットと同一）を示し、図4(b)は、Bkインクの印字ドットを同図(a)と同一の拡大率で示している。このように構成すれば、黒のみによる文字による印字の際には、第1列と第8列との印字を分組（例えば印字データの奇数列を第1列目のヘッド、偶数列を第8列目のヘッドで印字）することにより印字速度を2倍に向上させることができる。

【0049】また、前述の図1～図3において、8列全てのオリフィス列から同一色の（例えば黒の）インク滴を吐出するようにし、8列のオリフィス列のノズル孔配置を、それぞれ解像度を定めるピッチの整数倍の位置関係でずらして配置するようにしてもよい。そうすれば、単一色ではあるが極めて高精細の印字画像を得ることができる。

【0050】尚、上記の実施の形態では、いずれも色毎に2列のノズル列を構成する例を示したが、これに限ることなく、色毎のノズル列を1列で構成して、そのノズル列の抵抗を時分割で駆動するようにしてもよい。

【0051】図5(a)は、他の実施の形態におけるサーマルインクジェットヘッドの構成を示す平面図であり、同図(b)は、その断面図である。同図(a)、(b)に示すように、このサーマルインクジェットヘッド20'は、4列の抵抗25'のオリフィス列と、これに対応する4本のインク供給路28'を備えているが共通電極23'は3個のみ、駆動回路22'は2個のみの構成である。この駆動原理は図1～図3に示したサーマルインクジェットヘッド20の場合と同様である。

【0052】この構成によれば、例えば360dpiの解像度で、1列に256ノズルの構成とすれば、サーマルインクジェットヘッド20'は、およそ20mm×6mmの寸法で設計可能である。図6～図8に示した従来の設計では、20mm×8mmの寸法であり、これは、4インチのシリコンウエハ上では30個のチップとなるが、本例のように20mm×6mmであると、40個のチップを形成できる。また、5インチのシリコンウエハでは、従来の55個に対して、本例の構成では75個の

チップを形成できる。

【0053】このように、1個のシリコンウエハから取れるチップの個数が3割又は4割の差となって、生産性の向上に大きく寄与することができる。また、図5(a)から明らかなように、外部との接続端子数も半減できるので、プリンタ装置本体への実装も容易であり、このためカラープリンタでは比較的交流頻度の高い部品となるサーマルインクジェットヘッドの保守作業が容易となって、より実用性の高いサーマルインクジェットヘッドが実現する。

【0054】尚、上記の構成は、中央の共通電極23'といずれか片側の駆動回路22'を一組として、任意の数だけ連接すれば、オリフィス列が4列から6列あるいは8列というように如何様にも拡張することができ、より高精細な印字を実現することができるものである。

【0055】

【発明の効果】以上詳細に説明したように、本発明によれば、2列のオリフィス列を1/2間隔ずらして配置してオリフィス径のみを微細化するので、通常の積層処理の加工精度でその倍の解像度の印字ができ、したがって、高精細な印字を行うサーマルインクジェットヘッドを実現することが容易に可能となる。

【0056】また、隣接するオリフィス列の発熱素子をこれと並列に接続した1つの駆動回路で時分割で駆動するので、駆動回路数がオリフィス列数の1/2でよいことになり、したがって、サーマルインクジェットヘッドの小型化が可能となる。

【0057】また、同様にサーマルインクジェットヘッドが小型になるので、1つのシリコン基板に形成するサーマルインクジェットヘッドの個数を少なくとも従来の40%以上増やすことができ、したがって、サーマルインクジェットヘッドの生産性が向上する。

【0058】また、駆動回路と共に駆動回路端子が半減するので、外部との接続端子数が半減してプリンタ本体への実装が容易となり、したがって、印字ヘッドの交換頻度が比較的高くなるカラープリンタの保守作業が容易となり、これにより、使い勝手が良くなって顧客の信頼を得ることができる。

【図面の簡単な説明】

【図1】(a)は一実施の形態におけるフルカラー用サーマルインクジェットヘッドの構成を示す製作工程途中の平面図、(b)はその断面図である。

【図2】(a)は製作工程を完了し単体として切り出したフルカラー用サーマルインクジェットヘッドの完成品を示す平面図、(b)はその断面図である。

【図3】(a)はサーマルインクジェットヘッドの1列のノズル列によるベタ印字を模式的に示す図、(b)は同一色の2列のノズル孔の配置関係を示す図、(c)は2列のノズル列で同一印字領域に印字して2倍のドット密度を実現できることを示す図である。

【図4】(a)はノズル孔形成の変形例としてカラーインクの印字ドットの径を示す図、(b)は黒インクの印字ドットの径を同一拡大率で示す図である。

【図5】(a)は他の実施の形態におけるサーマルインクジェットヘッドの構成を示す平面図、(b)はその断面図である。

【図6】(a)、(b)、(c)は従来のサーマルインクジェットヘッドの印字部の製造方法を工程順に示す概略の平面図と断面図である。

10 【図7】(a)、(b)、(c)は従来の印字部の詳細な拡大部分平面図を上段に、そのA-A'断面矢視図を中段に、B-B'断面矢視図を下段に示す図である。

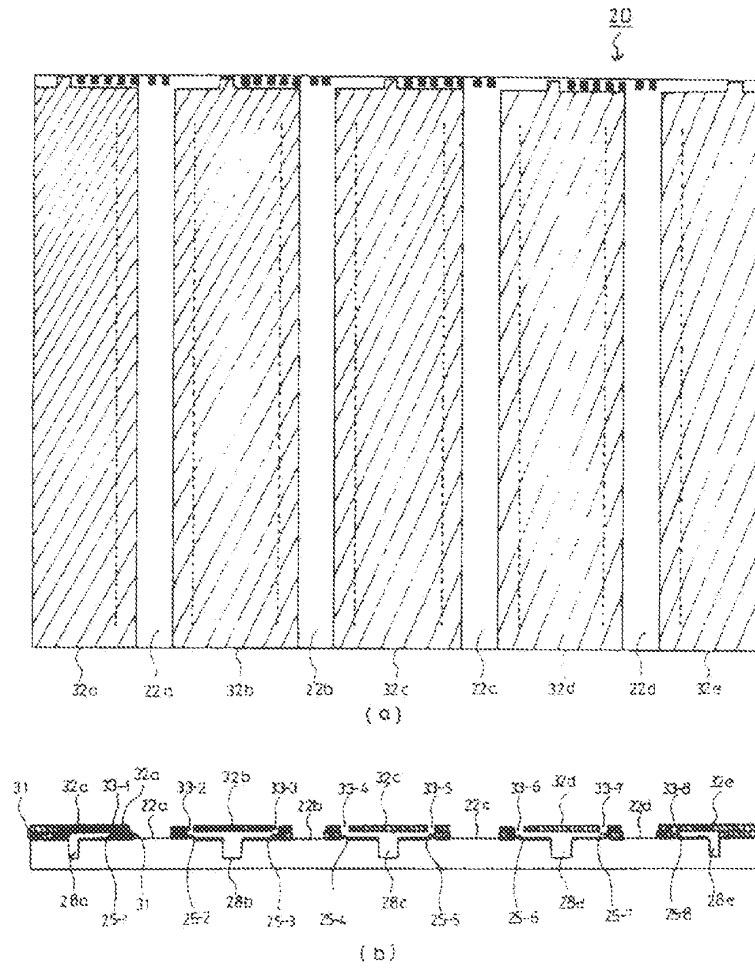
【図8】従来の印字部を4列並べてフルカラーのサーマルインクジェットヘッドを構成した状態を示す図である。

【符号の説明】

- 1 シリコン基板
- 2 共通電極
- 3 共通電極給電端子
- 20 4 個別配線電極
- 5 抵抗
- 6 駆動回路
- 7 駆動回路端子
- 8 (8a、8b、8c、8d) インク供給路
- 9 隔壁部材
- 9-1 極の銅相当部分
- 9-2 極の金相当部分
- 10 インク供給孔
- 11 薄板部材
- 12 インク案内路
- 13 ノズル孔
- 14 (14a、14b、14c、14d) 発熱ヘッド
- 20 サーマルインクジェットヘッド
- 21 シリコン基板
- 22 (22a、22b、22c、22d) 駆動回路
- 23 (23a、23b、23c、23d、23e) 共通電極
- 24 (24-1、24-2、…、24-7、24-8) 個別配線電極
- 25 (25-1、25-2、…、25-7、25-8) 抵抗(発熱素子)
- 26a、26b、26c、26d、26e 給電端子
- 27 (27a、27b、27c、27d) 駆動回路端子
- 28a、28b、28c、28d インク供給路
- 31 隔壁部材
- 32 (32a、32b、32c、32d、32e) オリフィス板
- 33 (33-1、33-2、…、33-7、33-8) ノズル孔

Figure 1 consists of three schematic diagrams labeled (a), (b), and (c). Diagram (a) shows a single vertical chain of eight spheres connected by horizontal lines, representing linear polymerization. Diagram (b) shows a central vertical chain of eight spheres, with four side chains branching off from the second, third, sixth, and seventh spheres; each side chain consists of two spheres, representing branched polymerization. Diagram (c) shows a network of interconnected chains, where spheres from different chains are connected to each other, representing cross-linked polymerization.

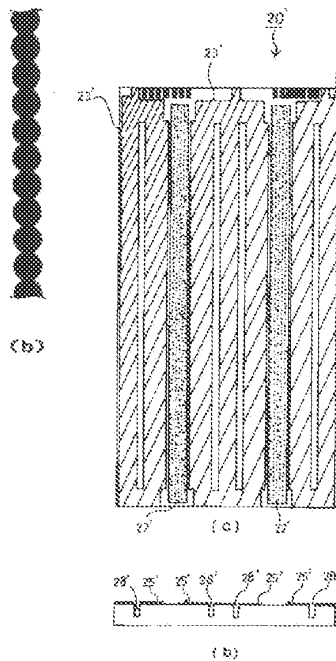
【図2】



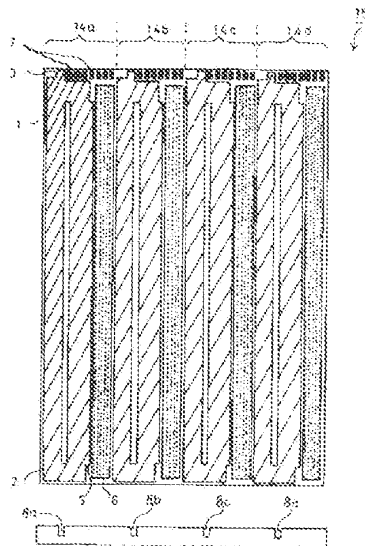
【図4】



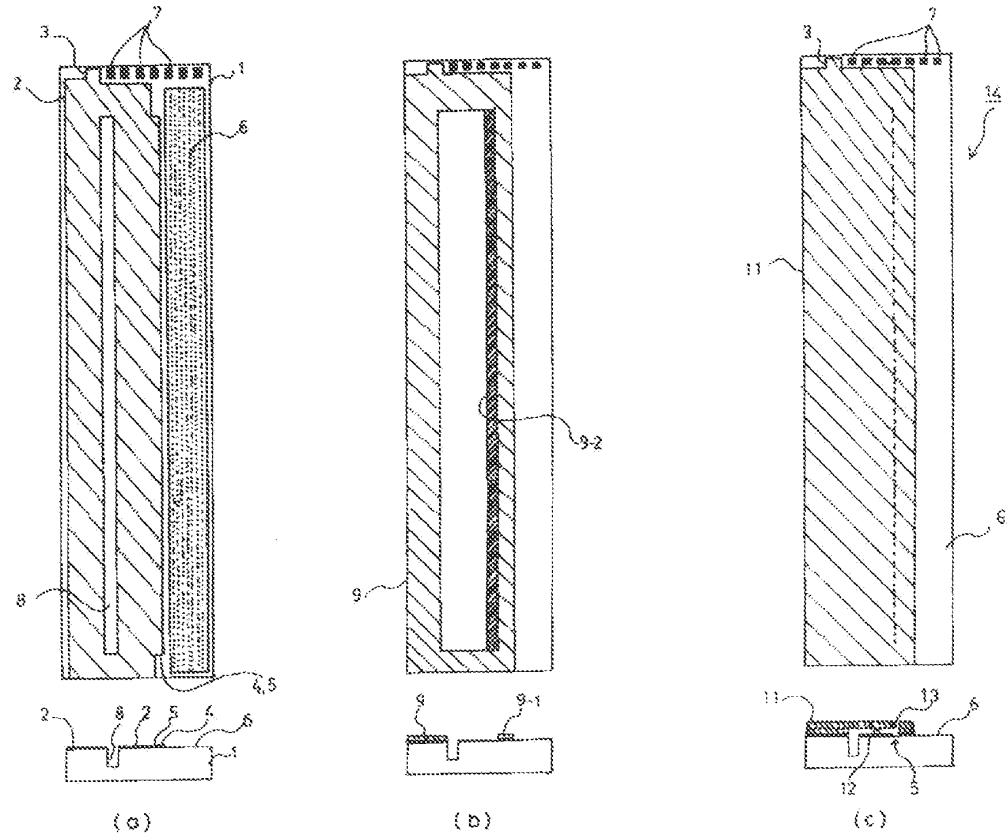
【図5】



【図8】



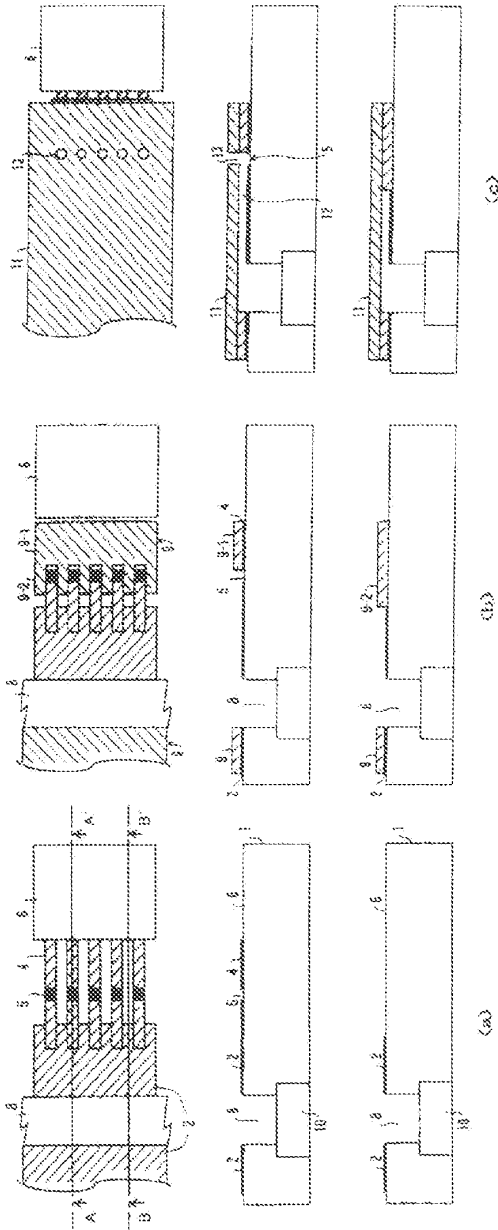
【図6】



(12)

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【図7】



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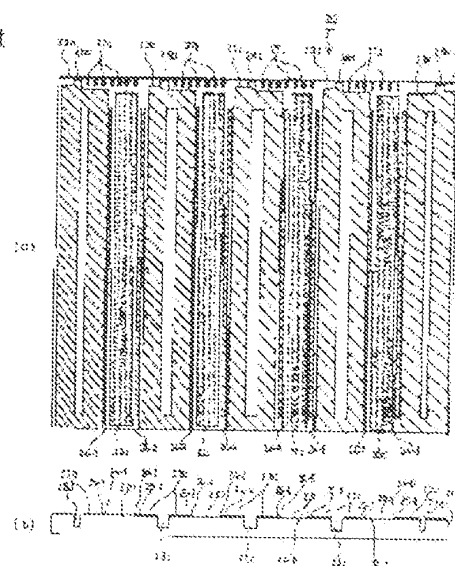
(72)Inventor : UENISHI KATSUZO
OTA MORIO

(54) THERMAL INK-JET HEAD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a thermal ink-jet head which can realize high resolution, small volume and stable layers of members.

SOLUTION: A thermal ink-jet head 20 on a silicon substrate 21 has four drive circuits 22a, 22b, 22c and 22d. A common electrode 23a has a first orifice array resistor 25-1 connected thereto via an individual wiring electrode 24-1 and a second orifice array resistor 25-2 connected thereto via an individual wiring electrode 24-2 held between a common electrode 23b and the common electrode. Ink discharge from the first and second orifice arrays is controlled in a time-sharing manner. The drive circuits 22b, 22c and 22d similarly drive resistors of right and left two orifice arrays in the time-sharing manner. A black ink is supplied from ink passages 28a, 28e to the first and an eighth orifice arrays, and a Y ink, an M ink, a C ink are supplied to the second and a third, a fourth and a fifth and, a sixth and a seventh orifice arrays respectively. The two orifice arrays of the same color are shifted by half a distance.



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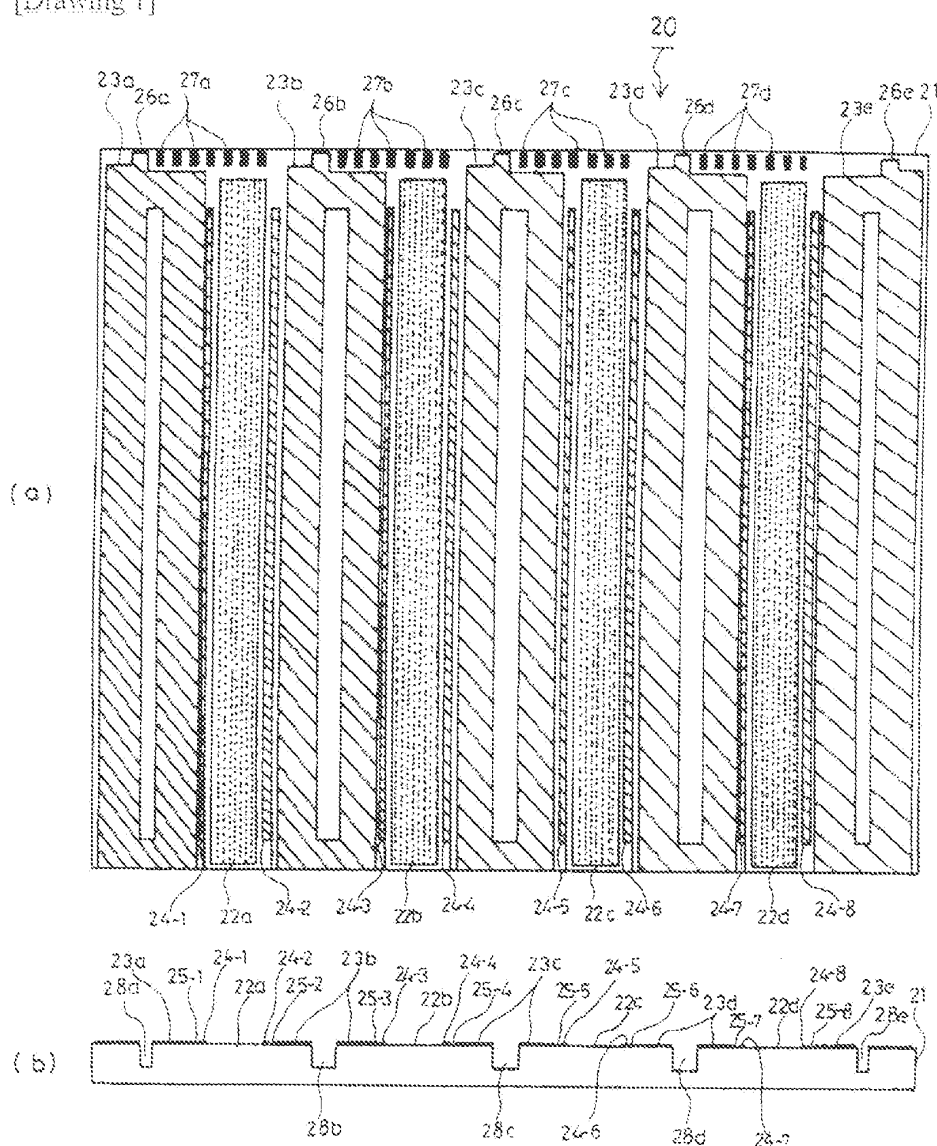
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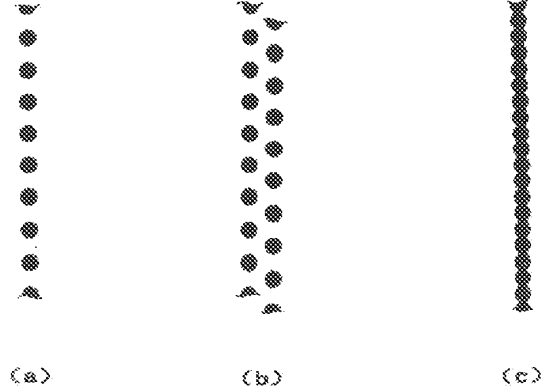
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DRAWINGS

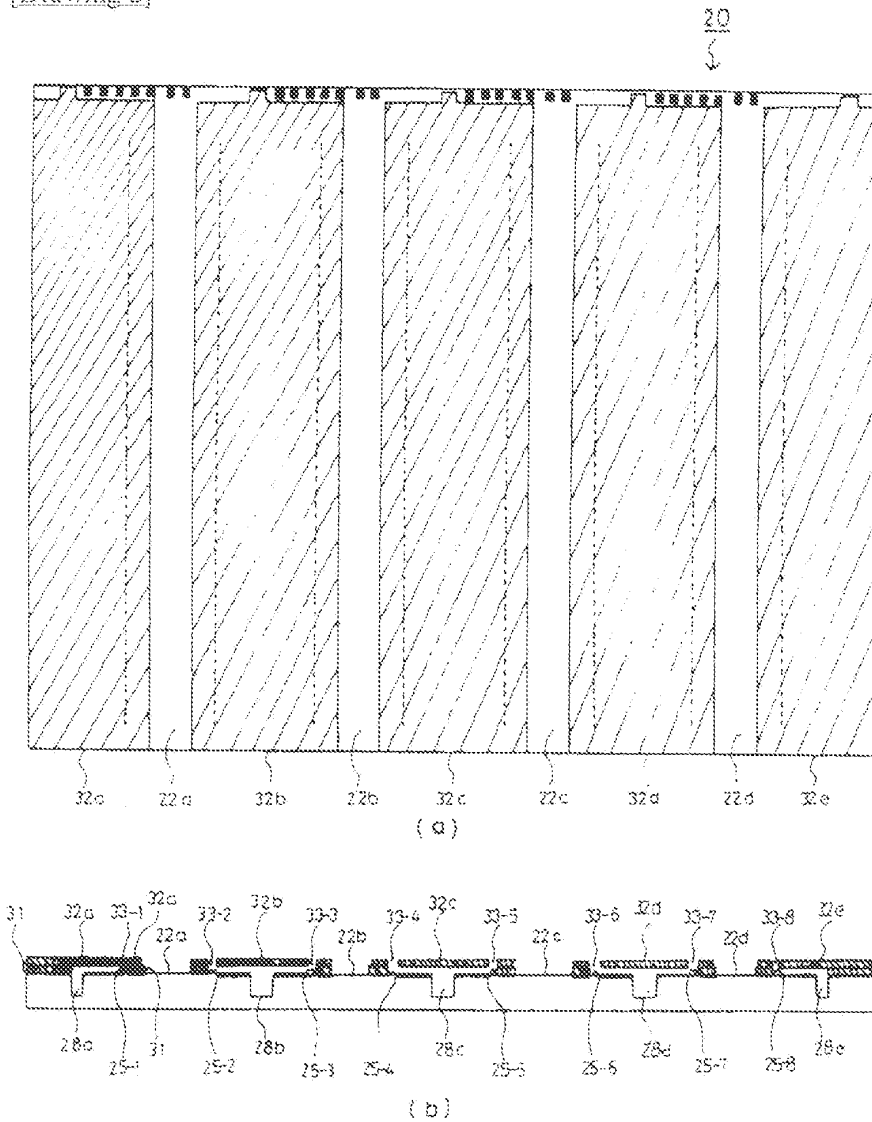
[Drawing 1]



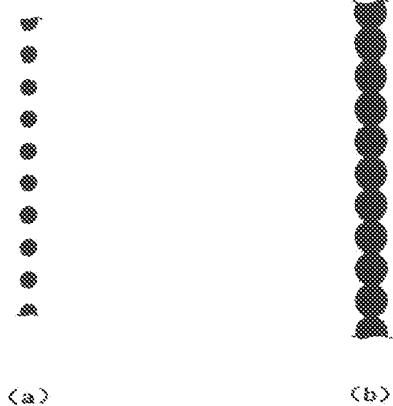
[Drawing 3]



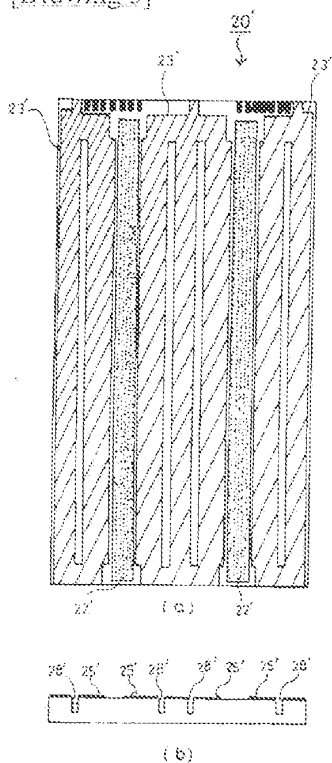
[Drawing 2]



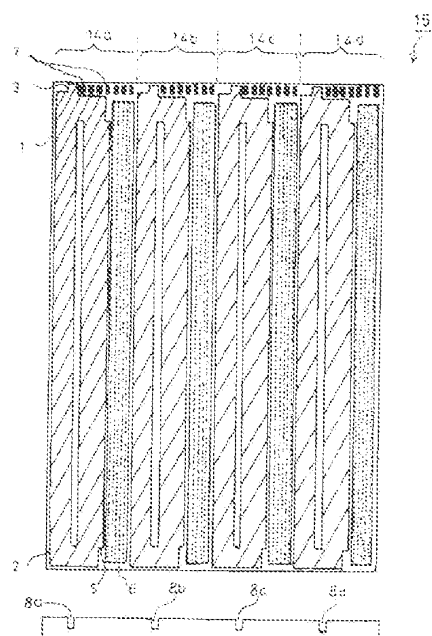
[Drawing 4]



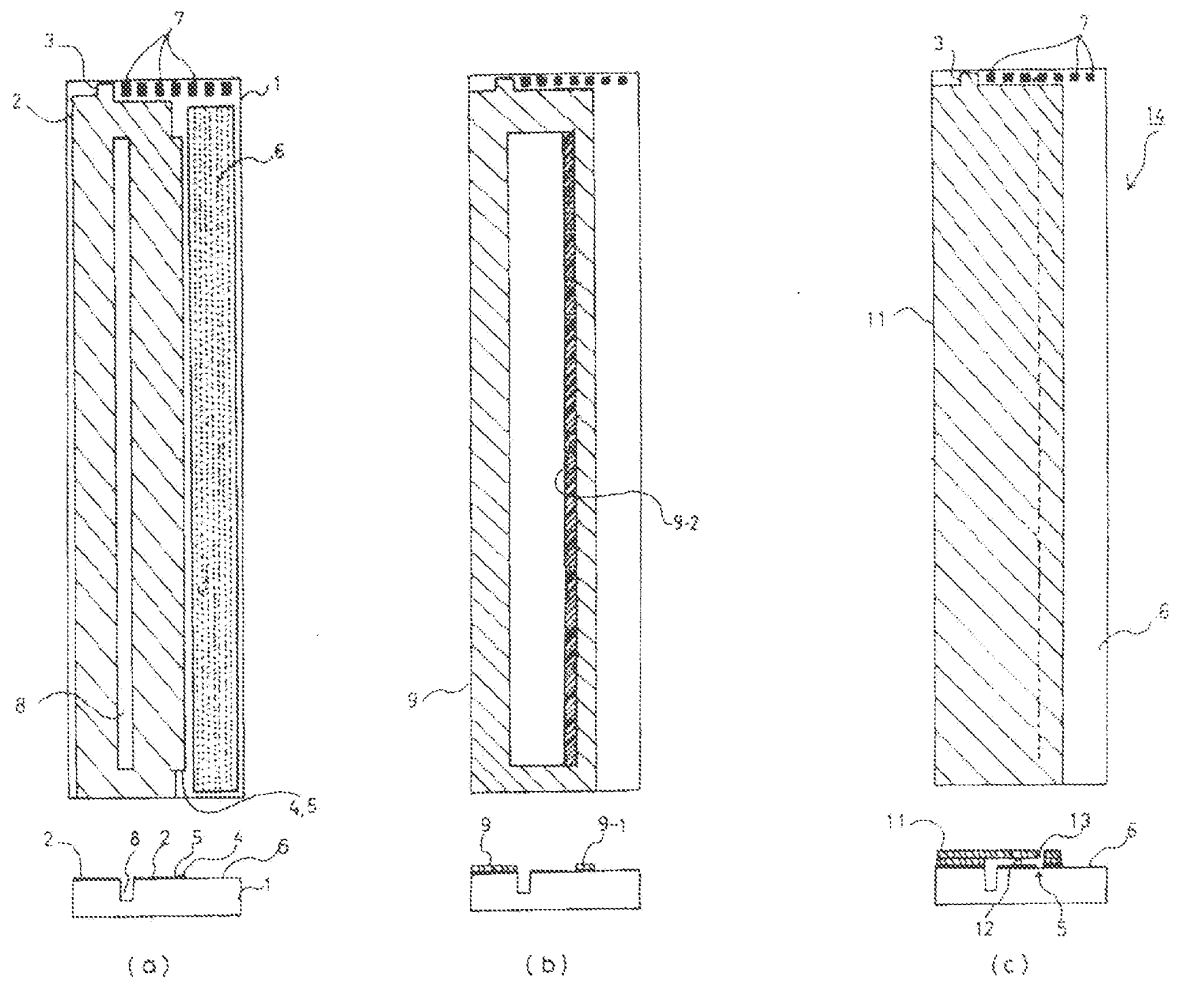
[Drawing 5]



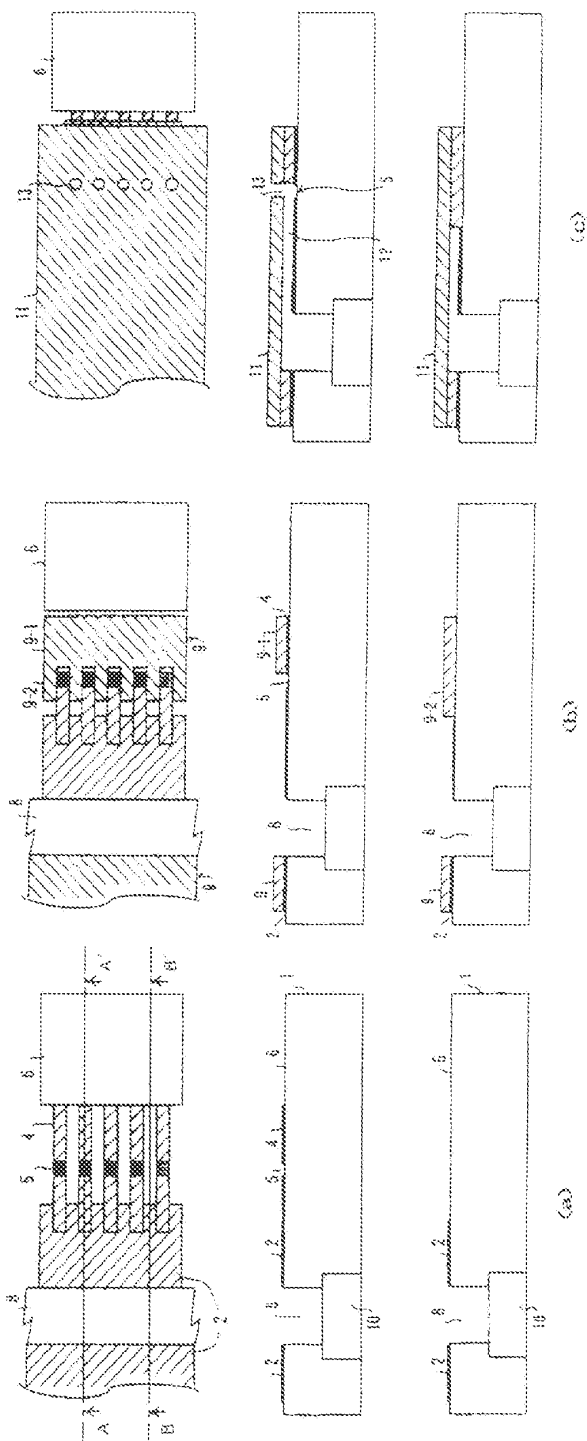
[Drawing 8]



[Drawing 6]



[Drawing 7]



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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] (a) The top view in the middle of the manufacture process which shows the configuration of the thermal ink jet head for full color in the gestalt of ** 1 operation, and (b) It is the sectional view.

[Drawing 2] (a) The top view and (b) which show the finished product of the thermal ink jet head for full color which completed the ***** process and was started as a simple substance It is the sectional view.

[Drawing 3] (a) Drawing and (b) which show typically solid printing by the nozzle train of one train of a ** thermal ink jet head Drawing and (c) which show the arrangement relation of the nozzle hole of two trains of the same color It is drawing showing that it prints to the same printing area in the nozzle train of two trains, and twice as many dot density as this can be realized.

[Drawing 4] (a) Drawing and (b) which show the path of the printing dot of color ink as a modification of ** nozzle hole formation It is drawing showing the path of the printing dot of black ink with the same dilation ratio.

[Drawing 5] (a) is the top view showing the configuration of the thermal ink jet head in the gestalt of other operations, and (b). It is the sectional view.

[Drawing 6] (a), (b), and (c) It is the top view and sectional view of an outline showing the manufacture approach of the printing section of the conventional thermal ink jet head in order of a process.

[Drawing 7] (a), (b), and (c) It is drawing showing the A-A' cross-section view Fig. to the middle, and showing a B-B' cross-section view Fig. for the detailed expansion part plan of the conventional printing section on the upper case at the lower berth.

[Drawing 8] It is drawing showing the condition of having constituted the full color thermal ink jet head for the conventional printing section 4 *****s.

[Description of Notations]

- 1 Silicon Substrate
- 2 Common Electrode
- 3 Common Electrode Electric Supply Terminal
- 4 Individual Wiring Electrode
- 5 Resistance
- 6 Drive Circuit
- 7 Drive Circuit Terminal
- 8 (8a, 8b, 8c, 8d) Ink supply way
- 9 Septum Member
- 9-1 Drum Equivalent Part of Comb
- 9-2 Gear-Tooth Equivalent Part of Comb
- 10 Ink Feed Holes
- 11 Sheet Metal Member
- 12 Ink Guidance Way
- 13 Nozzle Hole

14 (14a, 14b, 14c, 14d) Exoergic head
20 Thermal Ink Jet Head
21 Silicon Substrate
22 (22a, 22b, 22c, 22d) Drive circuit
23 (23a, 23b, 23c, 23d, 23e) Common electrode
24 (24-1, 24-2...24-7, 24-8) Individual wiring electrode
25 (25-1, 25-2...25-7, 25-8) Resistance (heater element)
26a, 26b, 26c, 26d, 26e Electric supply terminal
27 (27a, 27b, 27c, 27d) Drive circuit terminal
28a, 28b, 28c, 28d Ink supply way
31 Septum Member
32 (32a, 32b, 32c, 32d, 32e) Orifice plate
33 (33-1, 33-2, ..., 33-7, 33-8) Nozzle hole

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a thermal ink jet head.

[0002]

[Description of the Prior Art] In recent years, the printer using a thermal ink jet method is occupying the mainstream. This thermal ink jet method is set like the drop formation fault of the ink injected for printing, heats ** heater, and generates nucleus air bubbles on a heater side. ** These nucleus air bubbles coalesce and film air bubbles are produced. ** These film air bubbles carry out adiabatic expansion, and grow up. ** The grown-up film air bubbles have heat taken by surrounding ink, and contract. ** just -- being alike -- film air bubbles disappeared and it is realized by performing a series of processes of waiting for the next heater heating in an instant. And the film-boiling phenomenon is used for the process of above ** - **.

[0003] It is based on the approach for the film-boiling phenomenon in which it is used for a thermal ink jet printer "to raise, rapidly the skin temperature of the body which touches a liquid" for the latter, although a film-boiling phenomenon is discovered when the body heated by the elevated temperature like quenching of iron was soaked into the liquid, and when the skin temperature of the body which touches a liquid is raised rapidly.

[0004] Moreover, a film-boiling phenomenon is used in this way, ink in three primary colors is breathed out, and, generally the print head (thermal ink jet head) of an ink jet printer which performs full color printing is manufactured using Silicon LSI and a thin film technology.

[0005] And if resolution is the print head of 360dpi (dots per inch), for example, the approach of making a drive circuit correspond separately, respectively, bundling up 128 ink regurgitation nozzles, and manufacturing is learned for the manufacture approach. Moreover, if it is the case where resolution is 720dpi, 256 ink regurgitation nozzles will be formed with each drive circuit.

[0006] If this is explained briefly, a drive circuit and its terminal will be first formed in a silicon substrate 4 inches or more by LSI formation processing as a process 1. Next, detailed resistance of the electrode by nickel etc., Ta-Si-SiO₂, etc. is formed by the thin film technology as a process 2. Then, an ink supply way and ink feed holes are formed in the above-mentioned silicon substrate by wet etching or the sandblasting method as a process 3. Furthermore, the laminating of the septum is carried out that the ink slot corresponding to each ink delivery should be formed using organic materials, such as photosensitive polyimide, as a process 4. And the ink slot which stuck the sheet metal member which becomes with attached steel sheet metal or polyimide, such as epoxy resin adhesive, as a process 5 on the silicon substrate, and was formed by the above-mentioned septum is covered, and the detailed path according to individual (ink guidance way) is formed in it. Furthermore, a 40 micrometers - 20 micrometers hole is vacated for the part corresponding to the above-mentioned detailed resistance of the above-mentioned sheet metal member by excimer laser etc. as a process 6, and package formation of many nozzle holes (it is also called an orifice) is carried out. So far, it is processed in the state of a wafer. And finally, cutter TENGU of the dicing saw etc. is used and carried out as a process 7, and it

divides according to an individual for every unit. In addition, generally an orifice is the hole for energy transfers formed in termination or wall surfaces, such as a waveguide, or the kind of an aperture.

[0007] Drawing 6 (a), (b), and (c) And drawing 7 (a), (b), and (c) It is drawing showing the manufacture approach of the exoergic head of the above-mentioned thermal ink jet head in order of a process.

drawing 6 (a), (b), and (c) respectively -- the top view and sectional view of an outline -- being shown -- **** -- drawing 7 (a), (b), and (c) respectively -- an upper case -- drawing 6 (a), (b), and (c) The A-A' cross-section view Fig. of an upper case is shown in a detail expansion partial diagrammatic view and the middle, and the B-B' cross-section view Fig. of an upper case is shown in the lower berth.

[0008] In addition, in these drawings, although the expedient top of explanation and all show only one exoergic head, in fact, two or more such exoergic heads stand in a row, and are formed on the silicon substrate of one sheet. moreover, drawing 6 (a), (b), and (c) each -- the sectional view shown below -- drawing 7 (a), (b), and (c) It is each the same as that of the A-A' cross-section view Fig. shown in the middle.

[0009] Above-mentioned drawing 6 (a) And drawing 7 (a) The condition immediately after completing the process 1 mentioned above - a process 3 is shown. That is, on the silicon substrate 1, the common electrode 2, the common electrode electric supply terminal 3 (refer to drawing 6 (a)), the individual wiring electrode 4, resistance 5, the drive circuit 6, the drive circuit terminal 7 (refer to drawing 6 (a)), the ink supply way 8, and the ink feed holes 10 (refer to drawing 7 (a)) are formed.

[0010] Next, drawing 6 (b) And drawing 7 (b) The condition immediately after completing the above-mentioned process 4 is shown. That is, the laminating of the septum member 9 is carried out between the part located in the left-hand side of the ink supply way 8 of the common electrode 2, the part in which the individual wiring electrode 4 is arranged, and each resistance 5 and resistance 5. The part 9-2 into which the part by which a laminating is carried out between each above-mentioned resistance 5 of the septum member 9 begins to be extended between the drum of a comb, then each resistance 5 in the part 9-1 on the individual wiring electrode 4 is making the configuration equivalent to the gear tooth of a comb. Thereby, the detailed ink guide rail to which resistance 5 is located in the root part between that gear tooth and gear tooth is formed only for the number of resistance 5 by using the gear tooth of this comb as a septum. This septum member 9 has the thickness of 10 micrometers or more.

[0011] And drawing 6 (c) And drawing 7 (c) The condition immediately after completing the process 5 and process 6 which were mentioned above is shown. That is, the sheet metal member 11 has covered the drive circuit 6 and all the fields except the part of the electric supply terminals 3 and 7, and the above-mentioned ink guide rail also has a top covered, and forms the ink guidance way 12 of the height corresponding to 10 micrometers in thickness of the septum member 9. And the nozzle hole 13 is formed in the part corresponding to resistance 5. and, thereby, the exoergic head 14 equipped with the nozzle hole 13 of one train is completed.

[0012] Usually, in full color printing, the black (Bk) sole possession of is taken by the amount of [of an alphabetic character or an image] Kurobe is added to three colors of the yellow (Y) which is subtractive primary colors, a Magenta (M), and cyanogen (C), and the ink of a total of four colors is needed for them. Therefore, also at the lowest, the nozzle train of four trains is required. And according to the manufacture approach mentioned above, it is possible to constitute the component of four trains in a monolithic, and it is possible to also arrange the physical relationship of each train correctly by the manufacturing technology of today's semi-conductor.

[0013] Drawing 8 is drawing showing the condition of having constituted the full color thermal ink jet head for the silicon substrate 1 shown in above-mentioned drawing 6 and above-mentioned drawing 7, the common electrode 2, the common electrode electric supply terminal 3, the individual wiring electrode 4, resistance 5, the drive circuit 6, the drive circuit terminal 7, the ink supply way 8, the septum member 9, the ink feed holes 10, the sheet metal member 11, and the component (exoergic head) 14 that becomes considering each part of a nozzle hole 13 as 1 set 4 *****. In addition, the exoergic heads 14 of this drawing are 4 ***** -- in order to show a configuration intelligibly -- drawing 6 (a) The thing in the condition of having ended to the shown process 1 - the process 3 is shown.

[0014] As shown in this drawing, the thermal ink jet head 15 Four exoergic heads 14 (14a, 14b, 14c,

14d) are located in a line, and are arranged. For example, Y ink is supplied to the ink guidance way 12 (refer to drawing 6 (c) and drawing 7 (c)) of exoergic head 14a from ink supply way 8a. M ink is supplied to the ink guidance way 12 of exoergic head 14b from ink supply way 8b, and C ink is supplied to the ink guidance way 12 of exoergic head 14c from ink supply way 8c. From 8d of ink supply ways, Bk ink is supplied to the exoergic head 14d ink guidance way 12.

[0015] On the occasion of printing, resistance 5 energizes alternatively according to printing information, it generates heat in an instant, a film-boiling phenomenon is generated, and an ink droplet is breathed out from the nozzle hole 13 corresponding to the resistance 5. By such ink jet method, an ink droplet is breathed out in the abbreviation globular form of the magnitude corresponding to the path of a nozzle hole 13, on space, serves as magnitude of a twice as many diameter as ****, and is printed.

[0016] Thus, if the full color thermal ink jet head obtained is the case where resolution is 360dpi, it will be equipped with 128 nozzle x4 train =640 nozzle, and will be formed in outline 8.5mmx19.0mm magnitude. Moreover, if it is the case where resolution is 720dpi, 256 nozzle x4 train =1280 nozzle will be mostly formed into 8.5mmx19.0mm magnitude.

[0017]

[Problem(s) to be Solved by the Invention] By the way, the path and its arrangement spacing of a nozzle hole are designed by the resolution (resolution of an image) of printing. As mentioned above, since the ink droplet breathed out by the shape of a globular form of the magnitude corresponding to the path of a nozzle hole spreads in the path of the magnitude of **** on space, the path of a nozzle hole is designed by one half of the magnitude of the dot pitch to print. For example, if it is the case where resolution is 360dpi, a dot pitch will be about 70 micrometers, therefore the path of a nozzle hole will be formed in 30-40 micrometerphi. Moreover, a dot pitch is about 35 micrometers, therefore, in the case of 720dpi, the path of a nozzle hole is set to 15-20 micrometerphi, for example.

[0018] Thus, if a pitch becomes detailed, the problem that it becomes difficult for adhesion sides with the other party (gear-tooth equivalent part 9-2 of the comb of the septum member 9) at the time of sticking an orifice plate (sheet metal member 11) on a silicon substrate 1 by which a laminating is carried out to decrease in number, and to realize stable adhesion will occur.

[0019] however -- another side -- printing -- in order to raise resolution, many trains-ization which prints Isshiki with the exoergic head of two or more trains is desired, and the demand of the formation of many nozzles and highly-minute-izing has been increasing increasingly.

[0020] Although the thermal ink jet head for full color needs the exoergic head of at least 4 trains as mentioned above, these exoergic heads have the drive circuit 6 independent according to an individual, as shown in drawing 8, and the drive circuit terminal 7 is arranged in these. Moreover, it also has the feeder to an electrode common to each heater element (resistance 5) for every exoergic head. Therefore, many connections occur in connection with this thermal ink jet head and external circuit, and a more advanced technique is required of this connection.

[0021] Moreover, since there are not only it but many the circuits by which a laminating is independently carried out in this way for every exoergic head, electrodes, the numbers of connection terminals, etc., fertilization of the exoergic head which needs a big area for the silicon chip by which a laminating is carried out in these, therefore is formed in a monolithic (monolithic) is checked.

[0022] For example, drawing 6 (a), (b), and (c) Since the exoergic head which has the nozzle hole 13 of one train is constituted from a shown example, the width of face of 2mm of abbreviation is needed. And with a full color thermal ink jet head, since the four trains of the above-mentioned exoergic heads are formed successively, as mentioned above, it becomes 8.5mmx19.0mm magnitude about. It follows, for example, only about 55 above-mentioned 8.5mmx19.0mm chips cannot be formed with about 30 pieces and a 5 inches silicon wafer on a 4 inches silicon wafer. Thus, since there were very few thermal ink jet heads for full color which can be taken from one wafer, it also had the problem of causing the rise of a manufacturing cost.

[0023] The technical problem of this invention is offering the thermal ink jet head in which the laminating by which are high resolution and the small volume and the component member's was stabilized is possible in view of the above-mentioned conventional actual condition.

[0024]

[Means for Solving the Problem] Below, the configuration of the thermal ink jet head of this invention is described. First, the thermal ink jet head of invention according to claim 1 Prepare two or more exoergic heads which arranged two or more heater elements in the shape of an array, and the ink supplied on the above-mentioned heater element is heated in the above-mentioned heater element. It is the thermal ink jet head which carries out the regurgitation of the ink droplet from the orifice corresponding to this heater element by making the interface of the above-mentioned ink and the above-mentioned heater element generate air bubbles. It is prepared between the adjoining exoergic heads, and it has the single ink supply way which supplies the above-mentioned ink in common to the heater element of the exoergic head of these both sides, and is constituted.

[0025] Next, the thermal ink jet head of invention according to claim 2 Prepare two or more exoergic heads which arranged two or more heater elements in the shape of an array, and the ink supplied on the above-mentioned heater element is heated in the above-mentioned heater element. It is the thermal ink jet head which carries out the regurgitation of the ink droplet from the orifice corresponding to this heater element by making the interface of the above-mentioned ink and the above-mentioned heater element generate air bubbles. The driving means which is established between the 1st exoergic head and the 2nd exoergic head, and supplies a driving signal common to the n-th heater element in the exoergic head of the above 1st, and the m-th heater element in the exoergic head of the above 2nd. Supply of the above-mentioned driving signal by this driving means, and the common electrode of the exoergic head of the above 1st and the common electrode of the exoergic head of the above 2nd By choosing it as time sharing, it has the control means which controls the above-mentioned driving means to carry out the time-sharing drive of the heater element of the exoergic head of the above 1st, and the heater element of the exoergic head of the above 2nd, and is constituted.

[0026] Furthermore, the thermal ink jet head of invention according to claim 3 Prepare two or more exoergic heads which arranged two or more heater elements in the shape of an array, and the ink supplied on the above-mentioned heater element is heated in the above-mentioned heater element. It is the thermal ink jet head which carries out the regurgitation of the ink droplet from the orifice corresponding to this heater element by making the interface of the above-mentioned ink and the above-mentioned heater element generate air bubbles. Make n into an integer and the common electrode of the exoergic head of eye the n+1st trains and the exoergic head of eye the n+2nd trains is constituted from a single common electrode. The common electrode of the exoergic head of eye the n+3rd trains and the exoergic head of eye the n+4th trains is constituted from other single common electrodes, and it has the driving means which carries out the time-sharing drive of the heater element in the exoergic head of eye the n+2nd trains of the above, and the heater element in the exoergic head of eye the n+3rd trains of the above, and is constituted.

[0027] And by making m into an integer, like claim 4 publication, the heater element in the exoergic head of eye the m+1st trains of the above and the heater element of the exoergic heads of eye the m+2nd trains are the same pitches, and only 1/2 pitch shifts a location and is arranged. Moreover, for example like claim 5 publication, the exoergic head of eye the m+1st trains and the exoergic head of eye the m+2nd trains are constituted so that the regurgitation of the ink of the same color may be carried out. Moreover, the dot density according to claim 6 which is made to breathe out black ink from the exoergic head of eye the 1st train and the exoergic head of the last train, and is made to breathe out color ink from other exoergic heads like and by which this color ink is breathed out is constituted the twice of the dot density by which the above-mentioned black ink is breathed out, for example.

[0028]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained, referring to a drawing. Drawing 1 (a) It is the top view showing the configuration of the thermal ink jet head in the gestalt of 1 operation, and is this drawing (b). It is the sectional view. In addition, this drawing (a) and (b) The shown thermal ink jet head 20 In the manufacture process same in order to show a configuration intelligibly as the conventional exoergic head shown in drawing 6 and drawing 7 Form a drive circuit and its terminal in a silicon substrate, and an electrode and resistance are formed by

the thin film technology. Although the condition by the place which formed the ink supply way by wet etching or the sandblasting method is shown and it was formed in the silicon wafer at the monolithic, only one piece is started and shown from inside.

[0029] This thermal ink jet head 20 is drawing 1 (a) and (b). Four drive circuits 22a, 22b, 22c, and 22d are formed in the silicon substrate 21 so that it may be shown. On the other hand, resistance 25-1 is connected and formed through the individual wiring electrode 24-1 between 1st common electrode 23a, and resistance 25-2 is connected and formed in 1st drive circuit 22a through the individual wiring electrode 24-2 between 2nd common electrode 23b.

[0030] On the other hand, resistance 25-3 is connected and formed through the individual wiring electrode 24-3 between common electrode 23b of the above 2nd, and resistance 25-4 is connected and formed in 2nd drive circuit 22b through the individual wiring electrode 24-4 between 3rd common electrode 23c.

[0031] Similarly, on the other hand, resistance 25-5 is connected and formed through the individual wiring electrode 24-5 between common electrode 23c of the above 3rd, and resistance 25-6 is connected and formed through the individual wiring electrode 24-6 at 3rd drive circuit 22c between 23d of 4th common electrode.

[0032] And on the other hand, resistance 25-7 is connected and formed through the individual wiring electrode 24-7 between 23d of common electrodes of the above 4th, and resistance 25-8 is connected and formed in 22d of 4th drive circuit through the individual wiring electrode 24-8 between 5th common electrode 23e.

[0033] The electric supply terminals 26a-26e are connected, and it is formed, and the drive circuit terminals 27a-27d connect with the five above-mentioned common electrodes 23a-23e, respectively, and it is formed in four drive circuits 22a-22d at them, respectively.

[0034] And along with a longitudinal direction, a center section cuts and lacks the common electrodes 23a-23e, respectively, and the ink supply ways 28a-28d are formed in the lower part. Although not illustrated, the ink feed holes which penetrate a silicon substrate 21 are open for free passage in especially these ink supply ways 28a-28d, and it is formed in them, respectively.

[0035] From those ink feed holes, Bk ink is supplied to 1st ink supply way 28a and 5th ink supply way 28e in this example. And Y ink is supplied to 2nd ink supply way 28b, M ink is supplied to 3rd ink supply way 28c, and C ink is supplied to 28d of 4th ink supply way.

[0036] Drawing 2 (a) In the same manufacture process as the conventional exoergic head further shown in drawing 6 and drawing 7 from the above-mentioned condition Carry out the laminating of the septum which forms the ink slot corresponding to each resistance 25 (25-1, 25-2...25-7, 25-8), and stick an orifice plate, form an ink guidance way, and package formation of the nozzle hole is carried out by excimer laser. It is the top view showing the finished product of the thermal ink jet head for full color started as a simple substance, and is this drawing (b). It is the sectional view. Drawing 1 (a) and (b) which were mentioned above It is drawing 2 (b) in piles to some common electrodes 23 (23a-23e) and the part of the individual wiring electrode 24 (24-1 to 24-8) in the condition which showed. So that it may be shown the part the laminating of the septum member 31 is carried out, and excluding the arrangement section of the drive circuit 22 (22a-22d) to a it top -- the orifice plate 32 (32a, 32b, 32c, 32d, 32e) of five sheets -- this drawing (a) and (b) It is stuck so that it may be shown.

[0037] In orifice plate 32a, the nozzle hole 33 (33-1, 33-2, ..., 33-7, 33-8) of a predetermined path (if the resolution of this thermal ink jet head 20 is 360dpi, in this example, it will mention later about 15-20micrometerphi and this) bundles up at the predetermined spacing (about 70 micrometers), and is formed in the location corresponding to resistance 25-1 at it, respectively.

[0038] Bk ink of 1st ink supply way 28a mentioned above is supplied to the nozzle train of the nozzle hole 33-1 of orifice plate 32a, and Bk ink of 5th ink supply way 28e is supplied to the nozzle train of the nozzle hole 33-8 of orifice plate 32e.

[0039] And Y ink of 2nd ink supply way 28b The nozzle train of the nozzle hole 33-2 of orifice plate 32b and the nozzle train of a nozzle hole 33-3 are supplied. M ink of 3rd ink supply way 28c The nozzle train of the nozzle hole 33-4 of orifice plate 32c and the nozzle train of a nozzle hole 33-5 are supplied,

and C ink of 28d of 4th ink supply way is supplied to the nozzle train of the nozzle hole 33-6 of 32d of orifice plates, and the nozzle train of a nozzle hole 33-7.

[0040] Thus, the ink supply way 28 which is equipped with the nozzle train of eight trains for every color, the nozzle train, i.e., 4 classification-by-color sum total, of two trains, and supplies ink to those nozzle holes 33 consists of five [fewer / three / than the number of nozzle trains], and there are also five common electrodes 32. Moreover, the number of the drive circuits 22 which carry out the exoergic drive of the resistance 25 corresponding to those nozzle trains is four, and that of the drive circuit terminals 27 (27a-27d) is four.

[0041] Thus, it consists of four drive circuits 22 so that the exoergic drive of the resistance 25 of the nozzle hole 33 of the double number of trains may be controlled by time sharing. Thus, it is 1kHz - 10kHz (1 m seconds - 100-microsecond spacing), a period, i.e., a regurgitation repeat frequency, for the energization pulse width to the resistance for the regurgitation of ink (heater element) to be 1 microsecond, and for that a time-sharing drive is possible make ink breathe out by the following signal from the same nozzle hole in a thermal ink jet head. Therefore, there are time allowances of enough as a drive circuit which can operate with several 10mHz or the period beyond it, and it is made to drive resistance of the nozzle train of two trains by time sharing using these time allowances.

[0042] Moreover, since sufficient time allowances are between the first exoergic drive to the resistance same as mentioned above, and the next exoergic drive, even if it also considers the relation of the maximum allowed current of the exoergic head which is taken into consideration, for example in solid printing and performs the above-mentioned (vacating a time interval a little) time-sharing drive, the factor in which this time-sharing drive reduces printing speed does not become.

[0043] And while this thermal ink jet head 20 is equipped with the nozzle train of two trains, and the nozzle train of a total of eight trains for every color, the whole magnitude consists of dimensions without the thing and great difference of the nozzle train of four conventional trains shown in drawing 8.

[0044] Drawing 3 (a) Solid printing by the nozzle train of one train of the above-mentioned thermal ink jet head 20 is shown typically. If it is original, in the dot array of 360dpi, the magnitude of a nozzle hole is 30-40micrometerphi, the ink droplet had to spread twice in the pitch of 70.6 micrometers, and each printing dot must stick in the above-mentioned solid printing. However, in the gestalt of this operation, in order to print by arrangement twice the resolution of a nozzle hole, the path of a nozzle hole is formed in 15-20 micrometerphi which corresponds in the dot array of 720dpi. And arrangement of the nozzle hole of the nozzle train of two trains of the same color is 2 pitch ** carried out [1 /], and is formed.

[0045] Drawing 3 (b) The arrangement relation of the nozzle hole of two trains of such same color is shown. This drawing (b) Timing is taken so that it may print to the same printing area of space in the nozzle train of two trains by actual printing, although the case where printing timing is shifted and printed in the nozzle train of two trains is shown in order to show a gap of 1/2 pitch, and it is drawing 3 (c). Printing is performed with the dot density of 1/2 pitch of the nozzle hole array of one train so that it may be shown. Thus, a small orifice (nozzle hole) can be formed and twice [in case an orifice train is the configuration of one train] as many resolution as this can be realized by using the orifice train of two trains 2 pitch ** carried out [1 /].

[0046] Thus, in the gestalt of this operation, by communalizing a drive circuit, a feeder circuit, and an ink supply way in the orifice train of two trains, the miniaturization of a chip can be attained, and a twice [over the past] as many nozzle train as this can be constituted with the same size almost as the former, without enlarging size of a thermal ink jet head. Moreover, the high definition thermal ink jet head which has twice as many resolution as this can consist of technical levels of the conventional micro processing practical.

[0047] In addition, although, as for a color picture, always fine high resolution is demanded, black printing of an alphabetic character etc. does not require high resolution so much. Moreover, generally, even if a printer is used [not only the object for office work but personal], it is used for printing of an alphabetic character (text) in many cases. Therefore, it is twice the pitch of the nozzle hole array of other colors, and you may make it form the nozzle hole array of the nozzle train of Bk ink sole possession of

is mainly taken by alphabetic character printing by the twice as many aperture as this.

[0048] Drawing 4 (a) The printing dot (the same as that of the printing dot shown in drawing 3 (a)) of such Y ink of the thermal ink jet head of a configuration, M ink, and C ink is shown, and it is drawing 4 (b). It is this drawing (a) about the printing dot of Bk ink. The same dilation ratio shows. Thus, if constituted, printing speed can be raised twice by sharing printing with the 1st train and the 8th train in the case of printing in the alphabetic character only by black (the odd number train of for example, printing data being printed with the head of eye the 1st train, and an even number train being printed with the head of eye the 8th train).

[0049] Moreover, it is made to carry out the regurgitation of the ink droplet (for example, black) of the same color from the orifice trains of all eight trains, nozzle hole arrangement of the orifice train of eight trains is shifted by the physical relationship of the integral multiple of a pitch which determines resolving power, respectively, and you may make it arrange in above-mentioned drawing 1 - drawing 3. Then, although it is a single color, a very high definition printing image can be obtained.

[0050] In addition, without restricting to this, the nozzle train for every color is constituted from one train, and you may make it drive resistance of the nozzle train by time sharing, although the gestalt of the above-mentioned operation showed the example which all constitutes the nozzle train of two trains for every color.

[0051] Drawing 5 (a) It is the top view showing the configuration of the thermal ink jet head in the gestalt of other operations, and is this drawing (b). It is the sectional view. This drawing (a) and (b) Although this thermal ink jet head 20' is equipped with the orifice train of resistance 25' of four trains, and four ink supply way 28' corresponding to this so that it may be shown, three drive circuit 22' of common electrode 23' is two configurations. This drive principle is the same as that of the case of the thermal ink jet head 20 shown in drawing 1 - drawing 3.

[0052] According to this configuration, it is the resolution of 360dpi, for example, and the configuration of 256 nozzles, then thermal ink jet head 20' can be about designed with a 20mmx6mm dimension in one train. In the conventional design shown in drawing 6 - drawing 8, it is a 20mmx8mm dimension, and although this becomes 30 chips on a 4 inches silicon wafer, it can form 40 chips as it is 20mmx6mm like this example. Moreover, in a 5 inches silicon wafer, 75 chips can be formed with the configuration of this example to 55 conventional pieces.

[0053] Thus, the number of the chip which can be taken from one silicon wafer serves as a difference which is 30 percent or 40 percent, and can contribute to improvement in productivity greatly. moreover, drawing 5 (a) from -- since the number of connection terminals with the exterior can also be reduced by half so that clearly, the maintenance service of the thermal ink jet head which serves as components with comparatively high exchange frequency in a color printer becomes mounting to the body of printer equipment is also easy, and easy for this reason, and a thermal ink jet head with more high practicality is realized.

[0054] In addition, with central common electrode 23', either, if only the number of arbitration is connected by making drive circuit 22' of one side into a lot, an orifice train can be extended at any cost like six trains or eight trains from four trains, and, as for the above-mentioned configuration, higher definition printing can be realized.

[0055]

[Effect of the Invention] Since according to this invention the orifice train of two trains is 2 ***** carried out [1 /], is arranged and only the diameter of an orifice is made detailed as explained to the detail above, it becomes possible easily to realize the thermal ink jet head which printing of the double resolution can be performed in the process tolerance of the usual laminating processing, therefore performs high definition printing.

[0056] Moreover, since the heater element of the adjoining orifice train is driven by time sharing in one drive circuit linked to this and juxtaposition, 1/2 of the number of orifice trains will be sufficient as the number of drive circuits, therefore the miniaturization of a thermal ink jet head of it is attained.

[0057] Moreover, since a thermal ink jet head becomes small similarly, the former can increase at least the number of the thermal ink jet head formed in one silicon substrate 40% or more, therefore the

productivity of a thermal ink jet head improves.

[0058] Moreover, since a drive circuit terminal is halved with a drive circuit, the maintenance service of the color printer to which the number of connection terminals with the exterior is halved, and mounting to the body of a printer becomes easy, therefore the exchange frequency of a print head becomes comparatively high becomes easy, thereby, user-friendliness becomes good and reliance of a customer can be obtained.

[Translation done.]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : **11/324,167**
 Filed : **December 30, 2005**
 Applicant : **Lucas Barkley, et al.**
 Title : **METHODS AND APPARATUSES FOR REGULATING THE
 TEMPERATURE OF MULTI-VIA HEATER CLIPS**

Confirmation No. : **6156**
 Art Unit : **2853**
 Examiner : **Lam S. Nguyen**

Attorney Docket No. : **2005-0547-02**
 Customer No. : **29052**

DISCLOSURE UNDER 37 C.F.R. § 1.56

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

Sir:

The citation of information below and in the enclosed documents is made pursuant to 37 C.F.R. § 1.56.

The prosecution of the following U.S. patent application numbers may be relevant to pending U.S. Patent Application No. 11/324,167:

- (1) U.S. Patent Application No. 11/238,559 (filed September 29, 2005)
 - Non-final Office Action mailed March 22, 2007
 - Response to Non-final Office Action mailed June 19, 2007
 - Final Office Action mailed August 31, 2007
 - Response to Final Office Action mailed October 30, 2007
 - Advisory Action mailed November 13, 2007
 - Request for Continued Examination mailed November 30, 2007
 - Non-final Office Action mailed February 11, 2008
 - Response to Non-final Office Action mailed on May 12, 2008
- (2) U.S. Patent Application No. 11/323,809 (filed December 30, 2005)

7964387.1

Application No.: 11/324,167
Filed: December 30, 2005
Information Disclosure Statement - DISCLOSURE UNDER 37 C.F.R. § 1.56

- Non-final Office Action mailed November 1, 2007
- Response to non-final Office Action mailed February 1, 2008
- Final Office Action mailed May 19, 2008
- Response to Final Office Action mailed July 14, 2008

These Office Actions, Responses to Office Action, Advisory Opinions, and Notice of Allowances (if any) as well as additional information relating to the prosecution history of these granted and pending patent applications may be accessible through the Patent Application Information Retrieval System (PAIRS) located on the United States Patent and Trademark Office's website.

The citation of this information does not constitute an admission or a waiver of any right the Applicants may have under applicable statutes, Rules of Practice in patent cases, or otherwise. The citation of this information is made to ensure the Examiner is aware of and considers the prosecution history associated with these related patent applications and patents.

Respectfully submitted,



Christopher J. Chan
Attorney for the Assignee
Reg. No. 44,070

DATE: July 14, 2008

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Attorney Docket No.: 2005-0547-02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
Lucas Barkley, et al.	)	Confirmation No.: 6156
	)	
Serial No.: 11/324,167	)	Art Unit: 2853
	)	
Filed: December 30, 2005	)	Examiner: Lam S. Nguyen
	)	
For: METHODS AND APPARATUSES FOR	)	
REGULATING THE TEMPERATURE OF MULTI-	)	
VIA HEATER CLIPS	)	
	)	
Attorney Docket No. 2005-0547-02	)	

SUBMISSION OF SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

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

Dear Sir:

The citation of information on the attached Form PTO/SB/08A, "Information Disclosure Statement by Applicant" is made pursuant to 37 C.F.R. §§ 1.56, 1.97, and 1.98.

Pursuant to the Office's waiver of the requirement for submitting a copy of each cited U.S. patent and each U.S. patent application publication for all U.S. national patent applications, no copy of any cited U.S. patent or U.S. patent application publication is provided herewith.

The citation of this information does not constitute an admission of priority or that any cited item is available as a reference, or a waiver of any right applicant may have under applicable statutes, Rules of Practice in patent cases, or otherwise.

Applicant: Lucas Barkley, et al.
Application No.: 11/324,167
Filed: December 30, 2005
Page 2 of 2

This Statement is submitted under 37 C.F.R. § 1.97(c). Accordingly, the Commissioner is hereby authorized to charge the fee of \$180.00 required for consideration of this Statement to Deposit Account No. 19-5029. No additional fees are believed due; however, any additional fee required is hereby authorized to be charged to Deposit Account No. 19-5029.

Respectfully submitted,



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Date: July 14, 2008

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Attorney Docket No. 2005-0547.02

Electronic Acknowledgement Receipt	
EFS ID:	3608935
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	Methods and apparatuses for regulating the temperature of multi-via heater chips
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Christopher Chan/Theresa Camp
Filer Authorized By:	Christopher Chan
Attorney Docket Number:	2005-0547.02
Receipt Date:	14-JUL-2008
Filing Date:	30-DEC-2005
Time Stamp:	13:55:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		Response.pdf	373457	yes	9
			6057aa8c1ab099c9c03a8642042d30228e231efa		

	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Amendment After Final		1	1	
	Claims		2	5	
	Applicant Arguments/Remarks Made in an Amendment		6	9	
Warnings:					
Information:					
2	Information Disclosure Statement Letter	Disclosure_under_156.pdf	64558 259084244b424e3493702e1a34000dc47d408316	no	2
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Filed	US_IDS_Form__SB_08a.pdf	840017 bede489ed2d155dabffiffad53b83b54d54c3632d	no	5
Warnings:					
Information:					
4	Foreign Reference	JP11245409.pdf	20334798 a36106eb2ef579f79b54b35aac9b6c41da4cc9f2	no	30
Warnings:					
Information:					
5	Information Disclosure Statement Letter	IDS_TML.pdf	55624 dbf21b41c2d6b6ee8d13c5584009baefa b4250a1b	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			21668454		

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.

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 11/324,167		Filing Date 12/30/2005		☐ To be Mailed		
APPLICATION AS FILED – PART I											
(Column 1)			(Column 2)		SMALL ENTITY ☐		OR		OTHER THAN SMALL ENTITY		
FOR		NUMBER FILED	NUMBER EXTRA		RATE (\$)	FEE (\$)	OR		RATE (\$)	FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A		N/A				N/A		
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A		N/A				N/A		
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A		N/A				N/A		
TOTAL CLAIMS (37 CFR 1.16(i))		minus 20 =	*		X \$ =				X \$ =		
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*		X \$ =				X \$ =		
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).									
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))											
					TOTAL				TOTAL		
APPLICATION AS AMENDED – PART II											
(Column 1)			(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT	07/14/2008		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		
	Total (37 CFR 1.16(i))		* 17	Minus	** 20		= 0	X \$ =		OR X \$50= 0	
	Independent (37 CFR 1.16(h))		* 2	Minus	*** 3		= 0	X \$ =		OR X \$210= 0	
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))										
									TOTAL ADD'L FEE		OR TOTAL ADD'L FEE 0
AMENDMENT	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))										
									TOTAL ADD'L FEE		OR TOTAL ADD'L FEE
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.											

Legal Instrument Examiner:
/RENEE HAWKINS/

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

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



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
21972 7590 05/12/2008 LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999			EXAMINER NGUYEN, LAM S	
			ART UNIT 2853	PAPER NUMBER
			MAIL DATE 05/12/2008	DELIVERY MODE PAPER

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

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

Office Action Summary	Application No.	Applicant(s)	
	11/324,167	BARKLEY ET AL.	
	Examiner	Art Unit	
	LAM S. NGUYEN	2853	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 26 March 2008.

2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) 2-4, 14 and 15 is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1, 5-13, 16-20 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

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

a) ☐ All b) ☐ Some * c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.

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

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Terminal Disclaimer

The terminal disclaimer filed on 03/26/2008 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of the patent associated with the application mentioned in the terminal disclaimer has been reviewed and is accepted. The terminal disclaimer has been recorded.

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 –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 12, 18, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by the applicant's admission as prior art (*FIGs. 1-2*).

The applicant's admission as prior art as shown in FIG. 2 teaches a method of fabricating chips for use with a printing device, comprising:

providing a first heater array (208), positioned substantially adjacent a first via (202);

providing a second heater array (210), positioned substantially adjacent a second via (204);

positioning a temperature sensing element (222) in a region adjacent to and immediately between the first heater array and the second heater array (*temperature sensor 222 is positioned in the region defined by the cyan heater array and the magenta heater array. This*

region is adjacent to and immediately between the heater arrays), wherein the temperature sensing element is operable to sense a temperature of the region, the temperature being representative of the region, and wherein the temperature sensing element extends substantially the length of the first heater array and the second heater array (temperature sensor 222 extends along the length of the heater arrays); and

responsive to the temperature of the region sensed by the temperature sensing element, heating the first heater array and the second heater array to regulate the temperature of the region (*paragraphs [0008]-[0010]*).

Regarding to claim 18: further comprising providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array (*Specification, paragraph [0008]*).

Regarding to claim 20: wherein heating the first heater array and the second heater array to regulate the temperature of the region comprises heating the first heater array and the second heater array using non-nucleating heating (*Specification, paragraph [0008]*).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 5-7, 10-11, 12-13, and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admission as prior art (*FIGs. 1-2*) and in view of Askeland et al. (US 2003/0142159).

The applicant's admission as prior art (*FIGs. 1-2*) teaches a chip for use with a printing device, comprising:

a first heater array (208), positioned substantially adjacent a first via (202);
a second heater array (210), positioned substantially adjacent a second via (204);
a region, positioned between the first heater array and the second heater array, and also positioned adjacent to the first heater array and the second heater array (*Temperature sensor 222 is positioned in the region defined by the cyan heater array and the magenta heater array.*

This region is adjacent to and immediately between the heater arrays); and

a temperature sensing element (222) operable to sense a temperature of the region, the temperature being representative of the region, extending substantially the length of the first heater array and the second heater array (*temperature sensor 222 extends along the length of the heater arrays*), and positioned substantially planar to each of the first and second heater arrays, wherein the first heater array and the second heater array are operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region by non-nucleating heating the first heater array and the second heater array with a short duration such that ink will not be ejected (*paragraphs [0008]-[0010]*).

The applicant's admission as prior art however does not teach wherein the temperature sensing element is substantially centrally disposed with respect to the region.

Askeland et al. discloses an ink jet printhead having at least first and second heater arrays (*FIG. 4: Two arrays of elements 318*) and a temperature sensing element (*FIG. 4, elements 440 and 430*) for sensing the temperature in a region between the arrays, wherein the temperature sensing element is substantially centrally disposed with respect to the region between the arrays.

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the prior art printhead as admitted by the applicant to position the sensing element at the center of the region between the arrays as disclosed by Askeland et al. The motivation for doing so would have been to gain the accuracy of the sensed temperature in the region due to heat generated from both arrays as taught by Askeland et al. (*FIG. 4*).

Regarding to claims 5 and 16: The applicant's admission as prior art, in view of Askeland et al., discloses the claimed invention except wherein the temperature sensing element is positioned at least 300 microns from each of the first heater array and the second heater array. It would have been obvious to one having ordinary skill in the art at the time the invention was made to dispose the temperature sensing element at a desire location from either the array corresponding to the distance between the arrays, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

Applicant's arguments filed 3/26/08 have been fully considered but they are not persuasive.

Regarding to claim 12: The applicant's argument has been founded over commensurate the scope of the claim, since the claim language does not define wherein the temperature sensor

being positioned immediately between the first heater array and the second heater array. The claim instead defines the region, which the temperature sensor is positioned in, being adjacent to and immediately between the first heater array and the second heater array.

In addition, the examiner disagrees with the applicant's arguments about the 35 U.S.C. 103 rejection, as explained above, the temperature sensor 222 extends along the length of the heater arrays and is positioned in the region between the heater arrays. Thus, it is clearly that one of ordinary skill in the art would position that temperature sensor 222 substantially centrally between the heater arrays as disclosed by Askeland to gain the accuracy of the sensed temperature in the region due to heat generated from both heater arrays.

Conclusion

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.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/LAM S NGUYEN/
Primary Examiner, Art Unit 2853

Index of Claims 				Application/Control No. 11/324,167 Examiner LAM S. NGUYEN		Applicant(s)/Patent under Reexamination BARKLEY ET AL. Art Unit 2853	
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✓ Rejected = Allowed	— (Through numeral) Cancelled ÷ Restricted	N Non-Elected I Interference	A Appeal O Objected
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Claim		Date						
Final	Original	5/8/08						
	1	V						
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	4	N						
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Application Number 	Application No. 11/324,167	Applicant(s) BARKLEY ET AL.	
	Terminal Disclaimer Filed: 03/26/08		

TERMINAL DISCLAIMER	☒ APPROVED	☐ DISAPPROVED
Document Code - DISQ	This patent is subject to a Terminal Disclaimer	Reasons:
INTERNAL DOCUMENT – DO NOT MAIL		

U.S. Patent and Trademark Office

NOTE DISCLAIMER:

The term of this patent shall not extend
beyond the expiration date of Pat. No. , , , .

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PARALEGAL SPECIALIST
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)
Lucas David Barkley, et al.	) Customer No.: 29052
Serial No.: 11/324,167	) Confirmation No.: 6156
Filing Date: December 30, 2005	) Art Unit: 2853
For: METHODS AND APPARATUSES FOR	) Examiner: Lam S. Nguyen
REGULATING THE TEMPERATURE OF	)
MULTI-VIA HEATER CHIPS	)

AMENDMENT AND RESPONSE TO NON-FINAL OFFICE ACTION

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

Sir:

Responsive to the non-final Office Action dated December 26, 2007, Attorney for the Assignee submits the following amendments and remarks. In light of these amendments and remarks, Attorney for the Assignee respectfully asserts that all of the claims of the patent application are patentable, and that the application be allowed.

Amendments to the Specification are reflected on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks begin on page 7 of this paper.

Conclusion begins on page 11 of this paper.

AMENDMENTS TO THE SPECIFICATION

In Paragraph [0001], please insert the application serial number “11/323,809” of the related application in the space provided in the paragraph.

AMENDMENTS TO THE CLAIMS

Please enter the following amendments to the claims:

Listing of Claims:

1. (Currently Amended) A chip for use with a printing device, comprising:
a first heater array, positioned substantially adjacent a first via;
a second heater array, positioned substantially adjacent a second via;
a region, positioned between the first heater array and the second heater array, and also positioned adjacent to the first heater array and the second heater array; and
a temperature sensing element operable to sense ~~the~~ a temperature of the region, the temperature being representative of the region, wherein the temperature sensing element is substantially centrally disposed with respect to the region, and further extends substantially the length of the first heater array and second heater array,
wherein the first heater array and the second heater array are operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region.
2. (Withdrawn) The chip of claim 1, wherein the temperature sensing element comprises a temperature sensing resistor.
3. (Withdrawn) The chip of claim 2, wherein the temperature sensing element comprises a thermal sense resistor.
4. (Withdrawn) The chip of claim 3, wherein the temperature sensing element comprises an n-type implant donor thermal sensing resistor.
5. (Original) The chip of claim 1, wherein the temperature sensing element is positioned at least 300 microns from each of the first heater array and the second heater array.
6. (Original) The chip of claim 5, wherein the temperature sensing element is positioned

substantially planar to each of the first heater array and the second heater array.

7. (Original) The chip of claim 1, further comprising at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.

8. (Original) The chip of claim 1, further comprising:
a third heater array, positioned substantially adjacent the second via;
a fourth heater array, positioned substantially adjacent a third via;
a second region, positioned between the third heater array and the fourth heater array; and
a second temperature sensing element operable to sense the temperature of the second region, wherein the temperature sensing element is substantially centrally disposed with respect to the second region,

wherein the third heater array and the fourth heater array are operable to receive heating responsive to the temperature of the second region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region.

9. (Original) The chip of claim 8, wherein the temperature sensing element positioned between the first heater array and the second heater array is different than the second temperature sensing element positioned between the third heater array and the fourth heater array.

10. (Original) The chip of claim 1, wherein the first heater array and the second heater array are operable to receive non-nucleating heating responsive to the temperature of the region sensed by the temperature sensing element.

11. (Original) The chip of claim 10, wherein the non-nucleating heating is of a short duration such that ink will not be ejected from the first via or the second via during the non-nucleating heating.

12. (Currently Amended) A method of fabricating chips for use with a printing device,

comprising:

providing a first heater array, positioned substantially adjacent a first via;
providing a second heater array, positioned substantially adjacent a second via;
positioning a temperature sensing element in a region adjacent to and immediately
between the first heater array and the second heater array, wherein the temperature sensing
element is operable to sense ~~the~~ a temperature of the region, the temperature being representative
of the region, and wherein the temperature sensing element extends substantially the length of
the first heater array and second heater array; and
responsive to the temperature of the region sensed by the temperature sensing element,
heating the first heater array and the second heater array to regulate the temperature of the
region.

13. (Original) The method of claim 12, wherein positioning a temperature sensing element in
the region comprises positioning a temperature sensing element in substantially the center of the
region.

14. (Withdrawn) The method of claim 12, wherein positioning a temperature sensing
element in the region comprises positioning a thermal sense resistor in the region.

15. (Withdrawn) The method of claim 14, wherein positioning a temperature sensing
element in the region comprises positioning an n-type implant donor thermal sensing resistor in
the region.

16. (Original) The method of claim 12, wherein positioning a temperature sensing element in
the region between the first heater array and the second heater array comprises positioning the
temperature sensing element at least 300 microns from each of the first heater array and the
second heater array.

17. (Original) The method of claim 16, wherein positioning a temperature sensing element in
the region between the first heater array and the second heater array comprises positioning the

temperature sensing element substantially planar to each of the first heater array and the second heater array.

18. (Original) The method of claim 12, further comprising providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.

19. (Original) The method of claim 18, further comprising:
providing a third heater array substantially adjacent the second via;
providing a fourth heater array substantially adjacent a third via; and
positioning a second temperature sensing element in a second region located between the third heater array and the fourth heater array, wherein the temperature sensing element is operable to sense the temperature of the second region, and wherein the temperature sensing element is substantially centrally disposed with respect to the second region.

20. (Original) The method of claim 12, wherein heating the first heater array and the second heater array to regulate the temperature of the region comprises heating the first heater array and the second heater array using non-nucleating heating.

REMARKS

Claims 1, 5 - 13, and 16 - 20 are currently pending in the application. Claims 2 - 4, 14, and 15 were previously withdrawn from consideration by an earlier restriction requirement. By the present amendment, independent claims 1 and 12 have been amended to clarify the scope of the Applicants' claimed invention. The Office Action cites the Applicants' Background and *Askeland* against the Applicants' originally pending claims.

Reconsideration of the application in view of the amendments and remarks is respectfully requested.

I. Nonstatutory Double Patenting Rejection

In the non-final Office Action, claims 1, 5 - 6, 8 - 9, 12, 13, 16 - 17, and 19 were provisionally rejected on the grounds of judicially created nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 5 - 6, 8 - 9, 10, 11, 15 - 16, and 18 of copending Application No. 11/323,809. In response to the Office Action, Applicants submit concurrently with the filing of this response, a terminal disclaimer in compliance with 37 C.F.R. 1.321(c). By the submission of the terminal disclaimer, the double patenting rejection is believed to be traversed.

II. Claim Rejections – 35 U.S.C. § 102

Claims 12, 18, and 20 were rejected under 35 U.S.C. § 102(b) as anticipated by the Applicants' Background section, in particular paragraphs [0008] through [0010]. Independent claim 12 has been amended by the present amendment.

Independent claim 12 has been amended by the present amendment to clarify the scope of the claimed invention. In contrast to the cited reference, the Applicants' claimed invention of amended claim 12 includes the element, among others, "positioning a temperature sensing element in a region adjacent to and immediately between the first heater array and the second heater array, wherein the temperature sensing element is operable to sense a temperature of the region, the temperature being representative of the region, and wherein the temperature sensing element extends substantially the length of the first heater array and second heater array". As

shown in the Applicants' background, the temperature sense resistor either wraps around the heater array, shown in FIG. 1, or the temperature sense resistor is merely adjacent to a single heater array, shown in FIG. 2, and not immediately between a first heater array and a second heater array.

Dependent claims 18 and 20 ultimately depend from independent claim 12, for which arguments of patentability have been presented above. If the base independent claim is allowed over the cited reference, the corresponding dependent claims should also be in condition for allowance.

For at least the reasons above, Applicants assert the amended claim and rejected dependent claims are patentable over the Applicants' Background section.

III. Claim Rejections – 35 U.S.C. § 103

Claims 1, 5 - 7, 10 - 11, 12 - 13, and 16 - 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the Applicants' Background section, in particular paragraphs [0008] through [0010] in view of U.S. Patent Application Publication No. 2003/0142159 to Askeland et al. ("*Askeland*"). Independent claims 1 and 12 have been amended by the present amendment to clarify the scope of the claimed invention. In contrast to the cited references, the Applicants' claimed invention of amended claim 1 includes the elements, among others, "a region, positioned between the first heater array and the second heater array, and also positioned immediately adjacent to the first heater array and the second heater array; and a temperature sensing element operable to sense a temperature of the region, the temperature being representative of the region, wherein the temperature sensing element is substantially centrally disposed with respect to the region, and further extends substantially the length of the first heater array and second heater array".

The Applicant's Background, in particular paragraphs [0008] through [0010], does not disclose or suggest these elements since both Figures 1 and 2 illustrate examples of intervening ink vias between each pair of heater arrays. The first sentence of Applicants' paragraph [0009] acknowledges at least one drawback of conventional technology stating that, "When a heater array is positioned on both sides of ink vias, the temperature sensing and regulating devices utilized in the prior art do not provide adequate thermal control." Therefore, for at least the

reasons above, the Applicants' Background does not disclose a "region positioned between the first heater array and the second heater array, and also positioned immediately adjacent to the first heater array and the second heater array" as in the Applicants' claimed invention of amended claim 1.

Furthermore, since there is no such region disclosed by Figures 1 and 2, the Applicants' background does not disclose a "temperature sensing element operable to sense a temperature of the region, the temperature being representative of the region, wherein the temperature sensing element is substantially centrally disposed with respect to the region and further extends substantially the length of the first heater array and second heater array".

With respect to amended independent claim 12, the Applicant's Background, in particular paragraphs [0008] through [0010], does not disclose or suggest these elements since Figures 1 and 2 illustrate either examples of temperature resistors either wrapping around heater arrays or being disposed adjacent to a single heater array. Therefore, for at least the reasons above, the Applicants' Background does not disclose or suggest "positioning a temperature sensing element in a region adjacent to and immediately between the first heater array and the second heater array" as in the Applicants' claimed invention of amended claim 12.

Moreover, the Office Action cites the combination of the Applicants' Background and *Askeland* as rendering Applicants' independent claims obvious. *Askeland* relates to a conventional printhead, wherein a thermal sense resistor (TSR) (440) is located relatively far from local ejection elements (416) such that "there are differences in the local temperature in ejection chambers 418 and the global temperature measured by the TSR 440." *See* Paragraph [0044]. *Askeland* describes the difficulties in placement of a TSR relatively close to the ejection chambers since "heat must flow from the ejection elements 416 to the TSR before it can be measured ... [t]he time required for this heat to flow to the TSR where it can be measured creates a latency in the control system." *Id.* "The latency associated with using the TSR or DTS to predict local ejection chamber temperatures is evident in FIG. 5...." Paragraph [0045]. *Askeland* relates to an altogether different technique than described by the Applicants' claimed invention in that *Askeland* must use the TSR temperature measurements as well as the ejection history of the driver head to estimate the local ejection chamber temperature. *See* Paragraph [0047]. Instead of using a single TSR for each pair of opposing local ejection elements,

Askeland relates to a relatively complicated solution using ejection history to measure or estimate temperature.

The Applicants' claimed invention would not have been obvious to try in view of the combination of Applicants' Background section and *Askeland* since *Askeland* discloses that "due to layout issues on the driver head 316 it is typically not feasible to locate the TSR 440 or DTS 430 close to the ejection elements 416 ... [a]s a consequence, there are differences in the local temperature in ejection chambers 418 and the global temperature measured by the TSR 440." See Paragraph [0044]. Thus, in view of at least *Askeland*, layout issues would have discouraged placement of a temperature sensing element relatively close to the ejection elements.

Therefore, it would not have been obvious in view of *Askeland*, or the art, to place a temperature sensing element in a region between a first heater array and a second heater array, wherein the temperature sensing element is operable to sense a temperature of a region, and the temperature being representative of the first heater array and the second heater array, wherein the temperature sensing element is substantially centrally disposed with respect to the region, and further extends substantially the length of the first heater array and second heater array. Likewise, it would not have been obvious in view of *Askeland*, or the art, to position a temperature sensing element in a region adjacent to and immediately between the first heater array and the second heater array, wherein the temperature sensing element is operable to sense a temperature of the region, the temperature being representative of the region, and wherein the temperature sensing element extends substantially the length of the first heater array and second heater array.

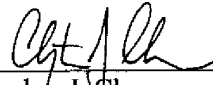
Dependent claims 5 - 7, 10 - 11, 13, and 16 - 17 ultimately depend from either independent claims 1 or 12, for which arguments of patentability have been presented above. If the base independent claim is allowed over the cited references, the corresponding dependent claims should also be in condition for allowance.

For at least the reasons above, Applicants assert the amended claims and rejected claims are patentable over the cited references.

CONCLUSION

It is not believed that extensions of time or fees for addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 19-5029. If the Examiner believes a telephone conversation would facilitate the examination of this application, Applicants invite the Examiner to call the Attorney below at any time.

Respectfully submitted,



Christopher J. Chan
Attorney for the Assignee
Reg. No. 44,070

DATE: 26 MARCH 2008

SUTHERLAND ASBILL & BRENNAN LLP
999 Peachtree Street NE
Atlanta, Georgia 30309-3996
Telephone: (404) 853-8049
Facsimile: (404) 853-8806
(19403-0066)

Attorney Docket No.: 2005-0547.02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	: 11/324,167	Customer No.	: 29052
Applicant	: Lucas David Barkley, et al.	Confirmation No.:	6156
Filed	: December 30, 2005	Art Unit	: 2853
Examiner	: Lam S. Nguyen		
Title	: METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS		
Atty. Docket No.	: 2005-0547.02		

TERMINAL DISCLAIMER IN APPLICATION

The applicant named in the above-identified application and the owner of the entire interest in that application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the present application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 to 156 and 173, as presently shortened by any terminal disclaimer, of co-pending U.S. Patent Application No. 11/323,809, filed December 30, 2005. The applicant hereby agrees that any patent so granted on the present application shall be enforceable only for and during such period that any patent granted on U.S. Patent Application No. 11/323,809 are commonly owned. This agreement runs with any patent granted on the present application and is binding upon the grantee of such patent, and its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of any patent granted on the present application that would extend to the expiration date of the full statutory term as defined in 35 U.S.C. 154 to 156 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that the 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 cancelled by a reexamination certificate, is reissued, or is in any manner terminated

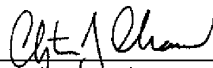
Serial No.: 11/324,167
Filed: December 30, 2005

prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer filed prior to its grant.

Please charge the \$130.00 fee required under 37 CFR § 1.20(d) for this terminal disclaimer, and any additional fees, or credit any overpayment, to Deposit Account No. 19-5029.

The undersigned is an attorney of record and is authorized to sign on behalf of the owner. The fee required by 37 CFR § 1.20(d) accompanies this disclaimer.

Respectfully submitted,



Christopher J. Chan
Registration No.: 44,070

Date: 26 MARCH 2008

SUTHERLAND ASBILL & BRENNAN LLP
999 Peachtree Street, NE
Atlanta, Georgia 30309-3996
Telephone: (404) 853-8000
Facsimile: (404) 853-8806
(19403-0066)

Attorney Docket No.: **2005-0547.02**

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Electronic Patent Application Fee Transmittal																																																						
Application Number:		11324167																																																				
Filing Date:		30-Dec-2005																																																				
Title of Invention:		Methods and apparatuses for regulating the temperature of multi-via heater chips																																																				
First Named Inventor/Applicant Name:		Lucas David Barkley																																																				
Filer:		Christopher Chan/Carla Key																																																				
Attorney Docket Number:		2005-0547.02																																																				
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Utility Filing Fees <table border="1"> <thead> <tr> <th>Description</th> <th>Fee Code</th> <th>Quantity</th> <th>Amount</th> <th>Sub-Total in USD(\$)</th> </tr> </thead> <tbody> <tr> <td colspan="5">Basic Filing:</td> </tr> <tr> <td colspan="5">Pages:</td> </tr> <tr> <td colspan="5">Claims:</td> </tr> <tr> <td colspan="5">Miscellaneous-Filing:</td> </tr> <tr> <td colspan="5">Petition:</td> </tr> <tr> <td colspan="5">Patent-Appeals-and-Interference:</td> </tr> <tr> <td colspan="5">Post-Allowance-and-Post-Issuance:</td> </tr> <tr> <td>Statutory disclaimer</td> <td>1814</td> <td>1</td> <td>130</td> <td>130</td> </tr> <tr> <td colspan="5">Extension-of-Time:</td> </tr> </tbody> </table>					Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)	Basic Filing:					Pages:					Claims:					Miscellaneous-Filing:					Petition:					Patent-Appeals-and-Interference:					Post-Allowance-and-Post-Issuance:					Statutory disclaimer	1814	1	130	130	Extension-of-Time:				
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Total in USD (\$)				130

Electronic Acknowledgement Receipt	
EFS ID:	3057998
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	Methods and apparatuses for regulating the temperature of multi-via heater chips
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Christopher Chan/Carla Key
Filer Authorized By:	Christopher Chan
Attorney Docket Number:	2005-0547.02
Receipt Date:	26-MAR-2008
Filing Date:	30-DEC-2005
Time Stamp:	19:03:34
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	\$ 130
RAM confirmation Number	12753
Deposit Account	195029
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment - After Non-Final Rejection	19403-0066_Response_NF OA1.PDF	63752	no	11
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Warnings:					
Information:					
2	Terminal Disclaimer Filed	19403-0066_Terminal_Disclaimer.PDF	47581	no	2
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Warnings:					
Information:					
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Information:					
Total Files Size (in bytes):			119513		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. New Applications Under 35 U.S.C. 111 If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. National Stage of an International Application under 35 U.S.C. 371 If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. New International Application Filed with the USPTO as a Receiving Office If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 11/324,167		Filing Date 12/30/2005		☐ To be Mailed			
APPLICATION AS FILED – PART I												
(Column 1)			(Column 2)		SMALL ENTITY ☐		OR		OTHER THAN SMALL ENTITY			
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), (l), 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 \$ =				OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =		*		X \$ =				OR		
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).										
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))												
* If the difference in column 1 is less than zero, enter "0" in column 2.												
APPLICATION AS AMENDED – PART II												
(Column 1)			(Column 2)		(Column 3)		SMALL ENTITY		OR		OTHER THAN SMALL ENTITY	
AMENDMENT	03/26/2008		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 \$ =		OR	
	Independent (37 CFR 1.16(h))		* 2		Minus *** 3		= 0		X \$ =		OR	
	☐ Application Size Fee (37 CFR 1.16(s))											
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))											
	TOTAL ADD'L FEE											
(Column 1) (Column 2) (Column 3)												
AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR		PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)		OR	
	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))											
	TOTAL ADD'L FEE											
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.												
Legal Instrument Examiner: /DALE A. HALL/												

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
21972 7590 12/26/2007 LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999			EXAMINER NGUYEN, LAM S	
			ART UNIT 2853	PAPER NUMBER
			MAIL DATE 12/26/2007	DELIVERY MODE PAPER

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

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

Office Action Summary	Application No. 11/324,167		Applicant(s) BARKLEY ET AL.	
	Examiner LAM S. NGUYEN		Art Unit 2853	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 27 November 2007.

2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) 2-4, 14 and 15 is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1, 5-13, 16-20 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on 30 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:

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

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892) 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>12/30/05</u> .	4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ 5) ☐ Notice of Informal Patent Application 6) ☐ Other: _____.
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DETAILED ACTION

In response to the restriction requirement, the applicant elected claims reading to Species II for further examination. Therefore, claims 1, 5-13, and 16-20 are included for further prosecution. As a result, claims 2-4 and 14-15 are withdrawn from consideration.

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 obviousness-type 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); and *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 a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 1, 5-6, 8-9, 12, 13, 16-17, and 19 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 5-6, 8-9, 10, 11, 15-16, and 18, respectively, of copending Application No. 11/323809 in view of the applicant’s admission as prior art.

This is a provisional obviousness-type double patenting rejection.

Claim 1, 5-6, 8-9, 10, 11, 15-16, and 18 of copending Application No. 11/323809 simply teaches all claimed limitations of the current claimed invention except wherein the first/third heater array and the second/fourth heater array are operable to receive heating responsive to the temperature of the region/second region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region.

The applicant, however, as described in the specification, has admitted that the first heater array and the second heater array operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element to regulate the temperature of the region is prior art (*Specification, paragraphs [0008]-[0010]*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the operation of the heater arrays and the temperature sensing element disclosed by Claim 1 of copending Application No. 11/323809 to response to the sensed temperature as disclosed by the applicant's admission as prior art. The motivation for doing so would have been to maintain an adequate operating temperature of the heater chip as taught by the applicant's admission as prior art (*paragraphs [0008]-[0010]*).

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 –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 12, 18, and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by the applicant's admission as prior art (*FIGs. 1-2*).

The applicant's admission as prior art as shown in FIG. 2 teaches a method of fabricating chips for use with a printing device, comprising:

providing a first heater array (208), positioned substantially adjacent a first via (202);

providing a second heater array (210), positioned substantially adjacent a second via (204);

positioning a temperature sensing element (222) in a region between the first heater array and the second heater array, wherein the temperature sensing element is operable to sense the temperature of the region; and

responsive to the temperature of the region sensed by the temperature sensing element, heating the first heater array and the second heater array to regulate the temperature of the region (*paragraphs [0008]-[0010]*).

Regarding to claim 18: further comprising providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array (*Specification, paragraph [0008]*).

Regarding to claim 20: wherein heating the first heater array and the second heater array to regulate the temperature of the region comprises heating the first heater array and the second heater array using non-nucleating heating (*Specification, paragraph [0008]*).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 5-7, 10-11, 12-13, and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admission as prior art (*FIGs. 1-2*) and in view of Askeland et al. (US 2003/0142159).

The applicant's admission as prior art (*FIGs. 1-2*) teaches a chip for use with a printing device, comprising:

- a first heater array (208), positioned substantially adjacent a first via (202);
- a second heater array (210), positioned substantially adjacent a second via (204);
- a region, positioned between the first heater array and the second heater array; and

a temperature sensing element (222) operable to sense the temperature of the region and positioned substantially planar to each of the first and second heater arrays, wherein the first heater array and the second heater array are operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element, and wherein the received heating regulates the temperature of the region by non-nucleating heating the first heater array and the second heater array with a short duration such that ink will not be ejected (*paragraphs [0008]-[0010]*).

The applicant's admission as prior art however does not teach wherein the temperature sensing element is substantially centrally disposed with respect to the region.

Askeland et al. discloses an ink jet printhead having at least first and second heater arrays (*FIG. 4: Two arrays of elements 318*) and a temperature sensing element (*FIG. 4, elements 440 and 430*) for sensing the temperature in a region between the arrays, wherein the temperature sensing element is substantially centrally disposed with respect to the region between the arrays.

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the prior art printhead as admitted by the applicant to position the sensing element at the center of the region between the arrays as disclosed by Askeland et al. The motivation for doing so would have been to gain the accuracy of the sensed temperature in the region due to heat generated from both arrays as taught by Askeland et al. (FIG. 4).

Regarding to claims 5 and 16: The applicant's admission as prior art, in view of Askeland et al., discloses the claimed invention except wherein the temperature sensing element is positioned at least 300 microns from each of the first heater array and the second heater array. It would have been obvious to one having ordinary skill in the art at the time the invention was made to dispose the temperature sensing element at a desired location from either the array corresponding to the distance between the arrays, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. 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

Application/Control Number:
11/324,167
Art Unit: 2853

Page 7

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



LAM SON NGUYEN

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Substitute for form 1449/PTO

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

Complete if Known

Application Number	11/324167
Filing Date	12/30/2005
First Named Inventor	Lucas D. Barkley
Art Unit	2853
Examiner Name	LAM NGUYEN
Attorney Docket Number	2005-0547.02

Sheet 1 of 1

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
/LN/		US- 6951378	10-04-2005	Yamada et al.	
/LN/		US- 6883904	04-26-2005	Jeanmarie et al.	
/LN/		US- 6871929	03-29-2005	Crivelli et al.	
/LN/		US- 6808243	10-26-2004	Markham et al.	
/LN/		US- 6644774	11-11-2003	Burger et al.	
/LN/		US- 6641242	11-04-2003	Canti et al.	
/LN/		US- 6601941	08-05-2003	Jones et al.	
/LN/		US- 6382773	05-05-2002	Chang et al.	
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FOREIGN PATENT DOCUMENTS

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		Country Code ³ -Number ⁴ -Kind Code ⁵ (if known)				

Examiner Signature	/Lam Nguyen/	Date Considered	12/19/2007
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*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.

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Notice of References Cited	Application/Control No. 11/324,167	Applicant(s)/Patent Under Reexamination BARKLEY ET AL.	
	Examiner LAM S. NGUYEN	Art Unit 2853	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2003/0142159	07-2003	Askeland et al.	347/14
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
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	K	US-			
	L	US-			
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims 	Application/Control No.	Applicant(s)/Patent under Reexamination	
	11/324,167	BARKLEY ET AL.	
	Examiner	Art Unit	
	LAM S. NGUYEN	2853	

✓	Rejected
≡	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
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Claim		Date			
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Search Notes

Application/Control No.

11/324,167

Examiner

LAM S. NGUYEN

Applicant(s)/Patent under
Reexamination

BARKLEY ET AL.

Art Unit

2853

SEARCHED

Class	Subclass	Date	Examiner
347	14,17,19	12/19/2007	LN

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

**SEARCH NOTES
(INCLUDING SEARCH STRATEGY)**

	DATE	EXMR
EAST (P&PUB, USPAT, EPO, JPO, DERWENT, IBM) Search note print out	12/19/07	LN

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	8	"6951378".PN. "6883904".PN. "6871929".PN. "6808243".PN. "6644774".PN. "6641242".PN. "6601941".PN. "6382773".PN.	USPAT	OR	OFF	2007/12/19 11:32
L2	3	"6357863".PN. "20050052500" "6764163".PN.	USPAT	OR	OFF	2007/12/19 11:36
L3	3845	"347"/\$.CCLS. AND ((TEMPERATURE SAME (SENS\$4 OR MONITOR\$4 OR MEASUR\$4)) SAME (THERMAL OR HEAT\$4))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/12/19 13:04
L4	139	3 AND ((TEMPERATURE SAME (SENS\$4 OR MONITOR\$4 OR MEASUR\$4)) SAME ((HEATER\$1 OR ELEMENT\$1) WITH ARRAY\$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/12/19 11:39
L5	129	4 AND ((TEMPERATURE WITH (SENS\$4 OR MONITOR\$4 OR MEASUR\$4)) SAME ((HEATER\$1 OR ELEMENT\$1) WITH ARRAY\$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/12/19 11:39
L6	73	5 AND ((TEMPERATURE WITH (SENS\$4 OR MONITOR\$4 OR MEASUR\$4)) SAME (POSITION\$4 OR LOCAT\$4 OR DISPOS\$4) SAME ((HEATER\$1 OR ELEMENT\$1) WITH ARRAY\$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/12/19 11:42
L7	27	6 AND ((TEMPERATURE WITH (SENS\$4 OR MONITOR\$4 OR MEASUR\$4)) SAME (POSITION\$4 OR LOCAT\$4 OR DISPOS\$4) SAME (CENTRAL\$4 OR CENTER OR MIDDLE OR WITHIN OR BETWEEN) SAME ((HEATER\$1 OR ELEMENT\$1) WITH ARRAY\$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/12/19 11:43
L8	21	("4313124" "4345262" "4459600" "4463359" "4558333" "4719472" "4723129" "4740796" "4791435" "4899180" "4910528" "4980702" "5075690" "5175565").PN. OR ("5467113").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 11:54

EAST Search History

L9	4	("5175565" "5467113" "6095637" "6139761").PN. OR ("7296869").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 12:00
L10	79	("4459600" "4550327" "4558333" "4601777" "4660056" "4692777" "4712172" "4719472" "4723129" "4740796").PN. OR ("5175565").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 12:00
L11	12	("4723129" "4740796" "5175565" "5367324" "5734392" "6109719" "6286924" "6309052").PN. OR ("6527367").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 12:37
L12	46	6 NOT 7	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 12:40
L13	53	5 NOT 6	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 12:40
L14	8	("4734359" "4756758" "4851924" "5262374" "5514635" "5786838" "6413305" "6562755").PN. OR ("6972780").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 12:55
L15	12	("4313124" "4345262" "4459600" "4463359" "4558333" "4723129" "4740796" "5453713" "5745130" "5877784" "6022094").PN. OR ("6474782").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/12/19 12:59
L16	46	"347"/\$.CCLS. AND ((TEMPERATURE WITH SENS\$4) SAME (BETWEEN OR WITHIN OR CENTR\$4) SAME ((THERMAL OR HEAT\$4) WITH ARRAY\$1))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/12/19 13:06

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Confirmation No.:	6156
	)		
Lucas David Barkley, et al.	)	Art Unit:	2853
	)		
Serial No. 11/324,167	)	Customer No.:	29052
	)		
Filed: December 30, 2005	)	Examiner:	Lam S. Nguyen
	)		
For: METHODS AND APPARATUSES FOR	)		
REGULATING THE TEMPERATURE OF	)		
MULTI-VIA HEATER CHIPS	)		
	)		
Atty Docket No.: 2005-0547.02	)		

RESPONSE AND ELECTION TO OFFICE ACTION

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

Sir:

Responsive to the Office Action mailed on November 1, 2007, set to expire on December 1, 2007, the Applicant makes the following election:

ELECTION

The Examiner restricted the application two ways:

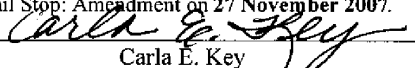
Species I, drawn to a chip for use with a printing device comprising a temperature sensing element including an n-type implant donor thermal sensing resistor, and

Species II, drawn to a chip for use with a printing device comprising a temperature sensing element positioned at least 300 microns and substantially planar to the heater arrays.

The Applicant elects Species II without prejudice to any divisional applications or other presentation of the claims. The election is made without traverse.

CERTIFICATE OF ELECTRONIC DELIVERY

I hereby certify that this correspondence is being electronically filed with the Commissioner for Patents,
 Mail Stop: Amendment on 27 November 2007.


 Carla E. Key

AO 1789232.1

U.S. Serial No.: 11/324,167

Title: "Methods and Apparatuses for Regulating the Temperature of Multi-VIA Heater Chips"

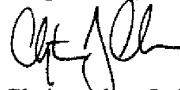
Filed: December 30, 2005

Page 2 of 2

CONCLUSION

The Applicant believes it has responded to each matter raised in the Office Action. Any questions can be directed to the undersigned at (404) 853-8049.

Respectfully submitted,



Christopher J. Chan

Reg. No. 44,070

SUTHERLAND ASBILL & BRENNAN LLP

999 Peachtree Street, N.E.

Atlanta, Georgia 30309-3996

(404) 853-8000

(404) 853-8049 direct phone

(404) 853-8806 facsimile

Attorney Docket No.: **19403-0066**

Electronic Acknowledgement Receipt	
EFS ID:	2513958
Application Number:	11324167
International Application Number:	
Confirmation Number:	6156
Title of Invention:	Methods and apparatuses for regulating the temperature of multi-via heater chips
First Named Inventor/Applicant Name:	Lucas David Barkley
Customer Number:	21972
Filer:	Christopher Chan/Carla Key
Filer Authorized By:	Christopher Chan
Attorney Docket Number:	2005-0547.02
Receipt Date:	27-NOV-2007
Filing Date:	30-DEC-2005
Time Stamp:	16:10:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment - After Non-Final Rejection	19403-0066_Response_Election.PDF	33756	no	2
			729f6d072d9aad8ad213b0eca1774a3f906250b8		

Warnings:

Information:

Total Files Size (in bytes):	33756
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. <u>New Applications Under 35 U.S.C. 111</u> 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. <u>National Stage of an International Application under 35 U.S.C. 371</u> 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. <u>New International Application Filed with the USPTO as a Receiving Office</u> 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.	

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 11/324,167		Filing Date 12/30/2005		☒ To be Mailed	
---	--	--	--	--	---	--	----------------------------------	--	--	--

APPLICATION AS FILED – PART I					OTHER THAN SMALL ENTITY				
(Column 1)		(Column 2)		SMALL ENTITY ☐		OR		SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)	OR		RATE (\$)	FEE (\$)	
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A				N/A		
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A				N/A		
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A				N/A		
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =				X \$ =		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =				X \$ =		
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).								
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))									
					TOTAL		TOTAL		

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II					OTHER THAN SMALL ENTITY						
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR		SMALL ENTITY	
AMENDMENT	11/27/2007	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0	X \$ =		OR	X \$50=	0	
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0	X \$ =		OR	X \$210=	0	
	☐ 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	0	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE (\$)	ADDITIONAL FEE (\$)		RATE (\$)	ADDITIONAL FEE (\$)	
	Total (37 CFR 1.16(i))	*	Minus	**	=	X \$ =		OR	X \$ =		
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X \$ =		OR	X \$ =		
	☐ Application Size Fee (37 CFR 1.16(s))										
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR			
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE		

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

Legal Instrument Examiner:
GOIGA N. DUCKETT

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

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



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02	6156
21972 7590 11/01/2007 LEXMARK INTERNATIONAL, INC. INTELLECTUAL PROPERTY LAW DEPARTMENT 740 WEST NEW CIRCLE ROAD BLDG. 082-1 LEXINGTON, KY 40550-0999			EXAMINER NGUYEN, LAM S	
			ART UNIT 2853	PAPER NUMBER
			MAIL DATE 11/01/2007	DELIVERY MODE PAPER

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

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

Office Action Summary	Application No.	Applicant(s)	
	11/324,167	BARKLEY ET AL.	
	Examiner	Art Unit	
	LAM S. NGUYEN	2853	

TH

-- 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 1 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on ____.

2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) ____ is/are withdrawn from consideration.

5) ☐ Claim(s) ____ is/are allowed.

6) ☐ Claim(s) ____ is/are rejected.

7) ☐ Claim(s) ____ is/are objected to.

8) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

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

a) ☐ All b) ☐ Some c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. ____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892) 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date ____	4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date ____ 5) ☐ Notice of Informal Patent Application 6) ☐ Other: ____
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Election/Restrictions

Claims 1 and 12 are generic to the following disclosed patentably distinct species:

Species I: The invention is drawn to a chip for use with a printing device comprising a temperature sensing element including an n-type implant donor thermal sensing resistor.

Species II: The invention is drawn to a chip for use with a printing device comprising a temperature sensing element positioned at least 300 microns and substantially planar to the heater arrays.

The species are independent or distinct because they contain claimed limitations that are different characteristics and patentable over each other. Applicant is required under 35 U.S.C. 121 to elect a single disclosed species, even though this requirement is traversed. Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species or invention to be examined even though the requirement be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

Application/Control Number:
11/324,167
Art Unit: 2853

Page 3

The election of an invention or species may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse.

Should applicant traverse on the ground that the inventions or species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions or species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C.103(a) of the other invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. 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

Application/Control Number:
11/324,167
Art Unit: 2853

Page 4

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



LAM SON NGUYEN

Index of Claims 	Application/Control No.		Applicant(s)/Patent under Reexamination	
	11/324,167		BARKLEY ET AL.	
	Examiner		Art Unit	
	LAM S. NGUYEN		2853	

✓	Rejected
=	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim		Date											
Final	Original												
	1	10/26/07											
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APPLICATION NUMBER	FILING OR 371(c) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02

CONFIRMATION NO. 6156

21972
LEXMARK INTERNATIONAL, INC.
INTELLECTUAL PROPERTY LAW DEPARTMENT
740 WEST NEW CIRCLE ROAD
BLDG. 082-1
LEXINGTON, KY40550-0999

Title: Methods and apparatuses for regulating the temperature of multi-via heater chips

Publication No. US-2007-0153045-A1

Publication Date: 07/05/2007

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 publicly 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 Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, 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 <http://pair.uspto.gov/>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 703-305-3028.

Pre-Grant Publication Division, 703-605-4283



Practitioner's Docket No. 2005-0547.02

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Lucas David Barkley, Bruce David Gibson, Eric Spencer Hall, David G. King,
and George K. Parish

Application No.: 11/324.167

Group No.: 2853

Filed: December 30, 2005

Examiner:

For: Methods And Apparatuses For Regulating The Temperature of Multi-Via Heater Chips

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

COMPLETION OF FILING REQUIREMENTS
—NONPROVISIONAL APPLICATION

- I. This replies to the Notice to File Missing Parts of Application (PTO-1533) mailed February 15, 2006.

A copy of the Notice to File Missing Parts of Application--Filing Date Granted (Form PTO-1533) is enclosed.

DECLARATION OR OATH

- II. A new original oath or declaration is attached.

CERTIFICATE OF MAILING/TRANSMISSION (37 C.F.R. § 1.8(a))

I hereby certify that this correspondence is, on the date shown below, being:

MAILING

☒ deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to the Commissioner for Patents, Washington, D.C. 20231.

FACSIMILE

☐ transmitted by facsimile to the Patent and Trademark Office, (703)

Signature

Edna L. Clark

(type or print name of person certifying)

Date: 3/30/2006

* Only the date of filing (' 1.6) will be the date used in a patent term adjustment calculation, although the date on any certificate of mailing or transmission under ' 1.8 continues to be taken into account in determining timeliness. See ' 1.703(f). Consider "Express Mail Post Office to Addressee" (' 1.10) or facsimile transmission (' 1.6(d)) for the reply to be accorded the earliest possible filing date for patent term adjustment calculations.

Completion of Filing Requirements—Nonprovisional Application--page 1 of 3

COMPLETION FEES

III.

1.	Filing fee	
	Utility Patent Application 37 C.F.R. § 1.16 (a)(1))	\$300.00
2.	Fees for claims	\$0.00
3.	Search fee	
	Utility (37 C.F.R. § 1.16(k))	\$500.00
4.	Examination fee	
	Utility (37 C.F.R. § 1.16(o))	\$200.00
5.	Surcharge Fees	
	Declaration or oath late payment of filing fee, search fee, examination fee, and/or late filing of original (37 C.F.R. § 1.16(f))	\$130.00
	Total Completion Fees	\$1,130.00

EXTENSION OF TIME

- IV. The proceedings herein are for a patent application, and the provisions of 37 C.F.R. § 1.136(a) apply.

Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

TOTAL FEE DUE

- V. The total fee due is:

Completion fees	\$1,130.00
Extension fee (if any)	\$0.00
Total Fee Due	\$1,130.00

PAYMENT OF FEES

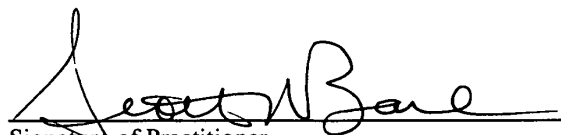
VI. Authorization is hereby made to charge the amount of \$1,130.00 to Deposit Account No. 12-1213.

Charge any additional fees required by this paper or credit any overpayment in the manner authorized above.

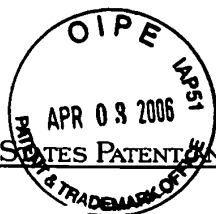
A duplicate of this paper is attached.

Date: 3/28/06

Reg. No.: 42,292
Tel. No.: 859-232-3668
Customer No.: 21972



Signature of Practitioner
Scott N. Barker
LEXMARK INTERNATIONAL, INC
740 West New Circle Road
Lexington, KY 40550
US



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	ATTORNEY DOCKET NUMBER
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02

CONFIRMATION NO. 6156

FORMALITIES
 LETTER

21972
 LEXMARK INTERNATIONAL, INC.
 INTELLECTUAL PROPERTY LAW DEPARTMENT
 740 WEST NEW CIRCLE ROAD
 BLDG. 082-1
 LEXINGTON, KY 40550-0999

Date Mailed: 02/15/2006

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 and pay any fees required 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).

- The statutory basic filing fee is missing.
Applicant must submit \$ 300 to complete the basic filing fee for a non-small entity. If appropriate, applicant may make a written assertion of entitlement to small entity status and pay the small entity filing fee (37 CFR 1.27).
- The oath or declaration is unsigned.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$130 for a non-small entity, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

04/05/2006 AWONDAF1 00000052 121213 11324167
 01 FC:1011 300.00 DA
 02 FC:1111 500.00 DA

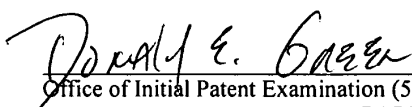
Total additional fee(s) required for this application is **\$1130** for a Large Entity

- **\$300** Statutory basic filing fee.
- **\$130** Surcharge.
- The application search fee has not been paid. Applicant must submit **\$500** to complete the search fee.

- The application examination fee has not been paid. Applicant must submit **\$200** to complete the examination fee for a large entity

Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

*A copy of this notice **MUST** be returned with the reply.*



Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199, or 1-800-972-6382
PART 2 - COPY TO BE RETURNED WITH RESPONSE



PTO/SB/01 (10-05)
Approved for use through 07/31/2006. 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.

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63) ☐ Declaration Submitted With Initial Filing OR ☒ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)	Attorney Docket Number	2005-0547.02
	First Named Inventor	Lucas David Barkley
	COMPLETE IF KNOWN	
	Application Number	11/324,167
	Filing Date	December 30, 2005
	Art Unit	2853
	Examiner Name	

I hereby declare that:

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Method And Apparatuses For Regulating The Temperature of Multi-Via Heater Chips

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 12/30/2005 as United States Application Number or PCT International

Application Number 11/324,167 and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 21 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 completing the form, call 1-800-PTO-9199 and select option 2.

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.

DECLARATION — Utility or Design Patent Application

Direct all correspondence to:	☒ The address associated with Customer Number:	21972	OR	☐ Correspondence address below
Name				
Address				
City		State	ZIP	
Country	Telephone		Email	
WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. I hereby declare that all statements made herein of my own knowledge are true and that all statements 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 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.				
NAME OF SOLE OR FIRST INVENTOR:		☐ A petition has been filed for this unsigned inventor		
Given Name (first and middle (if any))		Family Name or Surname		
Lucas David		Barkley		
Inventor's Signature			Date	
			3/24/06	
Residence: City	State	Country	Citizenship	
Lexington	KY	US	US	
Mailing Address 4800 Clifford Circle				
City	State	Zip	Country	
Lexington	KY	40515	US	
☒ Additional inventors or a legal representative are being named on the 2 supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.				

[Page 2 of 2]

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.

DECLARATION	ADDITIONAL INVENTOR(S) Supplemental Sheet Page <u>1</u> of <u>2</u>
--------------------	---

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Bruce David		Gibson	
Inventor's Signature <i>Bruce David Gibson</i>		Date <i>3-24-06</i>	
Lexington Residence: City	KY State	US Country	US Citizenship
4729 Scenicview Road Mailing Address			
Lexington City	KY State	40514 Zip	US Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Eric Spencer		Hall	
Inventor's Signature <i>Eric Spencer Hall</i>		Date <i>3-24-06</i>	
Lexington Residence: City	KY State	US Country	US Citizenship
1344 Copperfield Court Mailing Address			
Lexington City	KY State	40514 Zip	US Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
David G.		King	
Inventor's Signature <i>D G King</i>		Date <i>3/24/06</i>	
Shelbyville Residence: City	KY State	US Country	US Citizenship
66 Goldenrod Court Mailing Address			
Shelbyville City	KY State	40065 Zip	US Country

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 21 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 (1-800-786-9199) and select option 2.

DECLARATION	ADDITIONAL INVENTOR(S) Supplemental Sheet Page <u>2</u> of <u>2</u>
--------------------	--

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
George K		Parish	
Inventor's Signature		Date <u>3-24-06</u>	
Winchester Residence: City	KY State	US Country	US Citizenship
11 Fontaine Boulevard Mailing Address			
Winchester City	KY State	40391 Zip	US Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address			
City	State	Zip	Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Inventor's Signature		Date	
Residence: City	State	Country	Citizenship
Mailing Address			
City	State	Zip	Country

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 21 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 (1-800-786-9199) and select option 2.

NOTICE OF FEE DUE

DATE:

09-04-06

TO:

MP

FROM:

Office of Initial Patent Examination

SUBJECT:

Fee Due

APPLICATION NUMBER

11324167

A fee is due for the attached document submitted to the U.S. Patent and Trademark Office for the following reason. Please check the application for the appropriate authorizations to charge a deposit account if an authorization is present, please charge the Appropriate Fee. If and authorization is not present, notify the applicant of the fee deficiency.

☐

Insufficient fee by check

☒

Insufficient funds in deposit amount

☐

Insufficient by Credit Card

☐

Declined credit card

☐

Non-authorization for charge to deposit account

☐

No fee submitted per requirement

The correct fee code:

1113+1057

Amount

\$ 200+130

The suspended fee code:

1999

Amount

\$

The suspended

1622

Amount

\$

The suspended

2622

Amount

\$

Fee Due

\$ 330

Terminal Operator

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Deposit Account Maintenance



Deposit Account Window Help



Deposit Account

Number: 121213

Balance Amount: 10.75

Holder

Name: LEXMARK INTERNATIONAL INC



Address

Attention: INTELLECTUAL PROPERTY LAW DEPARTMENT

Street: 740 WEST NEW CIRCLE ROAD

DEPT. 865A BLDG. 082-01

Province:

City: LEXINGTON

State: KY

Postal Code: 40550

Country: US

Telephone: 859-232-7845

Fax:

Details

Category Code: NONGOVNMNT

Type: REGULAR

Notification Amt: 0.00

Status

Access Code:

☒ Active

☐ Closed

AWONDAF1 04/06/2006

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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	ATTORNEY DOCKET NUMBER
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02

CONFIRMATION NO. 6156

FORMALITIES
LETTER

21972
LEXMARK INTERNATIONAL, INC.
INTELLECTUAL PROPERTY LAW DEPARTMENT
740 WEST NEW CIRCLE ROAD
BLDG. 082-1
LEXINGTON, KY 40550-0999

Date Mailed: 02/15/2006

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 and pay any fees required 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).

- The statutory basic filing fee is missing.
Applicant must submit \$ 300 to complete the basic filing fee for a non-small entity. If appropriate, applicant may make a written assertion of entitlement to small entity status and pay the small entity filing fee (37 CFR 1.27).
- The oath or declaration is unsigned.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of \$130 for a non-small entity, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

04/05/2006	AWONDAF1	00000052	121213	11324167
01	FC:1011	300.00	DA	
02	FC:1111	500.00	DA	

Total additional fee(s) required for this application is \$1130 for a Large Entity

- \$300 Statutory basic filing fee.
- \$130 Surcharge.
- The application search fee has not been paid. Applicant must submit \$500 to complete the search fee.

04/05/2006 AWONDAF1 00000052 121213 11324167

01 FC:1011 300.00 DA
02 FC:1111 500.00 DA



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	ATTORNEY DOCKET NUMBER
11/324,167	12/30/2005	Lucas David Barkley	2005-0547.02

CONFIRMATION NO. 6156

FORMALITIES
 LETTER

21972
 LEXMARK INTERNATIONAL, INC.
 INTELLECTUAL PROPERTY LAW DEPARTMENT
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 BLDG. 082-1
 LEXINGTON, KY 40550-0999

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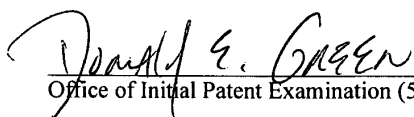
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- **\$130** Surcharge.
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- The application examination fee has not been paid. Applicant must submit **\$200** to complete the examination fee for a large entity

Replies should be mailed to: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

A copy of this notice MUST be returned with the reply.



Office of Initial Patent Examination (571) 272-4000, or 1-800-PTO-9199, or 1-800-972-6382
PART 3 - OFFICE COPY

123005

15666
U.S. PTO

PTO/SB/05 (05-05)

Approved for use through 07/31/2006. 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.

UTILITY
PATENT APPLICATION
TRANSMITTAL

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

Attorney Docket No.	2005-0547.02
First Inventor	Lucas David Barkley
Title	Methods And Apparatuses For Regulating The Temperature of Multi-Via Heater Chips
Express Mail Label No.	EQ 355785757 US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
2. ☐ Applicant claims small entity status.
See 37 CFR 1.27.
3. ☒ Specification [Total Pages 17]
Both the claims and abstract must start on a new page
(For information on the preferred arrangement, see MPEP 608.01(e))
4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 5]
5. ☐ Oath or Declaration [Total Sheets 4]
 - a. ☒ Newly executed (original or copy)
 - b. ☐ A copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 18 completed)
 - i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s)
name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ Application Data Sheet. See 37 CFR 1.76
7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
☐ Landscape Table on CD
8. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, items a. - c. are required)
 - a. Computer Readable Form (CRF)
 - i. ☐ Computer Readable Form (CRF)
 - ii. ☐ Transfer Request (37 CFR 1.821(e))
 - 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 PARTS

9. ☐ Assignment Papers (cover sheet & document(s))
Name of Assignee _____
10. ☐ 37 CFR 3.73(b) Statement (when there is an assignee) ☐ Power of Attorney
11. ☐ English Translation Document (if applicable)
12. ☒ Information Disclosure Statement (PTO/SB/08 or PTO-1449)
☐ Copies of foreign patent documents, publications, & other information
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
15. ☐ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. ☐ Nonpublication Request under 35 U.S.C. 122(b)(2)(B)(i).
Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ Other: _____

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Prior application information: Examiner _____

Art Unit: _____

19. CORRESPONDENCE ADDRESS

☒ The address associated with Customer Number: 21972 OR ☐ Correspondence address below

Name

Address

City

State

Zip Code

Country

Telephone

Email Address

Signature

Date

Name

(Print/Type)

Scott N. Barker

Registration No.

(Attorney/Agent)

42,292

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METHODS AND APPARATUSES FOR REGULATING THE TEMPERATURE OF MULTI-VIA HEATER CHIPS

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is related to U.S. Application Serial No. ____/____, filed contemporaneously herewith, entitled “Methods and Apparatuses for Sensing the Temperature of Multi-Via Heater Chips.”

FIELD OF THE INVENTION

[0002] The present invention relates generally to printing devices, and more particularly to methods and apparatuses for regulating the temperature of multi-via heater chips.

BACKGROUND OF THE INVENTION

[0003] A number of printers, copiers, and multi-function products utilize heater chips in their printing heads for discharging ink drops. The ink is supplied through one or more ink vias in the chip. These heater chips typically provide only one heater array for each ink via that is disposed along one side of the ink via. In particular, as shown in FIG. 1, a traditional heater chip **100** may include three ink vias—a cyan ink via **102**, a magenta ink via **104**, and a yellow ink via **106**. The cyan ink via **102** operates with the cyan heater array **108**; the magenta ink via **104** operates with the magenta heater array **110**; and the yellow ink via **106** operates with the yellow heater array **112**.

[0004] Similarly, FIG. 2 shows a heater chip which includes three ink vias, each connected to a single heater array. The cyan ink via **202** operates with the cyan heater array **208**; the magenta ink via **204** operates with the magenta heater array **210**; and the yellow ink via **206** operates with the yellow heater array **212**. However, the traditional use of single heater array on a single side of an ink via limits the achievable printing resolution, including the vertical resolution. The configurations shown in FIG. 1 and FIG. 2 may have significant difficulty providing ink drop sizes

of less than 4 pL (picoliters) while achieving a vertical resolution of about 1200 dpi (dots per inch) or better. Therefore, it is desirable to position heater arrays on both sides of the ink vias, which allow the ink vias to provide smaller ink drops in order to achieve higher printing resolutions.

[0005] Additionally, for proper functionality, inkjet heater chips need to monitor and maintain the silicon substrate of the heater chip at an acceptable temperature for printing. If the temperature is too low, the ink drops formed will be smaller and have a lower drop-weight than that required for good image quality. As the temperature rises, the drop-weight of the ink drop will rise. Variations in drop-weight will cause visible hue shifts in the printed image.

[0006] A thermal sense resistor (TSR) is typically used to sense the temperature of the silicon substrate. The temperature of the heater chip shown in FIG. 1 is measured by way of a metal serpentine temperature sense resistor **120**. The serpentine temperature sense resistor **120** is routed around the periphery of the heater chip and provides an average temperature of the entire die. This average measurement provides no discrimination between individual colors and does not provide any feedback on temperature differences between one area of the heater chip versus another. Thus, the metal serpentine temperature sense resistor **120** lacks the ability to control temperature on a per color or area basis.

[0007] The heater chip shown in FIG. 2 improves on that of FIG. 1 by providing for temperature sensing on a per color basis. Three temperature sense resistors **220**, **222**, and **224** are placed in close proximity to each of the ink vias, each situated on the same side of their respective ink vias. As shown, a first TSR **220** is situated on the left side of the cyan ink via **202** and cyan heater array **208**; a second TSR **222** is situated on the left side of the magenta ink via **204** and magenta heater array **210**; and a third TSR **224** is situated on the left side of the yellow ink via **206** and the yellow heater array **212**. The ink vias **202**, **204**, and **206** act as a thermal barrier between the colors. All the thermal heater arrays **208**, **210**, and **212** are situated on only one side of their respective ink vias, ensuring that there is only a small amount of thermal crosstalk between the temperature sense resistors.

[0008] Once the temperature within the heater chip is measured, the temperature can be maintained and regulated at an acceptable temperature for

printing. Some traditional heater chips use substrate heating elements to heat the silicon substrate to an acceptable temperature. Other heater chips apply fire pulses to selected heater arrays of a short duration to maintain desired temperature. The duration of the fire pulses is too short to cause the nucleation and subsequent ejection of an ink drop, but the pulses are sufficient to ensure that the heater chip operates within an acceptable temperature range. In FIG. 2, fire pulses may be applied on a per color basis from the respective heater arrays 208, 210, and 212. As previously mentioned, the ink vias 202, 204, and 206 function as thermal barriers between the colors. For example, heat generated by the magenta heater array 210 will not readily couple to the cyan heater array 208 and yellow heater array 212 on either side across the intervening ink vias 202 and 204. Thus, an adequate operating temperature can be maintained for each color of the heater chip.

[0009] When a heater array is positioned on both sides of ink vias, the temperature sensing and regulating devices utilized in the prior art do not provide adequate thermal control. A serpentine temperature sense resistor 120, as depicted in FIG. 1 is not capable of discriminating between the individual colors of the heater arrays and does not provide any feedback on temperature difference between various areas of the heater chip. Further, monitoring and regulating the operating temperature on a per color basis by situating a temperature sense resistor on the same side of each respective ink via, as shown in FIG. 2, is insufficient due to the fact that heater arrays of more than one color now occupy the silicon region between ink vias. Without accurate temperature readings, the method of providing fire pulses to regulate thermal conditions on a per color basis would also be subject to error.

[0010] Accordingly, there is a need in the industry for heater chips that can provide for monitoring and regulating the various regions of a heater chip at a desired temperature when heater arrays are placed on both sides of the ink vias.

BRIEF SUMMARY OF THE INVENTION

[0011] According to one embodiment of the present invention, there is disclosed a chip for use with a printing device. The chip includes a first heater array, positioned substantially adjacent a first via, and a second heater array, positioned substantially adjacent a second via. The chip also includes a region, positioned

between the first heater array and the second heater array, and a temperature sensing element operable to sense the temperature of the region, where the temperature sensing element is substantially centrally disposed with respect to the region. Additionally, the first heater array and the second heater array are operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element, and the received heating regulates the temperature of the region.

[0012] According to one embodiment of the invention, the temperature sensing element may include a temperature sensing resistor. The temperature sensing element may also include a thermal sense resistor, such as an n-type implant donor thermal sensing resistor. According to another embodiment of the invention, the temperature sensing element may be positioned several hundred microns, such as at least 300 microns, from both the first heater array and the second heater array. According to yet another embodiment of the invention, the temperature sensing element is positioned substantially planar to each of the first heater array and the second heater array such that the temperature sensing element is not positioned directly above the first or second heater arrays. According to another embodiment of the invention, the chip may include at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.

[0013] Additionally, the chip may include a third heater array, positioned substantially adjacent the second via, and a fourth heater array, positioned substantially adjacent a third via. The chip may also include a second region, positioned between the third heater array and the fourth heater array, and a second temperature sensing element operable to sense the temperature of the second region, where the temperature sensing element is substantially centrally disposed with respect to the second region. Furthermore, the temperature sensing element positioned between the first heater array and the second heater array may be different than the second temperature sensing element positioned between the third heater array and the fourth heater array.

[0014] According to another embodiment of the invention, the first heater array and the second heater array are operable to receive non-nucleating heating responsive to the temperature of the region sensed by the temperature sensing element. Additionally, the non-nucleating heating may be of a short duration such

that ink will not be ejected from the first via or the second via during the non-nucleating heating.

[0015] According to another embodiment of the invention, there is disclosed a method of fabricating chips for use with a printing device. The method includes providing a first heater array, positioned substantially adjacent a first via, and providing a second heater array, positioned substantially adjacent a second via. The method also includes positioning a temperature sensing element in a region between the first heater array and the second heater array, where the temperature sensing element is operable to sense the temperature of the region, and responsive to the temperature of the region sensed by the temperature sensing element, heating the first heater array and the second heater array to regulate the temperature of the region.

[0016] According to one embodiment of the invention, positioning a temperature sensing element in the region includes positioning a temperature sensing element in substantially the center of the region. According to another embodiment of the invention, positioning a temperature sensing element in the region includes positioning a temperature sensing resistor in the region. Positioning a temperature sensing element in the region may also include positioning a thermal sense resistor in the region. Additionally, positioning a temperature sensing element in the region may also include positioning an n-type implant donor thermal sensing resistor in the region.

[0017] According to yet another embodiment of the invention, positioning a temperature sensing element in the region between the first heater array and the second heater array includes positioning the temperature sensing element several hundred microns, such as at least 300 microns, from each of the first heater array and the second heater array. Additionally, positioning a temperature sensing element in the region between the first heater array and the second heater array may include positioning the temperature sensing element substantially planar to each of the first heater array and the second heater array such that the temperature sensing element is not positioned directly above the first or second heater arrays. According to yet another embodiment of the invention, the method may include providing at least one control element operable to receive a temperature measured by the temperature sensing element and to heat the first heater array and the second heater array.

[0018] The method may also include providing a third heater array substantially adjacent the second via, providing a fourth heater array substantially adjacent a third via, and positioning a second temperature sensing element in a second region located between the third heater array and the fourth heater array, where the temperature sensing element is operable to sense the temperature of the second region, and where the temperature sensing element is substantially centrally disposed with respect to the second region. Additionally, the temperature sensing element positioned between the first heater array and the second heater array may be different than the second temperature sensing element positioned between the third heater array and the fourth heater array. Further, heating the first heater array and the second heater array to regulate the temperature of the region may include heating the first heater array and the second heater array using non-nucleating heating.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

[0019] Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 illustrates a traditional heater chip utilizing a serpentine temperature sense resistor for providing an average temperature of the entire die.

FIG. 2 illustrates a traditional heater chip utilizing temperature sense resistors and heater arrays to monitor and regulate temperature on a by color basis.

FIG. 3 illustrates an exemplary configuration for a heater chip having a heater array positioned on both sides of each ink via, according to an illustrative embodiment of the present invention.

FIG. 4 illustrates an exemplary configuration for a heater chip having regions defined between the ink vias, according to an illustrative embodiment of the present invention.

FIG. 5 illustrates an exemplary configuration for a heater chip in accordance with an illustrative embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS OF THE
INVENTION

[0020] The present inventions now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the inventions are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

[0021] According to an exemplary embodiment of the present invention, heater arrays may be positioned on both sides of at least a portion of the ink vias, which can allow higher printing resolutions. Each of these heater arrays may include a plurality of individual heaters fabricated as resistors in the heater chips. For example, these resistors may be thin-film resistors in accordance with an exemplary embodiment of the invention. These thin-film resistors may be formed of a variety of materials, including platinum, aluminum, alloys, and other materials. The heaters may also be formed of other technologies besides thin-film resistors, as are known to those of ordinary skill in the art. When the heaters in the heater arrays are activated, they provide thermal energy to the nozzle chamber, and the ink is discharged through the nozzle .

[0022] FIG. 3 shows an illustrative heater chip **300** according to an embodiment of the present invention. The heater chip **300** illustrates the placement of a single via in between two corresponding heater arrays. With the heater arrays positioned on both sides of at least a portion of the ink vias, higher printing resolutions can be achieved. As shown in FIG. 3, the illustrative heater chip **300** is a CMYK (cyan-magenta-yellow-monochrome) heater chip that includes four ink vias each disposed between two heater arrays. In particular, a cyan ink via **302** is positioned between a first heater array **308** and a second heater array **314**; a magenta ink via **304** is positioned between a first heater array **310** and a second heater array **316**; a yellow ink via **306** is positioned between a first heater array **312** and a second heater array **318**; and a monochrome (K) ink via **307** is positioned between a first heater array **313** and a second heater array **319**.

[0023] Although the heater chip 300 illustrated in FIG. 3 shows only four ink vias, it will be appreciated by one of ordinary skill in the art that a greater number of vias and corresponding heater arrays may be utilized. As an example, an additional monochrome (K) ink via may be disposed between two additional heater arrays to form a CMYKK heater chip. Additionally, there may be numerous vias for a particular color within a heater chip. According to another embodiment of the invention, only some of the ink vias may be disposed between two heater arrays. For example, the monochrome ink via 307 may include only one monochrome heater array along a single side of the monochrome ink via 307.

[0024] The heater arrays 308, 310, 312, 313, 314, 316, 318, 319 shown in FIG. 3 may include one or more individual heaters fabricated as resistors in the heater chip. These resistors may be thin-film resistors in accordance with an exemplary embodiment of the invention. Thin-film resistors may be formed of one or more materials, including platinum (Pt), gold (Au), silver (Ag), copper (Cu), aluminum (Al), tantalum (Ta), titanium tungsten (TiW), silicon-nitrogen (SiN), silicon carbide (SiC), diamond-like carbon (DLC) coating, etc. Other metals, alloys, or materials appreciable by one of ordinary skill in the art may also be used. The heater arrays may also be formed of other technologies besides thin-film resistors, as is known to those of ordinary skill in the art.

[0025] It will be appreciated that the placement of a single via in between two heater arrays presents a challenge in attempting to sense the temperature of individual colors. If there is a single TSR associated with each heater array in the illustrative embodiment of FIG. 2, then two TSRs will be placed next to each other between adjacent ink vias. For instance, if one TSR is associated with the left yellow heater array and another TSR is associated with the right magenta heater array, the region between the magenta and yellow vias would include two TSRs. If a print job is heavy in yellow and light in magenta, the thermal energy generated by the yellow heaters would rapidly couple through the common silicon to the magenta TSR positioned in between the yellow and magenta ink vias, providing a false high reading for magenta. Rather than try to sense temperature on a per color basis with TSR's in close proximity to heaters, the present embodiment senses temperature by silicon region.

[0026] According to an embodiment of the present invention, an adequate operating temperature is monitored and regulated for various thermal regions separated by insulating ink vias on the heater chip. FIG. 4 illustrates an exemplary configuration for a heater chip **400** having thermal regions defined between the ink vias, according to one embodiment of the present invention. In particular, a first region **430** is defined as the area between the left edge of the heater chip **400** and the cyan ink via **402**; a second region **432** is defined as the area between the cyan ink via **402** and the magenta ink via **404**; a third region **434** is defined as the area between the magenta ink via **404** and the yellow ink via **406**; a fourth region **436** is defined as the area between the yellow ink via **406** and the mono ink via **407**; and a fifth region **438** is defined as the area between the mono ink via **407** and the right edge of the heater chip **400**. It will be understood by those of ordinary skill in the art that any number of thermal regions may be defined for monitoring and regulating temperature on the heater chip.

[0027] The heater chip **400** includes components, such as the ink vias **402, 404, 406, 407** and heater arrays **408, 414, 410, 416, 412, 418, 413, 419** connected to a substrate (not shown) made up of a semiconductor material. According to an exemplary embodiment of the present invention, the substrate may be a silicon substrate. It will be appreciated by those skilled in the art, however, that the substrate can be formed from a variety of solid crystalline substances used as a base material for electronic devices, such as germanium (Ge), having electrical conductivity greater than insulators but less than good conductors. The thermal regions **430, 432, 434, 436, and 438** are defined regions of the silicon substrate of the heater chip **400** situated around and between the ink vias **402, 404, 406, and 407**. The minimum width of the thermal regions **430, 432, 434, 436, and 438** is generally limited by the heater chip **400** circuitry.

[0028] According to an embodiment of the present invention, temperature of the heater chip **400** is measured on a per thermal region basis. A temperature sensing element is placed in each of the thermal regions, and each is operable to measure the temperature of the silicon substrate in a corresponding thermal region. According to an exemplary embodiment of the present invention, the temperature sensing elements are n-type implant donor thermal sensing resistors (NSD sense resistors), as will be understood by those skilled in the art. As the

substrate temperature of the heater chip 400 increases, the resistance of the TSRs increases, allowing a temperature measurement to be taken. It will also be appreciated by those of ordinary skill in the art that many other temperature sensing elements can be used, including but not limited to metal resistors and p-type implant donors.

[0029] With particular reference to FIG. 5, a TSR is positioned within each of the thermal regions 430, 432, 434, 436, 438. Thus, a first TSR 540 is situated in the first region 430; a second TSR 542 is situated in the second region 432; a third TSR 544 is situated in the third region 434; a fourth TSR 546 is situated in the fourth region 436; and a fifth TSR 548 is situated in the fifth region 438. The TSRs 540, 542, 544, 546, and 548 are placed well away from the heater arrays 408, 410, 412, 413, 414, 416, 418, 419, at a distance 550 of several hundred microns, rather than in close proximity to the heater arrays. For the first region 430 the first TSR 440 is centered between the left edge (i.e., the left edge of the substrate) of the heater chip 400 and the cyan ink via 402. Similarly, for the fifth region 438 the fifth TSR 448 is centered between the right edge of the heater chip 400 and the mono ink via 402. The remaining TSRs 542, 544, 546 are centered between heater arrays from adjacent ink vias corresponding to different colors (i.e., heater arrays 414 and 410, 416 and 412, and 418 and 413, respectively). It will be understood by those skilled in the art that the TSRs 540, 542, 544, 546, and 548 need not be centered within their respective thermal regions 430, 432, 434, 436, and 438, but rather, they can be positioned at any point within their respective thermal regions.

[0030] Due to the relative high thermal conductivity of the silicon substrate, each of the thermal regions 430, 432, 434, 436, 438 have a very uniform temperature across the width of that region. Because of this conductivity, the TSRs 540, 542, 544, 546, 548 can be placed in the center of their respective thermal regions 430, 432, 434, 436, and 438 and still provide an accurate temperature measurement for the region. The ink vias 402, 404, 406, 407, on the other hand, act as thermal insulators between the thermal regions 430, 432, 434, 436, 438. As an example, if the right cyan heater array 414 fires, then the adjacent left magenta heater array 410 will quickly be at the same temperature as the right cyan heater array 414. A temperature reading from the second region 432 represents the temperature of both the magenta and cyan heater arrays 414 and 410 in the second region. As previously mentioned,

the minimum width of the thermal regions **430**, **432**, **434**, **436**, and **438** is generally limited by the heater chip **400** circuitry. It will be appreciated by those of ordinary skill in the art that the maximum practical width for temperature sensing accuracy depends on a combination of the printing rate and the frequency at which the temperature is read from a thermal region. For instance, if the right cyan heater array **414** is firing at a high frequency, then the width of the second region **432** would need to be small enough to ensure uniform temperature across the second region **432** for a given temperature sampling rate of the second TSR **542**.

[0031] According to one embodiment of the invention, each TSR **540**, **542**, **544**, **546**, **548** makes up half of a wheatstone bridge circuit, as is known to those of ordinary skill in the art for use in measuring small changes in resistance. The other half of the bridge circuit feeds into a differential op-amp, the output of which is provided as input to an A/D converter. The A/D converter may be included in an Application Specific Integrated Circuit (ASIC) that controls the functioning of the printhead. Firmware running on the system, in conjunction with the ASIC may monitor the measured temperature from each TSR. According to one embodiment of the invention, the temperature may be monitored continuously prior to the beginning of printing. As described in detail below, this information can allow heater arrays to be fired at a high frequency to maintain a desired temperature in each region. According to another embodiment of the invention, the monitoring of temperature in each region may not be monitored during printing.

[0032] According to yet another embodiment of the present invention, the temperature of the heater chip **400** is regulated on a per region basis. The heater chip **400** may use non-nucleating heating (NNH) to maintain an adequate substrate temperature for the heater chip **400** in each region in order to ensure the best print quality. NNH includes applying fire pulses to selected heater arrays **408**, **410**, **412**, **413**, **414**, **416**, **418** of a duration too short to cause nucleation and the subsequent ejection of an ink drop from an ink via **402**, **404**, **406**, and **407**. NNH is applied on a per thermal region basis rather than on a per color basis. According to one embodiment of the invention, NNH pulses are applied to heaters within each region. Additionally, the heaters used in each region may vary, and the firing of pulses in two or more heaters may be asynchronous to minimize the current and power required for maintaining a desired temperature in each region. Instructions for firing heaters may

be provided via one or more data streams used to control heater address data, the printhead, and like elements. Those skilled in the art will recognize that other methods for heating the various thermal areas can be used, including but not limited to substrate heating elements.

[0033] As shown in FIG. 5, the first region **430** is heated by the left cyan heater array **408**; the second region **432** is heated by the right cyan heater array **414** and the left magenta heater array **410**; the third region **434** is heated by the right magenta heater array **416** and the left yellow heater array **412**; the fourth region **436** is heated by the left yellow heater array **418** and the mono heater array **413**; and the fifth region **438** is heated by the right mono heater array **419**. According to one embodiment of the invention, one or more of the regions may not be heated by both adjacent heater arrays due to hardware constraints. For instance, the fourth region **436** may be heated only by the left mono heater array **413** rather than by both the left mono heater array **413** and the right yellow heater array **418**. As described above, the firing of pulses in two or more heaters may be asynchronous to minimize the current and power required for maintaining a desired temperature in each region. Based on the average thermal region temperature measurements provided by the TSRs **540**, **542**, **544**, **546**, **548**, if heating is required in a particular thermal region, NNH is applied to each heater array situated in that thermal region. Thus, each thermal region can be regulated at its optimal operating temperature.

[0034] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

THAT WHICH IS CLAIMED:

- 1 1. A chip for use with a printing device, comprising:
2 a first heater array, positioned substantially adjacent a first via;
3 a second heater array, positioned substantially adjacent a second via;
4 a region, positioned between the first heater array and the second heater array;
5 and
6 a temperature sensing element operable to sense the temperature of the region,
7 wherein the temperature sensing element is substantially centrally disposed with
8 respect to the region,
9 wherein the first heater array and the second heater array are operable to
10 receive heating responsive to the temperature of the region sensed by the temperature
11 sensing element, and wherein the received heating regulates the temperature of the
12 region.
- 1 2. The chip of claim 1, wherein the temperature sensing element comprises a
2 temperature sensing resistor.
- 1 3. The chip of claim 2, wherein the temperature sensing element comprises a
2 thermal sense resistor.
- 1 4. The chip of claim 3, wherein the temperature sensing element comprises an n-
2 type implant donor thermal sensing resistor.
- 1 5. The chip of claim 1, wherein the temperature sensing element is positioned at
2 least 300 microns from each of the first heater array and the second heater array.
- 1 6. The chip of claim 5, wherein the temperature sensing element is positioned
2 substantially planar to each of the first heater array and the second heater array.
- 1 7. The chip of claim 1, further comprising at least one control element operable
2 to receive a temperature measured by the temperature sensing element and to heat the
3 first heater array and the second heater array.

1 8. The chip of claim 1, further comprising:
2 a third heater array, positioned substantially adjacent the second via;
3 a fourth heater array, positioned substantially adjacent a third via;
4 a second region, positioned between the third heater array and the fourth
5 heater array; and
6 a second temperature sensing element operable to sense the temperature of the
7 second region, wherein the temperature sensing element is substantially centrally
8 disposed with respect to the second region,
9 wherein the third heater array and the fourth heater array are operable to
10 receive heating responsive to the temperature of the second region sensed by the
11 temperature sensing element, and wherein the received heating regulates the
12 temperature of the region.

1 9. The chip of claim 8, wherein the temperature sensing element positioned
2 between the first heater array and the second heater array is different than the second
3 temperature sensing element positioned between the third heater array and the fourth
4 heater array.

1 10. The chip of claim 1, wherein the first heater array and the second heater array
2 are operable to receive non-nucleating heating responsive to the temperature of the
3 region sensed by the temperature sensing element.

1 11. The chip of claim 10, wherein the non-nucleating heating is of a short duration
2 such that ink will not be ejected from the first via or the second via during the non-
3 nucleating heating.

1 12. A method of fabricating chips for use with a printing device, comprising:
2 providing a first heater array, positioned substantially adjacent a first via;
3 providing a second heater array, positioned substantially adjacent a second
4 via; positioning a temperature sensing element in a region between the first heater
5 array and the second heater array, wherein the temperature sensing element is
6 operable to sense the temperature of the region; and

1 responsive to the temperature of the region sensed by the temperature sensing
2 element, heating the first heater array and the second heater array to regulate the
3 temperature of the region.

1 13. The method of claim 12, wherein positioning a temperature sensing element in
2 the region comprises positioning a temperature sensing element in substantially the
3 center of the region.

1 14. The method of claim 12, wherein positioning a temperature sensing element in
2 the region comprises positioning a thermal sense resistor in the region.

1 15. The method of claim 14, wherein positioning a temperature sensing element in
2 the region comprises positioning an n-type implant donor thermal sensing resistor in
3 the region.

1 16. The method of claim 12, wherein positioning a temperature sensing element in
2 the region between the first heater array and the second heater array comprises
3 positioning the temperature sensing element at least 300 microns from each of the
4 first heater array and the second heater array.

1 17. The method of claim 16, wherein positioning a temperature sensing element in
2 the region between the first heater array and the second heater array comprises
3 positioning the temperature sensing element substantially planar to each of the first
4 heater array and the second heater array.

1 18. The method of claim 12, further comprising providing at least one control
2 element operable to receive a temperature measured by the temperature sensing
3 element and to heat the first heater array and the second heater array.

1 19. The method of claim 18, further comprising:
2 providing a third heater array substantially adjacent the second via;
3 providing a fourth heater array substantially adjacent a third via; and
4 positioning a second temperature sensing element in a second region located
5 between the third heater array and the fourth heater array, wherein the temperature

6 sensing element is operable to sense the temperature of the second region, and
7 wherein the temperature sensing element is substantially centrally disposed with
8 respect to the second region.

1 20. The method of claim 12, wherein heating the first heater array and the second
2 heater array to regulate the temperature of the region comprises heating the first
3 heater array and the second heater array using non-nucleating heating.

ABSTRACT

Heater chips for use with a printing device, such as heater chips that include a first heater array, positioned substantially adjacent a first via, and a second heater array, positioned substantially adjacent a second via. The heater chip can also include a region, positioned between the first heater array and the second heater array, and a temperature sensing element operable to sense the temperature of the region, where the temperature sensing element is substantially centrally disposed with respect to the region. Additionally, the first heater array and the second heater array are operable to receive heating responsive to the temperature of the region sensed by the temperature sensing element to regulate the temperature of the region. According to one embodiment of the invention, the temperature sensing element comprises a temperature sensing resistor and the heating may occur via non-nucleating heating.

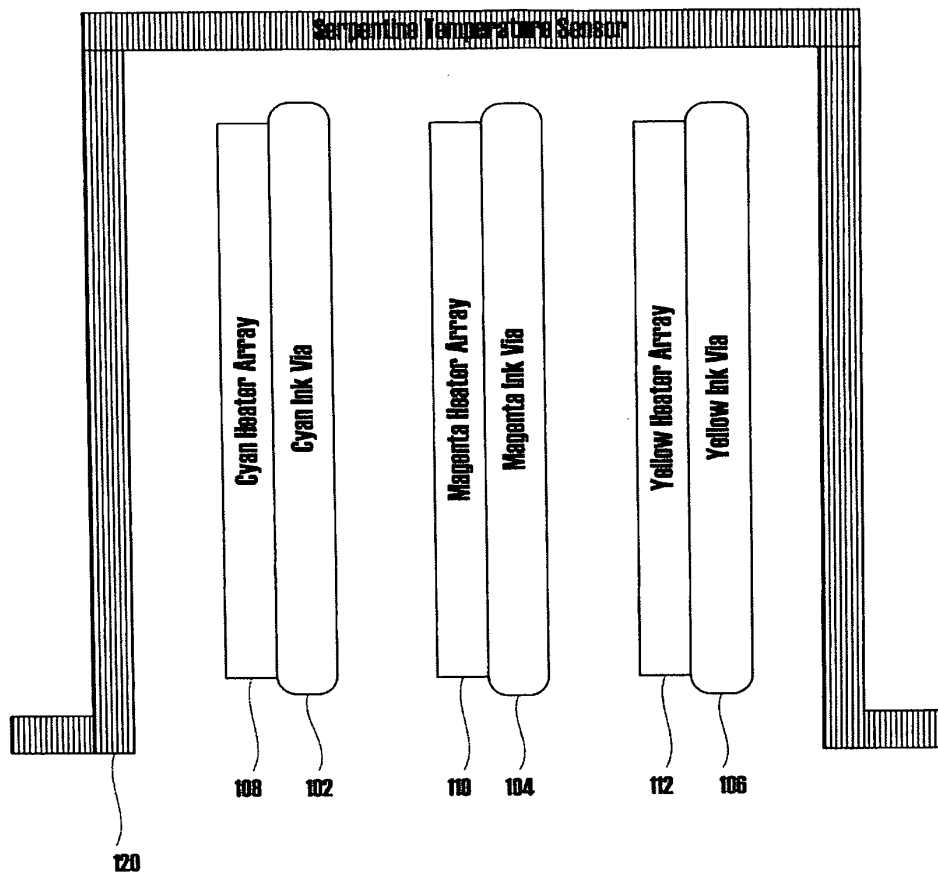


FIG. 1
(Prior Art)

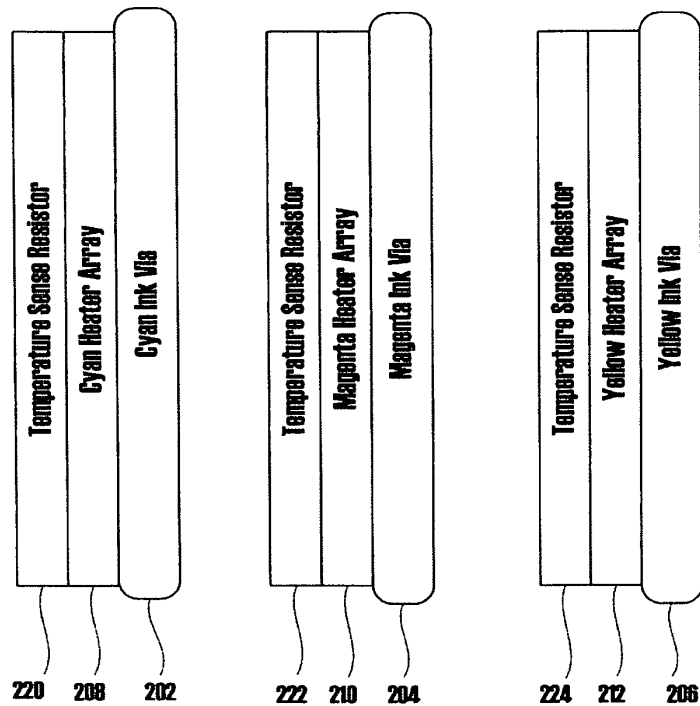


FIG. 2
(Prior Art)

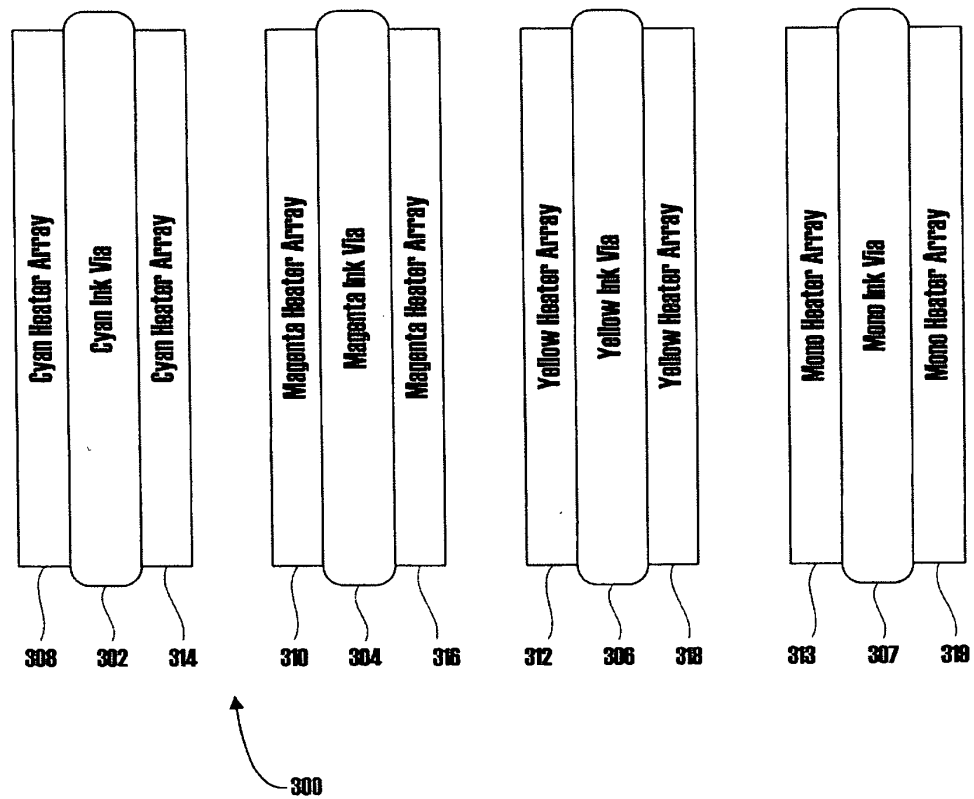


FIG. 3

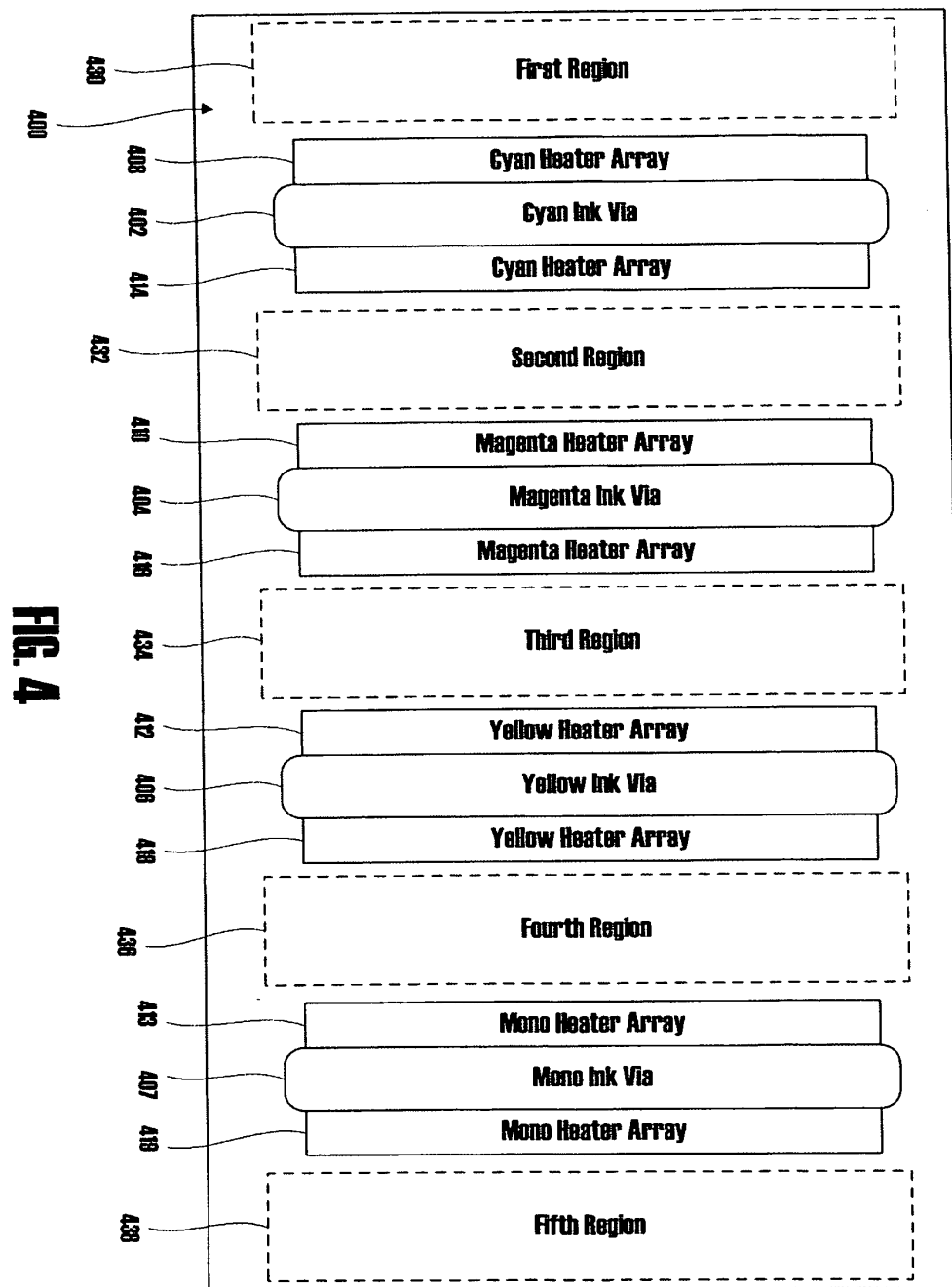
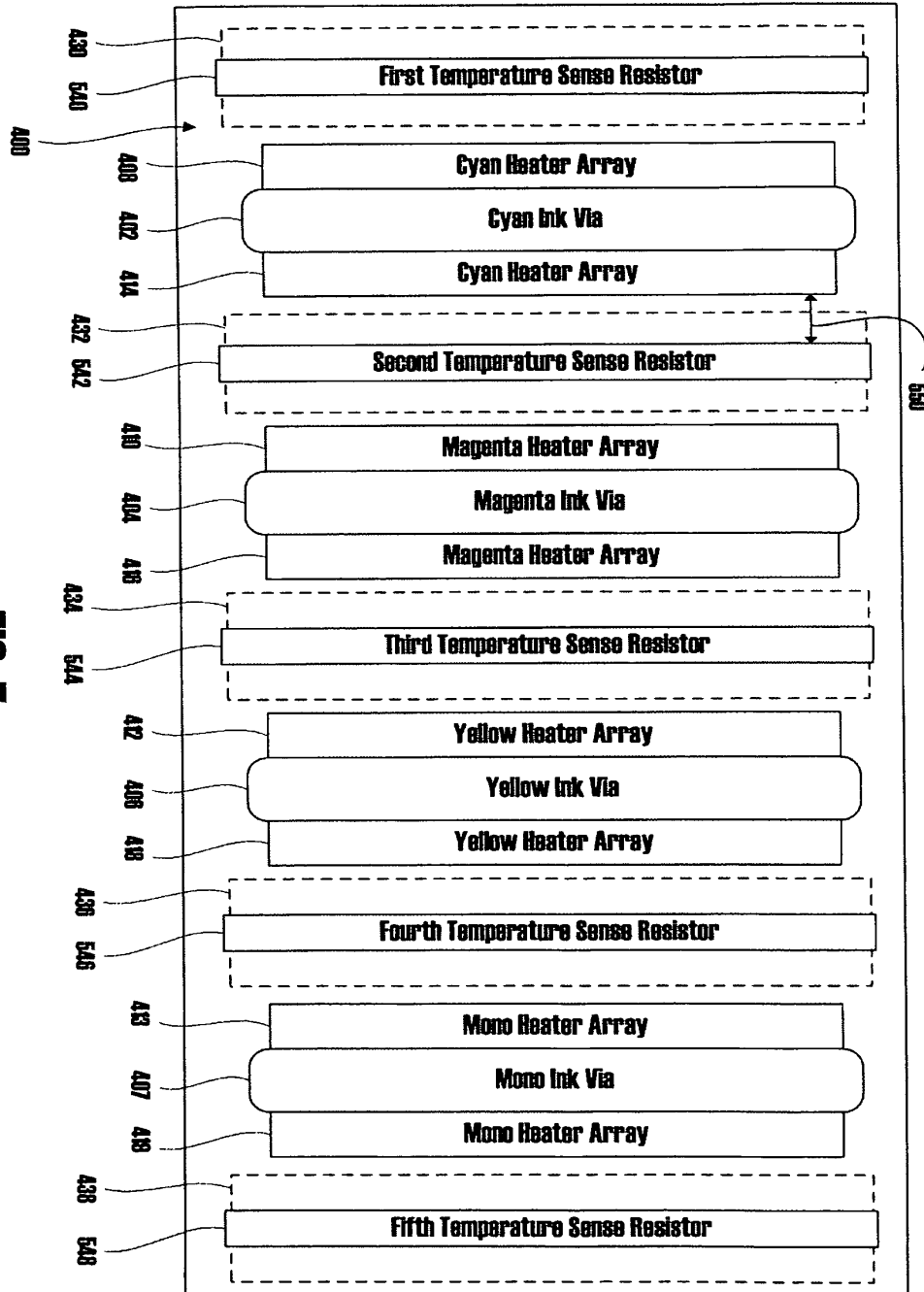


FIG. 5



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**DECLARATION FOR UTILITY OR
DESIGN
PATENT APPLICATION
(37 CFR 1.63)**☒ Declaration
Submitted
With Initial
Filing

OR

☐ Declaration
Submitted after Initial
Filing (surcharge
(37 CFR 1.16 (e))
required)Attorney Docket
Number

2005-0547.02

First Named Inventor

Lucas D. Barkley

COMPLETE IF KNOWN

Application Number

Filing Date

Art Unit

Examiner Name

I hereby declare that:

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Methods and Apparatuses for Regulating the Temperature of Multi-Via Heater Chips

(Title of the Invention)

the specification of which

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) as United States Application Number or PCT InternationalApplication Number and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 21 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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DECLARATION — Utility or Design Patent Application

Direct all correspondence to:		☒ The address associated with Customer Number:	21972	OR	☐ Correspondence address below
Name					
Address					
City		State		ZIP	
Country		Telephone		Email	
WARNING: Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available. I hereby declare that all statements made herein of my own knowledge are true and that all statements 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 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.					
NAME OF SOLE OR FIRST INVENTOR:			☐ A petition has been filed for this unsigned inventor		
Given Name (first and middle [if any])			Family Name or Surname		
Lucas David			Barkley		
Inventor's Signature					Date
Residence: City	State	Country	Citizenship		
Lexington	Kentucky	US	US		
Mailing Address					
4800 Clifford Circle					
City	State	Zip	Country		
Lexington	Kentucky	40515	US		
☒ Additional inventors or a legal representative are being named on the <u>2</u> supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.					

[Page 2 of 2]

DECLARATION**ADDITIONAL INVENTOR(S)**
Supplemental SheetPage 1 of 2

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Bruce David		Gibson	
Inventor's Signature			Date
Lexington Residence: City	Kentucky State	US Country	US Citizenship
4729 Scenicview Road			
Mailing Address			
Lexington City	Kentucky State	40514 Zip	US Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Eric Spencer		Hall	
Inventor's Signature			Date
Lexington Residence: City	Kentucky State	US Country	US Citizenship
1344 Copperfield Court			
Mailing Address			
Lexington City	Kentucky State	40514 Zip	US Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
David G.		King	
Inventor's Signature			Date
Shelbyville Residence: City	Kentucky State	US Country	US Citizenship
66 Goldenrod Court			
Mailing Address			
Shelbyville City	Kentucky State	40065 Zip	US Country

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DECLARATION**ADDITIONAL INVENTOR(S)**
Supplemental SheetPage 2 of 2

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
George K.		Parish	
Inventor's Signature			Date
Winchester Residence: City	Kentucky State	US Country	US Citizenship
11 Fontaine Boulevard Mailing Address			
Winchester City	Kentucky State	40391 Zip	US Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Inventor's Signature			Date
Residence: City	State	Country	Citizenship
Mailing Address			
City	State	Zip	Country
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor	
Given Name (first and middle (if any))		Family Name or Surname	
Inventor's Signature			Date
Residence: City	State	Country	Citizenship
Mailing Address			
City	State	Zip	Country

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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	
Filing Date	
First Named Inventor	Lucas D. Barkley
Art Unit	
Examiner Name	
Attorney Docket Number	2005-0547.02

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		Number-Kind Code ² (if known)			
		US- 6951378	10-04-2005	Yamada et al.	
		US- 6883904	04-26-2005	Jeanmarie et al.	
		US- 6871929	03-29-2005	Crivelli et al.	
		US- 6808243	10-26-2004	Markham et al.	
		US- 6644774	11-11-2003	Burger et al.	
		US- 6641242	11-04-2003	Canti et al.	
		US- 6601941	08-05-2003	Jones et al.	
		US- 6382773	05-05-2002	Chang et al.	
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No. ¹	Foreign Patent Document	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
		Country Code ³ Number ⁴ Kind Code ⁵ (if known)				

Examiner Signature		Date Considered	
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*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.

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1. 12.

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 11324167																											
APPLICATION AS FILED – PART I																																
(Column 1)		(Column 2)			(Column 3)																											
FOR	NUMBER FILED	NUMBER EXTRA																														
BASIC FEE (37 CFR 1.16(a), (b), or (c))																																
SEARCH FEE (37 CFR 1.16(k), (l), or (m))																																
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))																																
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *																														
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2	minus 3 = *																														
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$250 (\$125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR																															
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))																																
* If the difference in column 1 is less than zero, enter "0" in column 2.																																
APPLICATION AS AMENDED – PART II																																
(Column 1)		(Column 2)			(Column 3)																											
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			PRESENT EXTRA																											
	Total (37 CFR 1.16(i))	*	Minus **			=																										
	Independent (37 CFR 1.16(h))	*	Minus ***			=																										
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AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR			PRESENT EXTRA																											
	Total (37 CFR 1.16(i))	*	Minus **			=																										
	Independent (37 CFR 1.16(h))	*	Minus ***			=																										
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* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
 ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
 *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
 The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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