

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
 Stylesheet Version v1.2

EPAS ID: PAT8222850

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT
CONVEYING PARTY DATA	
Name	Execution Date
ANASTASIA ZINK	03/15/2022
FELIX ZAMORA	10/08/2020
MICHAEL GREMINGER	10/08/2020
H. ERHAN DINCER	10/12/2020
GILLS FAI	10/16/2020
BRIAN KROHN	10/13/2020
ROY JOSEPH CHO	10/09/2020
AMIT GOYAL	09/01/2020
SARA OSTLIE	10/16/2020
RECEIVING PARTY DATA	
Name:	REGENTS OF THE UNIVERSITY OF MINNESOTA
Street Address:	600 MCNAMARA ALUMNI CENTER
Internal Address:	200 OAK STREET
City:	MINNEAPOLIS
State/Country:	MINNESOTA
Postal Code:	55455-2020
PROPERTY NUMBERS Total: 1	
Property Type	Number
Application Number:	17659442
CORRESPONDENCE DATA	
Fax Number:	
<i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i>	
Phone:	(612) 349-5773
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Correspondent Name:	PATTERSON THUENTE P.A.
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Address Line 2:	4800 IDS CENTER
Address Line 4:	MINNEAPOLIS, MINNESOTA 55402
ATTORNEY DOCKET NUMBER:	1008.47US03

PATENT

NAME OF SUBMITTER:	JILL RABOIN
SIGNATURE:	/Jill Raboin/
DATE SIGNED:	10/16/2023
Total Attachments: 44 source=Complete Assignment#page1.tif source=Complete Assignment#page2.tif source=Complete Assignment#page3.tif source=Complete Assignment#page4.tif source=Complete Assignment#page5.tif source=Complete Assignment#page6.tif source=Complete Assignment#page7.tif source=Complete Assignment#page8.tif source=Complete Assignment#page9.tif source=Complete Assignment#page10.tif source=Complete Assignment#page11.tif source=Complete Assignment#page12.tif source=Complete Assignment#page13.tif source=Complete Assignment#page14.tif source=Complete Assignment#page15.tif source=Complete Assignment#page16.tif source=Complete Assignment#page17.tif source=Complete Assignment#page18.tif source=Complete Assignment#page19.tif source=Complete Assignment#page20.tif source=Complete Assignment#page21.tif source=Complete Assignment#page22.tif source=Complete Assignment#page23.tif source=Complete Assignment#page24.tif source=Complete Assignment#page25.tif source=Complete Assignment#page26.tif source=Complete Assignment#page27.tif source=Complete Assignment#page28.tif source=Complete Assignment#page29.tif source=Complete Assignment#page30.tif source=Complete Assignment#page31.tif source=Complete Assignment#page32.tif source=Complete Assignment#page33.tif source=Complete Assignment#page34.tif source=Complete Assignment#page35.tif source=Complete Assignment#page36.tif source=Complete Assignment#page37.tif source=Complete Assignment#page38.tif source=Complete Assignment#page39.tif source=Complete Assignment#page40.tif source=Complete Assignment#page41.tif source=Complete Assignment#page42.tif source=Complete Assignment#page43.tif	



UNIVERSITY OF MINNESOTA
ASSIGNMENT

WHEREAS, I, Roy Joseph Cho, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Provisional application no. 62/358,285 on July 5, 2016, Provisional application no. 62/528,652 on July 5, 2017 and Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.

I have hereunto set my hand on October 9, 2020 | 2:27 PM CDT.


DocuSigned by:

/ Roy Joseph Cho /
10566A31A8EE431...

Roy Joseph Cho

I have hereunto set my hand on October 17, 2020 | 9:46 AM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:
/  /
0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866

DOCUMENTATION IN LIEU OF SIGNED INVENTOR ASSIGNMENT

Applicant: Regents of the University of Minnesota

Inventor: Anastasia Zink

Principal Inventor: Michael A. Greminger

Additional Inventors: Brian Krohn, Amit Goyal, Roy Joseph Cho, H. Erhan Dincer, Felix Zamora, Gills Fai, Sarah Ostlie

Assignee: Regents of the University of Minnesota

Invention Docket No.: 20160374US1

Name of Invention: Lung Biopsy Devices, Systems and Methods for Locating and Biopsying an Object

U.S. Utility Patent Application No.: 16/026,410 filed on July 3, 2018

Explanation:

After multiple, repeated attempts using different e-mail addresses and phone messages, Applicant was not able to obtain a signed Assignment from Inventor Anastasia Zink. We have not been able to locate this inventor.

Per 37 C.F.R. 1.46, Applicant is the assignee to whom the inventor Anastasia Zink is obligated to assign the invention. Under the provisions of 37 C.F.R. 1.46, Applicant submits documentation in lieu of a signed Assignment for recordation to transfer ownership of the invention from Inventor Anastasia Zink to Regents of the University of Minnesota.

Four documents are attached:

- Regents of the University of Minnesota Policy Commercialization of Intellectual Property Rights
 - SECTION v. OWNERSHIP OF TECHNOLOGY Subds. 1 and 2 Ownership and Assignment of Intellectual Property Rights, respectively, states:

Subd. 1. Ownership.

The University shall be the sole owner of all rights, titles, and interests (including intellectual property rights) in and to technology:

- (a) created by University employees in the course of their employment;
- (b) created by individuals, including employees, students, or post-doctoral or other fellows, using substantial University resources.

Subd. 2. Assignment of Intellectual Property Rights.

Inventors assign to the University all rights, titles, and interests, if any, in and to technology owned by the University.

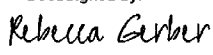
- Invention Disclosure (ROI20160374 received May 5, 2016)
 - Section 6 Contributors lists Inventor Anastasia Zink and indicates that at the time of the invention she was employed by Regents of the University of Minnesota fulltime in the Medical Devices Center, College of Science and Engineering.
- Letter of Employment from Arthur G. Erdman, Richard C. Jordan Professor, Morse Alumni Distinguished Teaching Professor, Director of the Medical Devices Center, University of Minnesota, dated May 7, 2015.
- Anastasia Zink University of Minnesota Employee Job History Report.

Based on the attached documentation, Anastasia Zink transfers all rights, titles, and interests in the above-referenced invention and application to Regents of the University of Minnesota.

I hereby request on behalf of the Regents of the University of Minnesota that this submission with its attachments be accepted in lieu of a signed inventor Assignment and to issue the Letters Patent to Assignee.

I have hereunto set my hand on March 15, 2022 | 1:13 PM CDT.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:

EF98FC35C27B499...

Rebecca Gerber
Associate Director
per Presidential Delegation ID_293206



BOARD OF REGENTS POLICY: ***Commercialization of Intellectual Property Rights***

SECTION I. SCOPE.

This policy governs patents and the ownership, commercialization, and dissemination of intellectual property rights in technology created at the University of Minnesota (University).

SECTION II. EXCLUSIONS.

Subd. 1. Copyright.

With the exception of the commercialization of intellectual property rights in software owned by the University, this policy shall not apply to the ownership or use of copyrighted works that are governed by other Board of Regents (Board) or administrative policies.

Subd. 2. Trademarks.

With the exception of intellectual property rights in University trademarks that identify University-owned plant varieties or that are commercialized in conjunction with other technology covered by this policy, this policy shall not apply to the use of University-owned or licensed names, trademarks, or service marks.

Subd. 3. Equity Interests.

This policy shall not apply (a) to the University's acquisition of equity securities in a publicly held company or appointment of a voting member to the governing body of a publicly held company or (b) to the acquisition of equity securities of a publicly held company by a University employee.

Subd. 4. Student-Created Technology.

This policy shall not apply to technology created or reduced to practice by University students to fulfill a University course requirement unless (i) the development of the technology was funded, in whole or in part, by an external sponsor; (ii) the technology was an improvement of an invention in which the University holds the intellectual property rights; (iii) a University faculty member or other University employee was a co-inventor of the technology; or (iv) substantial University resources were used to develop or reduce the technology to practice. This policy does not prohibit the University from conditioning participation in a University course or other University-sponsored activity on an individual's assigning to or licensing to the University the rights in technology created or reduced to practice in the course or activity.

SECTION III. DEFINITIONS.

Subd. 1. Inventor.

Inventor shall mean a University employee, student, or postdoctoral or other fellow who invents technology.

Subd. 2. Technology.

Technology shall mean the following items and their related intellectual property rights:

- (a) a discovery or invention, patentable or not;
- (b) software owned by the University; and
- (c) trademarks owned by the University that identify University-owned or University-licensed plant varieties or that are commercialized in conjunction with other technology covered by this policy.

Subd. 3. University Official.

University official shall mean a person defined as a University official in Board of Regents Policy: *Institutional Conflict of Interest* and any person covered by administrative policies or procedures implementing that policy.

Subd. 4. Controlling Equity Interest.

Controlling equity interest shall mean the University's ownership of equity securities of a licensee sufficient to grant the University the power to direct the licensee's management. The University shall be considered to have a controlling equity interest in a licensee under this policy if:

- (a) the University owns a majority of the voting equity interest in the licensee; or
- (b) the University has the power to appoint a majority of the voting members of the governing body of the licensee.

Subd. 5. Licensee.

Licensee shall mean a for-profit, privately held company to which the University licenses or assigns intellectual property rights in University-owned technology.

Subd. 6. Net Income.

Net income shall mean the gross monetary payments the University receives in consideration for granting rights in the technology less (a) the University's out-of-pocket expenditures (including legal fees) directly attributable to protecting, developing, and transferring that technology and (b) a fifteen percent administrative fee of the gross monetary payments to help defray the costs associated with operating the Office of Technology Commercialization. Net income includes the net cash proceeds received from the sale of securities acquired under Section V, Subd. 6 of this policy. Net income does not include the net cash proceeds received from the sale of securities acquired under Section VII, Subd. 5 of this policy. Fees, charges, and other monetary payments made to the University to compensate it for administering intellectual property agreements or seeking and maintaining intellectual property protection for technology shall not be considered monetary payments under this policy.

SECTION IV. GUIDING PRINCIPLES.

The following principles shall guide the University in commercializing technology:

- (a) The primary mission of University research is the generation and dissemination of knowledge, and academic freedom requires that faculty, staff, and students be free to pursue areas of research and study without regard to the potential for the creation of inventions.

- (b) The development and dissemination of new knowledge, technology, or scientific procedures resulting in innovative products, practices, and ideas is a valued supplement to scholarly publications.
- (c) University commercialization activities shall not inhibit the ability of University researchers to pursue research of their choosing, to publish results of their work in a timely manner, and otherwise to exercise their rights of academic freedom.
- (d) Licensing University-owned technology to private companies promotes the University's interest in successful commercial development of University-owned intellectual property. In some circumstances, a non-commercial method of distribution, such as open source sharing of technology or licensing for humanitarian needs, may be the preferred method of providing public access to, and use of, University discoveries.
- (e) The University may own a controlling equity interest and assert control over the direction and management of a licensee only when doing so (1) enhances the potential for the licensee to successfully develop and make available to the public useful products and services and (2) increases the potential value of the University's investment.

SECTION V. OWNERSHIP OF TECHNOLOGY.

Subd. 1. Ownership.

The University shall be the sole owner of all rights, titles, and interests (including intellectual property rights) in and to technology:

- (a) created by University employees in the course of their employment;
- (b) created by individuals, including employees, students, or post-doctoral or other fellows, using substantial University resources.

Subd. 2. Assignment of Intellectual Property Rights.

Inventors assign to the University all rights, titles, and interests, if any, in and to technology owned by the University.

Subd. 3. Ownership Under Third Party Agreements.

Ownership of and rights in technology are subject to the terms of written agreements between the University and third parties under which the University, solely or in collaboration, conducts research or other activities. Under these agreements, the University may claim, disclaim, or otherwise grant or accept rights in technology as appropriate and desirable.

Subd. 4. Waiver of University Rights.

Consistent with administrative policies and procedures, the president or delegate is authorized to waive or otherwise assign to an inventor all or part of the University's rights, titles, or interests in or to a technology created by the inventor.

Subd. 5. Rights to Publish.

At the University's request, inventors shall delay the publication or public disclosure of any descriptions of technology for a brief period of time to permit the registration, application for, and protection of the intellectual property rights in the technology.

Subd. 6. Rights to Third Parties.

The president or delegate may assign, license, or otherwise grant a third party the right to use technology royalty-free or in exchange for cash, stock or other securities, or other tangible or intangible property.

SECTION VI. DISTRIBUTION OF INCOME FROM COMMERCIALIZATION OF TECHNOLOGY.

The University shall share with inventors the net income from the commercialization of technology as follows:

- (a) thirty-three and one-third percent to the inventors;
- (b) twenty-five and one-third percent to the department, division, or center that supported the creation of the technology, to be spent in support of the inventor's research or directly related University work;
- (c) eight percent to the collegiate unit that supported the creation of the technology; and
- (d) thirty-three and one-third percent to the Office of the Vice President for Research, to be spent in support of the University's technology commercialization activities and to fund University research and scholarly activity.

The president or delegate may change the distribution to collegiate units or to departments, divisions, or centers if such amounts become disproportionate compared to their budgets or if there have been administrative organizational changes, including an inventor's movement among units or departments. The president or delegate also may distribute to inventors a portion of the net income from commercialization of technology in the form of a bonus or salary supplement.

SECTION VII. EQUITY, CONTROLLING INTERESTS, AND ASSISTANCE WITH COMMERCIALIZATION.

Subd. 1. Disposition of Equity Securities.

The University shall sell the equity securities acquired under Section V. Subd. 6. of this policy as soon as prudent and in strict compliance with all applicable federal and state laws.

Subd. 2. Acquiring a Controlling Equity Interest in the Commercialization of Technology.

In acquiring, as part of a transaction to commercialize technology, a majority or other equity interest in a company that grants the University the power to direct the company's management or the power to appoint a majority of the voting members of the governing body of the company, the following prohibitions shall apply:

- (a) Except as permitted under Section VII. Subds. 4. and 5. of this policy or any other applicable Board policies, the University shall not make a cash investment in, lend money to, or guarantee the obligations of the company; and
- (b) University officials shall not purchase or invest, directly or indirectly, in the equity securities of a licensee as long as the licensee is privately held, except that University employees who are not University officials may purchase or invest, directly or indirectly, in such equity securities if permitted under Board of Regents Policy: *Individual Business or Financial Conflict of Interest* and other applicable Board policies.

Subd. 3. Appointment of Voting Members to Governing Bodies as Part of the Commercialization of Technology.

The president or delegate may authorize the appointment of voting members to the governing bodies of privately held companies commercializing technology. The member shall:

- (a) be an individual with demonstrated experience and competence in technology commercialization and in the creation, management, and capitalization of privately held companies; and
- (b) be reasonably insured against liability arising from service on the governing bodies of such companies.

The member:

- (a) shall not accept compensation for service as a member of the governing body of the company, but may accept reasonable reimbursement for service-related expenses;
- (b) shall comply with applicable University policies and procedures;
- (c) shall discharge fiduciary and contractual responsibilities to the company, subject to the performance of University duties as provided in Board and other University policy and procedures if the individual is an employee of the University; and
- (d) shall resign as a voting member of the governing body of the company prior to the company's becoming publicly held, unless the president or delegate approves an extension of the appointment.

Subd. 4. Use of Technology Commercialization Income to Assist Commercialization by Non-University Entities.

The president or delegate may authorize non-University entities to use income the University earns from technology commercialization to directly encourage, promote, or assist with the commercialization and development of University intellectual property. The commitment of financial support for particular projects shall not exceed \$250,000, consistent with Board of Regents Policy: *Reservation and Delegation of Authority*.

Subd. 5. Equity Investment to Support Commercialization by Non-University Entities.

The president or delegate may authorize an investment in the equity securities (including securities that are convertible to equity securities) of a company formed for the purpose of commercializing and developing University-owned technology. No such investment may exceed \$1,050,000.

SECTION VIII. REPORTING.

The president or delegate shall report annually to the Board on University activities under this policy.

SECTION IX. IMPLEMENTATION.

The president or delegate shall implement this policy and maintain appropriate policies and procedures to administer it.

REVISION HISTORY

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Adopted: December 14, 2007

Amended: December 10, 2010, February 14, 2014, June 12, 2015

Supersedes: Educational Materials dated April 14, 1967, Patent and Technology Transfer dated October 10, 1986, Intellectual Property adopted October 8, 1999, Use of Royalty Income to Support Technology Commercialization adopted March 12, 2004, and Acquiring Controlling Equity Interests in Technology Licensees adopted December 8, 2006.



UNIVERSITY OF MINNESOTA

OTC staff use only
Case Number: 20160374

INTELLECTUAL PROPERTY DISCLOSURE FORM

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Time-Sensitive Material, Please Expedite

All documents submitted to the Office for Technology Commercialization (OTC) are treated as confidential, including technical and personal information submitted within this Intellectual Property Disclosure Form.

This form should be used for reporting:

Inventions that can be protected under patent laws, including: Compositions; Methods and processes; Machines, medical devices; Algorithms; Plants; and;

"Works of Authorship": that can be protected under copyright laws, including: Software, Applications ("Apps"); Testing materials; Analytical profiles; Designs; and Architectural plans.

The questions in this form are designed to assist you in the disclosure process. Please fill out every section as completely as possible as it pertains to the intellectual property you are disclosing.

If you require more space for your disclosure, attach additional disclosure materials as needed to this document or send as attachments in the e-mail message you send with this document.

You may also contact the Technology Strategy Manager for your unit to answer questions regarding intellectual property or the completion of this form.

Send the completed form and all attachments via e-mail to the Office for Technology Commercialization at umotc@umn.edu.

Start here:

1. Intellectual Property Title.

1.1 Intellectual Property Title – *Title must be short, simple and non-confidential.*
Lung Biopsy Tool

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2. Intellectual Property Description.

- 2.1 Summary of the intellectual property. – *Please attach any drawings, figures, graphs, supporting manuscripts, posters, abstracts, presentation slides, etc. that would assist OTC in understanding the intellectual property.*
A lung biopsy tool that incorporates a endobronchial ultrasensor (EBUS), LED illumination, a camera chip, and steering capabilities. See the attached document for a detailed description of the design.
- 2.2 What are the essential elements of this intellectual property that need to be protected? *Examples – new methods of use, medical device design, chemical structures, research tools, works of authorship, design schematics, software code, presentation materials etc.*
we are proposing a new medical device design
- 2.3 What existing problem(s) does this intellectual property solve?
This device is intended to enable peripheral lung biopsies without the expensive and overhead incurred with the current electromagnetic navigation bronchoscopy (ENB) systems.
- 2.4 How are these problems currently addressed by others? What makes this intellectual property different and better compared to the solutions or approaches used by others?
The proposed solution is unique in that it combines ultrasound, imaging, and steering in a single device.
- 2.5 What are the commercial or other applications of this intellectual property? What products or services could be based on this intellectual property?
This tool would be useful for smaller hospitals that do not have an ENB system.
- 2.6 What is the stage of development of this intellectual property? *Examples – working prototype, beta tested, scripted, in vitro/in vivo data, pre-clinical data, clinical data, etc.*
The development is at the concept stage.
- 2.7 What plans are being made for advancing this intellectual property? Is funding in place to do so? *If possible, explain what additional development steps would be required to make this intellectual property ready for commercialization.*
The next steps would be building a prototype and benchtop testing.

3. Funding Sources. Please list all sources of funding related to the conception and development of this intellectual property (include federal (e.g. NIH, NSF, USDA, VA, etc.) and non-federal (e.g. foundation, industry sponsored, gifts, etc.)). **It is important that this information is accurate and complete because sponsors may have certain rights in the intellectual property.**

Source	Agency Grant No.	UMN EFS No.

Form: OGC-SC412
Form Date: 05.22.02
Revision Date: 05.21.15

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4. Third Party Rights in the Intellectual Property. Are there any other agreements in place with a third party that may affect ownership of this intellectual property? – *Examples: Material Transfer Agreements (MTA), confidentiality agreements (CDA/NDA) private foundation grant, etc.?*

☐ Yes – Identify the third party.
Please attach a copy of each agreement(s)

☒ No

If software or digital content incorporates Open Source content OR has been released in an Open Source release, what license(s) was used?

- ☐ MIT License ☐ LGPL License ☐ Apache License
☐ BSD License ☐ GPL License ☐ Creative Commons License
☐ Other:

5. Public Disclosure or Public Use/Sale. List the titles and dates of all possible public disclosures of the intellectual property (past or future, internal or external) and attach copies of published or submitted versions. This request includes internal university disclosures as well. The public disclosure date is the date the material was or will be available to others.

IMPORTANT: Please inform OTC of any changes in public disclosure dates.

Papers (including manuscripts, letters, and abstracts):	Date:

Presentations and posters:	Date:

Thesis (presentations and published):	Date:

Web sites:	Date:

Other public disclosures:	Date:

Form: OGC-SC412
Form Date: 05.22.02
Revision Date: 05.21.15

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Public or commercial use/sale description:	Date:

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6. Contributors. Please list all individuals who contributed to the *conception* of the invention, including: students, post-doctorates, scientists and non-University of Minnesota personnel. "Inventorship" will ultimately be determined by an attorney in accordance with the laws applicable at the time of intellectual property protection. If there are more than eight contributors, please attach an additional sheet with the following information for each contributor.

The Primary Investigator should be the first contributor listed; this person will be the primary contact for additional information and for all correspondence. Your finance/accounting group can provide the appropriate Department ID number.

Full Legal Name: Michael Greminger
UMN Department Name: Medical Devices Center
UMN Department ID No.: 11914
UMN E-mail Address: mgreming@d.umn.edu
UMN Phone: 612-625-8252
UMN Employee Status (check): <input checked="" type="checkbox"/> Full time <input type="checkbox"/> Part time <input type="checkbox"/> Unpaid <input type="checkbox"/> Grad student <input type="checkbox"/> Undergrad student <input type="checkbox"/> Employed elsewhere Where?

Full Legal Name: Anastasia Zink
UMN Department Name: Medical Devices Center
UMN Department ID No.: 11914
UMN E-mail Address: azink@umn.edu
UMN Phone: 612-626-4406
UMN Employee Status (check): <input checked="" type="checkbox"/> Full time <input type="checkbox"/> Part time <input type="checkbox"/> Unpaid <input type="checkbox"/> Grad student <input type="checkbox"/> Undergrad student <input type="checkbox"/> Employed elsewhere Where?

Full Legal Name: Brian Krohn
UMN Department Name: Medical Devices Center
UMN Department ID No.: 11914
UMN E-mail Address: kroh0051@umn.edu
UMN Phone: 612-626-5068
UMN Employee Status (check): <input checked="" type="checkbox"/> Full time <input type="checkbox"/> Part time <input type="checkbox"/> Unpaid <input type="checkbox"/> Grad student <input type="checkbox"/> Undergrad student <input type="checkbox"/> Employed elsewhere Where?

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Full Legal Name: Amit Goyal
UMN Department Name: Medical Devices Center
UMN Department ID No.: 11914
UMN E-mail Address: goyal@umn.edu
UMN Phone: 612-626-6593
UMN Employee Status (check): <input checked="" type="checkbox"/> Full time <input type="checkbox"/> Part time <input type="checkbox"/> Unpaid <input type="checkbox"/> Grad student <input type="checkbox"/> Undergrad student <input type="checkbox"/> Employed elsewhere Where?

Full Legal Name: Roy Cho
UMN Department Name: Pulmonary and Critical Care Medicine
UMN Department ID No.:
UMN E-mail Address: choxx548@umn.edu
UMN Phone: 612-626-1146
UMN Employee Status (check): <input checked="" type="checkbox"/> Full time <input type="checkbox"/> Part time <input type="checkbox"/> Unpaid <input type="checkbox"/> Grad student <input type="checkbox"/> Undergrad student <input type="checkbox"/> Employed elsewhere Where?

Full Legal Name:
UMN Department Name:
UMN Department ID No.:
UMN E-mail Address:
UMN Phone:
UMN Employee Status (check): <input type="checkbox"/> Full time <input type="checkbox"/> Part time <input type="checkbox"/> Unpaid <input type="checkbox"/> Grad student <input type="checkbox"/> Undergrad student <input type="checkbox"/> Employed elsewhere Where?

Full Legal Name:
UMN Department Name:
UMN Department ID No.:
UMN E-mail Address:
UMN Phone:
UMN Employee Status (check): <input type="checkbox"/> Full time <input type="checkbox"/> Part time <input type="checkbox"/> Unpaid <input type="checkbox"/> Grad student <input type="checkbox"/> Undergrad student <input type="checkbox"/> Employed elsewhere Where?

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7. References/Literature. Please attach a list of any known background publications or published technical material such as patents, commercial literature, or scientific articles relating to this intellectual property. If any of these references are not readily available, please include copies with your disclosure.

See the attached description for related references.

8. Industry or Other Contacts for Commercialization (Optional). Please provide the names and contact information for any contact(s) with whom an OTC representative could discuss the commercial possibilities for this intellectual property.

.

9. Additional Information or Comments (Optional).

Lung Biopsy Tool Description

Need

A way to biopsy peripheral lung nodules with reduced risk of pneumothorax and without the need for the expensive capital equipment required for electromagnetic navigation bronchoscopy

Market Statement

Lung cancer is the leading cause of cancer deaths worldwide. There were 180k CMS admissions for bronchial/lung cancer in 2010. In 2013, CMS paid for 46k bronchoscopic lung biopsy procedures. Of these 46k procedures, 3.4k procedures were performed using electromagnetic navigation bronchoscopy (ENB) and 15.3k procedures were performed using endobronchial ultrasound (EBUS). In that same year, 40k transthoracic needle biopsies were paid for by CMS. The risk of pneumothorax for transthoracic needle biopsies is between 9 and 54%, depending on the study¹.

Voice of the Customer

The physician co-inventor of this device indicated that there are times with the SuperDimension system when it would be useful to have a camera on the tip of the probe since the navigation feedback is occasionally incorrect which makes it difficult to advance the probe. He also indicated that EBUS is useful for insuring that the biopsy needle is located adjacent to the tumor being biopsied.

Reimbursement

Covidien publishes a guide for coding ENB procedures that lists the relevant CPT codes for lung biopsy, ENB, and EBUS procedures and their reimbursement rate. This guide can be found here: [2013 Physician Coding for ENB Procedure](#). Additional relevant CPT codes that are not in that document are 32405 for percutaneous needle biopsy and the 77012 modifier code to indicate CT guidance for the percutaneous needle biopsy.

¹ Boskovic, Tatjana, Jelena Stanic, Slobodanka Pena-Karan, Paul Zarogoulidis, Kostas Drevelegas, Nikolaos Katsikogiannis, Nikolaos Machairiotis, et al. "Pneumothorax after Transthoracic Needle Biopsy of Lung Lesions under CT Guidance." *Journal of Thoracic Disease* 6, no. Suppl 1 (March 2014): S99–107. doi:10.3978/j.issn.2072-1439.2013.12.08.

Regulation

Both the SuperDimension and the Veran Medical ENB systems were cleared through the FDA using a 510(k) application. Existing EBUS and biopsy needle devices have been cleared by a 510(k) application so it is believed that the device presented here could can regulatory approval through a similar means.

Competitors/Existing Solutions/IP

Currently a bronchoscope can be used to biopsy tumors that are in the larger bronchial tubes of the lung. Due to the 5.3 mm diameter of a bronchoscope, it cannot reach the periphery of the lung where the bronchial tubes get smaller than 5.3 mm. A standard bronchoscope has a 2 mm tool port where smaller tools can be deployed. One of these tools is an endobronchial ultrasound (EBUS) probe that can be used to verify the location of a tumor. If the bronchial tube where EBUS probe passes through a tumor, the edges of the tumor will be seen in the EBUS image. The Fig. 1 below shows an EBUS probe extending past the end of a bronchoscope on the left and an ultrasound image of a tumor captured using an EBUS probe on the right.

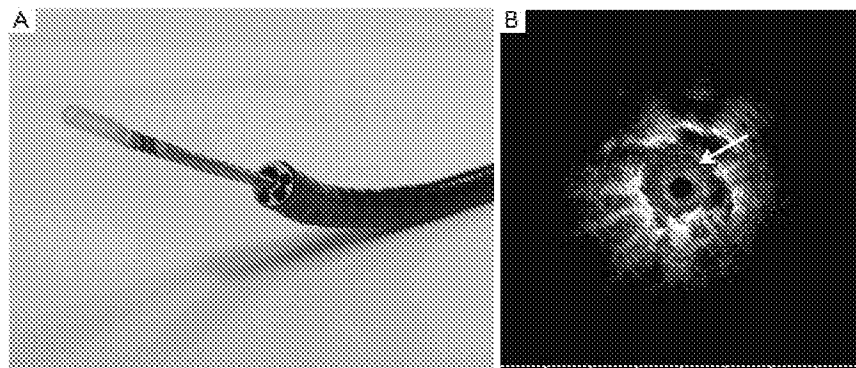


Figure 1: EBUS probe on the left and an EBUS probe image of a tumor on the right.

Electromagnetic navigation bronchoscopy (ENB) also tracking of tools within the body using radio waves. Antennas are placed on the patient's body, which receive a signal emitted from the tools inserted into the body. The position of the tool is superimposed onto a CT image of the patient to provide feedback to the physician on the location of the tool. There are two ENB systems currently on the market. The SuperDimension system has been on the market the longest (received FDA clearance in 2004). The SuperDimension system costs \$193k. The competitor to SuperDimension is The Veran Medical EndoBronchial guidance system which gained FDA clearance in 2009. The SuperDimension system has a steerable guide catheter with position sensor that is smaller in diameter a bronchoscope. Once the guide catheter is placed, a tool can be deployed through the guide catheter. The Veran Medical system adds some additional features. They supply a suite of tools that all include the position sensing

element at their tip. They enable the switching from a endobronchial approach to a transcutaneous approach in a single setup.

The combination of a biopsy needle with a biopsy needle has been cited in the patent literature (see Fig. 2)².

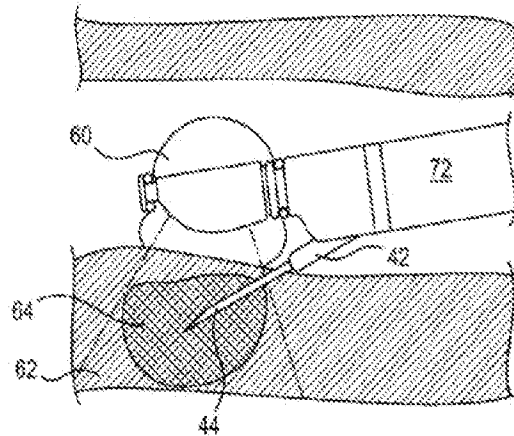


Figure 2: Ultrasound probe with integrated biopsy needle.

Proposed Solution

Figs. 3 and 4 show the proposed solution. Fig. 3 shows the biopsy device without the biopsy needles and Fig. 4 shows the same device with the biopsy needles deployed. The device is designed to be less than 2 mm in diameter so that it can be deployed through the tool port of a standard bronchoscope. The unique aspect of the proposed device is the integrated camera chip and LED illumination. The Naneye camera from Awaiba has been identified as the camera chip for this application³. That Naneye camera costs \$60 in small volumes. This camera is a 1x1 mm square camera that will fit the proposed device. Since there is not sufficient room to place both the camera and LED diode at the tip of the device, as is done with traditional bronchoscopes, the LEC and camera chip are positioned coaxially. Optical light guides, not shown, would be used to guide the light around the periphery of the camera chip.

² Wang, Ko-Pen. Double lumen or double wire endobronchial ultrasound-guided histology needle (EBUS). US9295454 B2, filed September 21, 2012, and issued March 29, 2016. <http://www.google.com/patents/US9295454>.

³ "NanEye Family Overview | AWAIBA CMOS Image Sensors." Accessed May 4, 2016. <http://www.awaiba.com/product/naneye-family-overview/>.

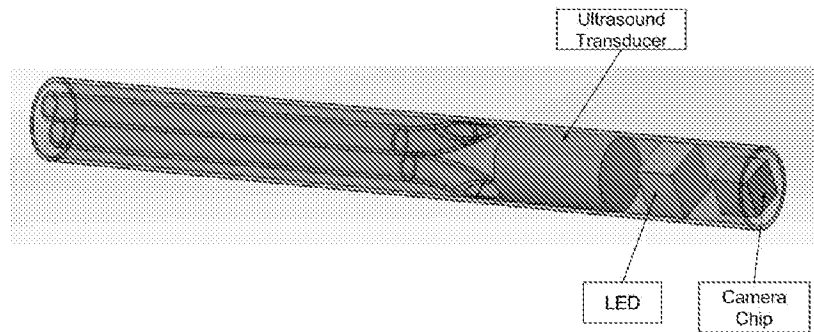


Figure 3: Proposed biopsy tool design.

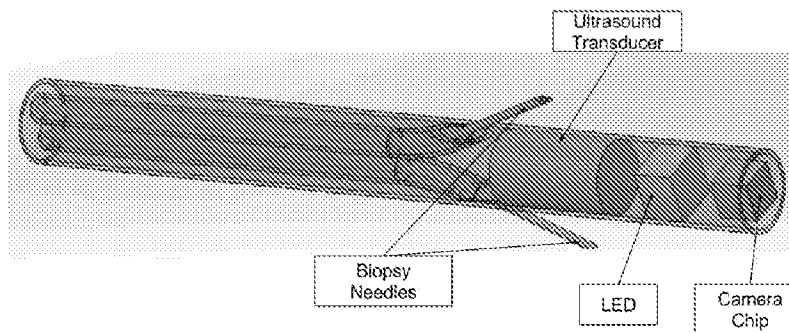


Figure 4: Proposed biopsy tool design with biopsy needles deployed.

The proposed device would also be steerable using either one or two angulation wires (not shown) similar to how traditional bronchoscopes are angulated.

This device would most likely need to be sterilizable to be economically viable. This would likely be sterilized in the same manner as current bronchoscopes using a chemical sterilization method.

The proposed device, with its integrated camera, illumination, and steering, will be capable of reaching tumors in the periphery of the lung that are only currently reachable through the expensive SuperDimension or Veran Medical ENB systems. This device would be ideal for medical centers that do not currently have these ENB systems.

UNIVERSITY OF MINNESOTA

*Twin Cities Campus**Innovation Fellows Program**Medical Devices Center
College of Science & Engineering**G-217 Mayo Memorial Building
420 Delaware St. SE
Minneapolis, MN 55455**Phone: 612-626-3441**Fax: 612-625-8741**Email: ifpinfo@umn.edu**Website: www.mdc.umn.edu/fellows.html*

Anastasia Zink
26 W 22nd Street, Apt. 207
Minneapolis, MN 55455

May 7, 2015

Dear Anastasia,

It is with pleasure that I write to formally offer you a Medical Devices Center Innovation Fellow position. The Medical Devices Center is a unit within the College of Science and Engineering and the Institute of Medicine. For logistical reasons, your appointment will be managed by the Medical Devices Center. You will report to the Director of the Innovation Fellows Program.

Your position is classified as a Senior Fellow, class #9751, which is a Professional Academic classification. Additional terms and conditions of this appointment are detailed in the Contracts and Governing Documents for Professional and Academic Employees (P&A), specifically under the section "Appointment of Academic Professional and Administrative Employees," which is available at the following website: <http://www1.umn.edu/ohr/index.html>.

This is a temporary, 100% time position. The mutually agreed upon start date for this appointment is August 19, 2015. This appointment shall end no later than June 17, 2016 contingent upon the availability of funds and/or work for the position. You will receive an annualized salary of \$40,000 for this position (10 month salary will be \$33,333.33). In addition to your base salary, you are entitled to fringe benefits that cover medical, dental and life insurance. You are also eligible to participate in optional programs through the University of Minnesota's Employee Benefits Department at <http://www1.umn.edu/ohr/benefits/index.html>, 612-624-8647. This offer is contingent upon your ability to provide authorization to work in the United States and the University of Minnesota prior to the start date. This offer is contingent upon the successful completion of a background check. You will receive an email from the University's background check vendor, General Information Services, Inc. (GIS) that will include the link to enter your personal information and authorization for the check. Please enter your information as soon as possible upon receipt of the eLink from GIS.

The Innovation Fellowship is a full-time, multi-disciplinary immersion Program. During your Fellowship, you will work closely with researchers and students at the University of Minnesota College of Science and Engineering and clinicians at the University of Minnesota Academic Health Center. You will work either individually or collectively on a variety of research projects in several different clinical areas. These projects may be generated internally at the Medical Devices Center, in an interdisciplinary mode at the University of Minnesota, as well as in partnership with established medical device corporations. On these projects, you will identify clinical needs, invent business-worthy concepts, and build & test prototype solutions that may lead to patentable disclosures. Your performance will be evaluated every 8-12 weeks during the Fellowship.

Please sign below to indicate that you have read and understood the provisions of your employment as explained above and return the signed letter to Holly Edgett, Fellows Program Administrator G-217 Mayo 420 Delaware St. SE Minneapolis, MN 55455, as soon as possible and no later than the end of the day on May 17, 2015. This letter will be placed in your employee file.

We look forward to seeing you in August. Please feel free to contact Samantha DeGroot at ifpinfo@umn.edu (612) 625-8172, if you need administrative assistance prior to your arrival.

Sincerely,

Arthur G. Erdman
Richard C. Jordan Professor
Morse Alumni Distinguished Teaching Professor
University of Minnesota
Director of the Medical Devices Center

Accepted: _____ Date: _____

Employee Name: Zoh, Annette
Employee ID: 3177931
Original Hire Date: 01/23/2009
University Start Date: 01/23/2009

Report Run
Data As Of:

Employee Record Number	Effective Date	Sequence Number	Position Number	Workforce Action	Workforce Action Reason	Employee Status	ADP/ATO	Depth	Job Code	Program	Compensation Frequency	Empl Class	Amount Rate	Employee Type	Standard Hours	Compensation on Date	Last Date Worked	Reg Temp	FLSA Status	Full Part Time	EP/SD
0	05/29/2015	0	286385	TER	End of Appointment	Terminated	20007	11026	9538	P08	H	Graduate Assistant	\$19,500.00 E		20.00	\$25.00	05/24/2015	N	P	P	1-66E39
0	06/06/2015	0	286385	OTA	Conversion	Active	20007	11026	9538	P08	H	Graduate Assistant	\$19,500.00 E		20.00	\$25.00		N	P	P	SOE020K
1	08/31/2015	1	274670	TER	End of Appointment	Terminated	20007	11026	9572	P14	H	Graduate Assistant	\$26,000.00 E		22.00	\$22.73	08/30/2015	T	P	P	PT0255
1	08/31/2015	0	274670	SUS	Appointment End	Suspended	20007	11026	9572	P14	H	Graduate Assistant	\$26,000.00 E		22.00	\$22.73	08/30/2015	T	N	P	SOE020N
1	08/19/2015	0	274670	OTA	Appointment Primary Job Change	Active	20007	11026	9572	P14	H	Graduate Assistant	\$26,000.00 E		22.00	\$22.73		T	P	P	SOE020N
1	05/29/2015	0	274670	HJR	Appointment	Active	20007	11026	9572	P14	H	Graduate Assistant	\$26,000.00 E		22.00	\$22.73		T	P	P	SOE020N
2	05/04/2017	0	286183	TER	End of Appointment	Terminated	20438	11934	974205	P12	S	Academic Professor	\$40,600.76 S		32.00	\$1,561.76	04/30/2017	N	P	P	STET04
2	06/30/2017	0	286183	REL	Appointment	Active	20438	11934	974205	P12	S	Academic Professor	\$40,600.76 S		32.00	\$1,561.76		N	P	P	WOLF4001
2	07/01/2017	0	286183	P14	Leave with Pay	Active with Pay	20438	11934	974205	P12	S	Academic Professor	\$40,600.76 S		32.00	\$1,561.76	01/31/2017	N	P	P	CARL2609
2	12/12/2016	1	286183	POS	Standard Hours Change	Active	20438	11934	974205	P12	S	Academic Professor	\$40,600.76 S		32.00	\$1,561.76		N	P	P	PT0255
2	12/12/2016	0	286183	OTA	Standard Hours Change	Active	20438	11934	974205	P12	S	Academic Professor	\$40,757.20 S		40.00	\$1,562.20		N	P	P	CARL2609
2	09/30/2016	0	286183	OTA		Active	20438	11934	974205	P12	S	Academic Professor	\$40,757.20 S		40.00	\$1,562.20		N	P	P	1-66E39
2	06/07/2016	0	286183	PAT	In-range	Active	20438	11934	974205	P12	S	Academic Professor	\$40,757.20 S		40.00	\$1,562.20		N	P	P	1-66E39
2	06/18/2016	1	286183	PAT	North	Active	20438	11934	974205	P12	S	Academic Professor	\$40,600.00 S		40.00	\$1,558.31		N	P	P	1-66E39
2	06/18/2016	0	286183	OTA	Position	Active	20438	11934	974205	P12	S	Academic Professor	\$40,000.00 S		40.00	\$1,538.46		N	P	P	1-66E39
2	12/13/2015	0	286184	POS	Position Data Update	Active	20438	11934	974205	P12	S	Academic Professor	\$40,000.00 S		40.00	\$1,538.46		N	P	P	JARENS
2	09/07/2015	0	286184	POS	Position Data Update	Active	20438	11934	974205	P12	S	Academic Professor	\$40,000.00 S		40.00	\$1,538.46		N	P	P	SLR00C
2	08/31/2015	0	286184	OTA	Primary Job Change	Active	20438	11934	9753	P12	S	Academic Professor	\$40,000.00 S		40.00	\$1,538.46		N	P	P	ERN
2	08/18/2015	0	286184	HJR	Additional Job Change	Active	20438	11934	9753	P12	S	Academic Professor	\$40,000.00 S		40.00	\$1,538.46		N	P	P	STET04
3	09/06/2017	0	299377	TER	End of Appointment	Terminated	20437	13025	974205	P14	S	Academic Professor	\$40,601.00 H		32.00	\$1,561.65	09/05/2017	N	P	P	JOH12783
3	09/04/2017	1	299377	LTD	Leave with Pay	Leave with Pay	20437	13025	974205	P14	S	Academic Professor	\$40,600.76 H		32.00	\$1,561.76		N	P	P	JOH12783
3	08/01/2017	5	299377	HJR	Leave	Active	20437	13025	974205	P14	S	Academic Professor	\$40,600.76 H		32.00	\$1,561.76		N	P	P	LOUGHER



UNIVERSITY OF MINNESOTA

ASSIGNMENT

WHEREAS, I, Amit Goyal, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Provisional application no. 62/358,285 on July 5, 2016, Provisional application no. 62/528,652 on July 5, 2017 and Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.


I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.


I have hereunto set my hand on September 1, 2020 | 12:15 PM CDT.

DocuSigned by:

94719BB456B7433...

Amit Goyal

I have hereunto set my hand on September 1, 2020 | 1:27 PM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:

0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866



UNIVERSITY OF MINNESOTA
ASSIGNMENT

WHEREAS, I, Felix Zamora, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

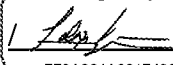
I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.


I have hereunto set my hand on October 8, 2020 | 3:35 PM PDT.

DocuSigned by:

F78A304A6817438...

Felix Zamora

I have hereunto set my hand on October 17, 2020 | 9:46 AM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:

0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866



UNIVERSITY OF MINNESOTA
ASSIGNMENT

WHEREAS, I, H. Erhan Dincer, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.

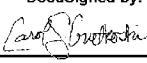
I have hereunto set my hand on October 12, 2020 | 10:44 AM CDT.

DocuSigned by:
/H. Erhan Dincer /
4BA8CA26E73B4D2...

H. Erhan Dincer

I have hereunto set my hand on October 17, 2020 | 9:46 AM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:

0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866



UNIVERSITY OF MINNESOTA

ASSIGNMENT

WHEREAS, I, Sarah Ostlie, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.


I have hereunto set my hand on October 16, 2020 | 4:38 PM PDT.

DocuSigned by:
/Sarah Ostlie /
31A62D7BE8F243F...

Sarah Ostlie

I have hereunto set my hand on October 17, 2020 | 9:46 AM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:
/  /
0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374



UNIVERSITY OF MINNESOTA

ASSIGNMENT

WHEREAS, I, Brian Krohn, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Provisional application no. 62/358,285 on July 5, 2016, Provisional application no. 62/528,652 on July 5, 2017 and Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.


I have hereunto set my hand on October 13, 2020 | 8:50 AM PDT.

DocuSigned by:
/ *Brian Krohn* /
A6BC4808CB9E40E...

Brian Krohn

I have hereunto set my hand on October 17, 2020 | 9:46 AM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:

0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866



UNIVERSITY OF MINNESOTA

ASSIGNMENT

WHEREAS, I, Gills Fai, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.


I have hereunto set my hand on October 16, 2020 | 10:45 AM CDT.

DocuSigned by:
/ Gills Fai /
CCB80DB125304FB...

Gills Fai

I have hereunto set my hand on October 17, 2020 | 9:46 AM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:
/  /
0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866



UNIVERSITY OF MINNESOTA

ASSIGNMENT

WHEREAS, I, Michael Greminger, have invented certain new and useful improvements in LUNG BIOPSY DEVICES, SYSTEMS AND METHODS FOR LOCATING AND BIOPSYING AN OBJECT, for which applications for Letters Patents of the United States have been made, said applications being filed as follows: Provisional application no. 62/358,285 on July 5, 2016, Provisional application no. 62/528,652 on July 5, 2017 and Utility application no. 16/026,410 on July 3, 2018 (the "Application(s)");

WHEREAS, REGENTS OF THE UNIVERSITY OF MINNESOTA ("Assignee"), having offices at 600 McNamara Alumni Center, 200 Oak Street SE, Minneapolis, Minnesota 55455-2020, is desirous of documenting the acquisition of the entire right, title and interest in and to said invention, said Application(s) and in, to and under any and all Letters Patent to be obtained therefor;

WHEREAS, I hereby acknowledge an obligation of assignment of the inventions disclosed in the Application(s) to Assignee at the time the invention(s) was made;

NOW, THEREFORE, to all whom it may concern, be it known that for good and valuable consideration, the receipt and sufficiency whereof is hereby acknowledged, and to the extent that I have not done so already via a prior agreement with the Assignee, or if I have already done so via a prior agreement with the Assignee then in confirmation of said prior agreement, I have sold, assigned, transferred and set over and by these presents do sell, assign, transfer and set over unto Assignee, its successors and assigns, the entire right, title and interest in and to the inventions set forth hereinabove and the entire right, title and interest in and to any and all Letters Patent of the United States and any foreign countries which may be granted therefor on the Application(s) including rights of priority under the Paris Convention for the Protection of Industrial Property and the European Patent Convention, and in and to any and all extensions, divisions, continuations, continuations-in-part or reissues of said Application(s) and Letters Patent that may be granted, including all rights to claim priority therefrom, and specifically including the right to enforce such Letters Patent in the name of Assignee and to recover damages for past infringement of the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and use and benefit of its successors and assigns to the full end of the term for which said Letters Patent may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

I hereby authorize said Assignee, its successors and assigns, or anyone it may properly designate, to apply for Letters Patent, in its own name if desired, in any and all foreign countries, and additionally to claim the filing date of any the Application(s) and/or otherwise take advantage of all rights of priority created by said Application(s) under any treaty relating thereto (including the right to claim priority to said patent application, e.g., under the provisions of the Paris Convention for the Protection of Industrial Property and the European Patent Convention).

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374

Upon said consideration I do hereby covenant and agree with said Assignee, its successors and assigns, that I will not execute in writing or do any act whatsoever conflicting with these presents, and that I or my executors or administrators will at any time upon request, without further or additional consideration, but at the expense of said Assignee, its successors and assigns, execute such additional writings and do such additional acts as said Assignee, its successors and assigns, may deem necessary or desirable to perfect the Assignee's enjoyment of this grant, and render all necessary assistance in making application for and obtaining original, divisional, reissues or extended Letters Patent of the United States, or of any and all foreign countries on said invention, and in enforcing any rights occurring as a result of such application or patents, by giving testimony in any proceedings or transactions involving such applications or patents.

I hereby request the Honorable Commissioner of Patents and Trademarks to issue the Letters Patent to Assignee in accordance with this instrument.

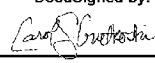
I have hereunto set my hand on October 8, 2020 | 6:53 PM CDT.

DocuSigned by:
/ Michael Greninger /
93A290E0DF49483...

Michael Greninger

I have hereunto set my hand on October 17, 2020 | 9:46 AM CDT, on behalf of
Assignee Regents of the University of Minnesota accepting this assignment.

REGENTS OF THE UNIVERSITY OF MINNESOTA

DocuSigned by:

0FB835187311411...

Carol Grutkoski
Chief of Staff and Operations Manager
per Presidential Delegation ID_257866

Attorney Docket No. 1008.47US01P1
UM Case No. 20160374