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1061637

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April 05, 2020

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APPLICATION NUMBER: 62/906,434

FILING DATE: *September 26, 2019*

RELATED PCT APPLICATION NUMBER: *PCT/US20/24705*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US62/906,434*



Certified by

Anders Iversen

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

Electronic Acknowledgement Receipt

EFS ID:	37288669
Application Number:	62906434
International Application Number:	
Confirmation Number:	1097
Title of Invention:	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE
First Named Inventor/Applicant Name:	Somnath RAY
Customer Number:	61650
Filer:	Daniel Jacob Gross/Michaelanne Stelling
Filer Authorized By:	Daniel Jacob Gross
Attorney Docket Number:	CLIP 9421P
Receipt Date:	26-SEP-2019
Filing Date:	
Time Stamp:	16:28:50
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
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RAM confirmation Number	E20199PG29579085
Deposit Account	503894
Authorized User	Michaelanne Stelling
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)
37 CFR 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	Application Data Sheet	clip_9421p_20190926_ads.pdf	1822219	no	8
			c96931756198231e47d34475c80d49b70a5427c5		
Warnings:					
Information:					
2	Drawings-only black and white line drawings	clip_9421p_20190926_dwgs_final.pdf	3437645	no	8
			96d0d179f894c582365a4b2c06ed3b159f11014		
Warnings:					
Information:					
3		clip_9421p_20190926_spec.pdf	135163	yes	23
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	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Abstract		23	23	
	Claims		19	22	
	Specification		1	18	
Warnings:					
Information:					
4	Certification of Micro Entity (Gross Income Basis)	clip_9421p_20190926_micro_entity.pdf	120545	no	2
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Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	29938	no	2
			b42bb67129f269232ac273d5ea01c4b4d8557c15		

Warnings:	
Information:	
Total Files Size (in bytes):	5545510
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CLIP 9421P
		Application Number	
Title of Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

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

Inventor	1				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Somnath		RAY			
Residence Information (Select One) • US Residency Non US Residency Active US Military Service						
City	Brooklyn	State/Province	NY	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	c/o CLIP.BIKE Inc.					
Address 2	19 Morris Avenue, Building 128					
City	Brooklyn	State/Province	NY			
Postal Code	11205	Country	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.						
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Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	61650		
Email Address	patent@myerswolfin.com	Add Email	Remove Email

Application Information:

Title of the Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE		
Attorney Docket Number	CLIP 9421P	Small Entity Status Claimed	☒
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	Suggested Figure for Publication (if any)	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CLIP 9421P
	Application Number	
Title of Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE	

Filing By Reference:

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

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

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

Publication Information:

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

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

Representative Information:

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

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	61650		

Domestic Benefit/National Stage Information:

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

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CLIP 9421P
		Application Number	
Title of Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE		

Foreign Priority Information:

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

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)	Remove

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

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

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CLIP 9421P
		Application Number	
Title of Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE		

Authorization or Opt-Out of Authorization to Permit Access:

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

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

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

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

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

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

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

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

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

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

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

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CLIP 9421P
	Application Number	
Title of Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE	

Applicant Information:

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

Applicant	1	Remove
------------------	----------	------------------------

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

[Clear](#)

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

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	CLIP.BIKE Inc.		
-------------------	----------------	--	--

Mailing Address Information For Applicant:

Address 1	19 Morris Avenue		
Address 2	Building 128		
City	Brooklyn	State/Province	NY
Country	US	Postal Code	11205
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. [Add](#)

Assignee Information including Non-Applicant Assignee Information:

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

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	CLIP 9421P
	Application Number	
Title of Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE	

Assignee	1
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Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

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

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				

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Signature:

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

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

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

Signature	/Daniel J. Gross/		Date (YYYY-MM-DD)	2019-09-26
First Name	Daniel	Last Name	Gross	Registration Number
				66449

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

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	CLIP 9421P
		Application Number	
Title of Invention	SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE		

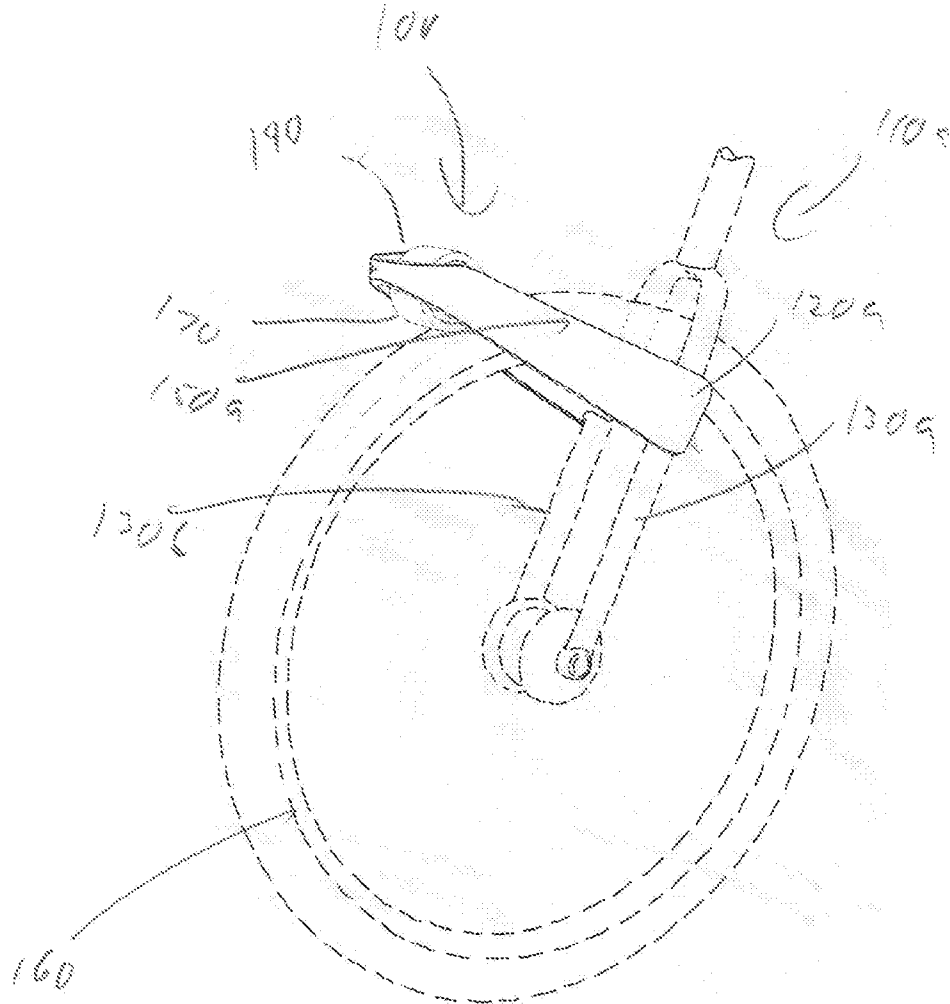
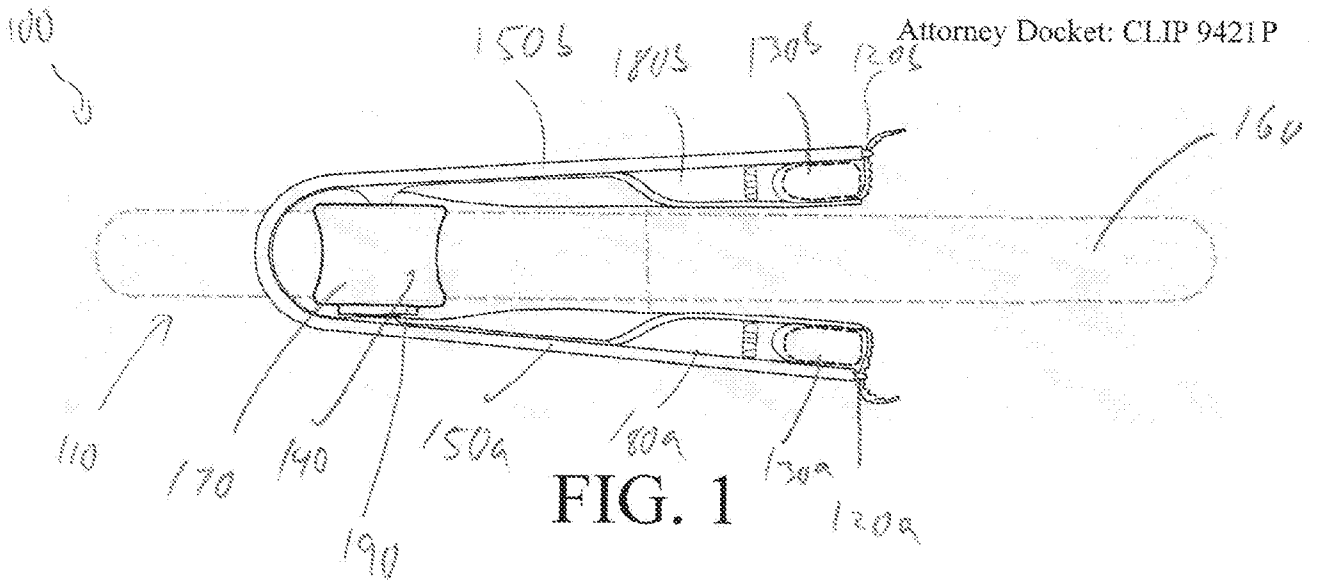
This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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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.



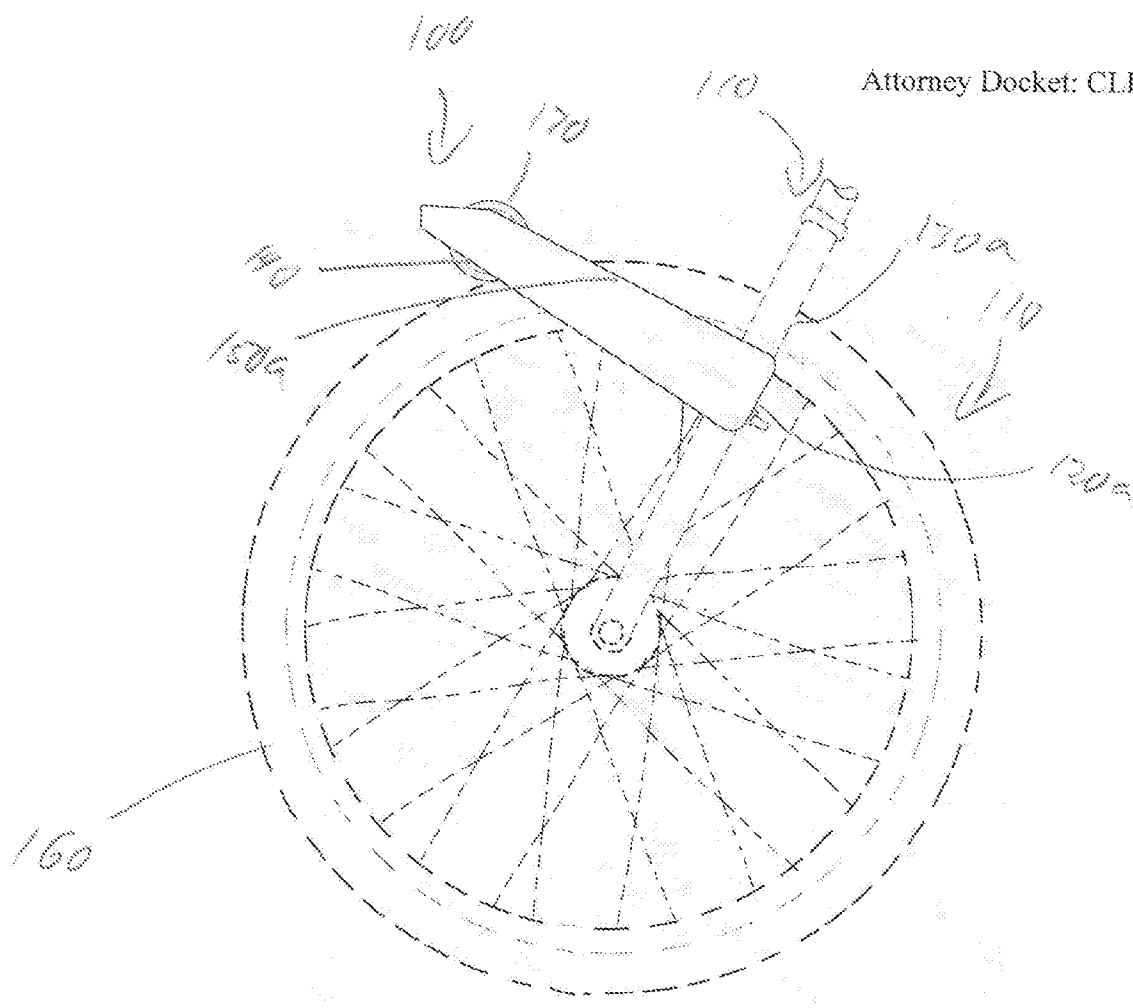
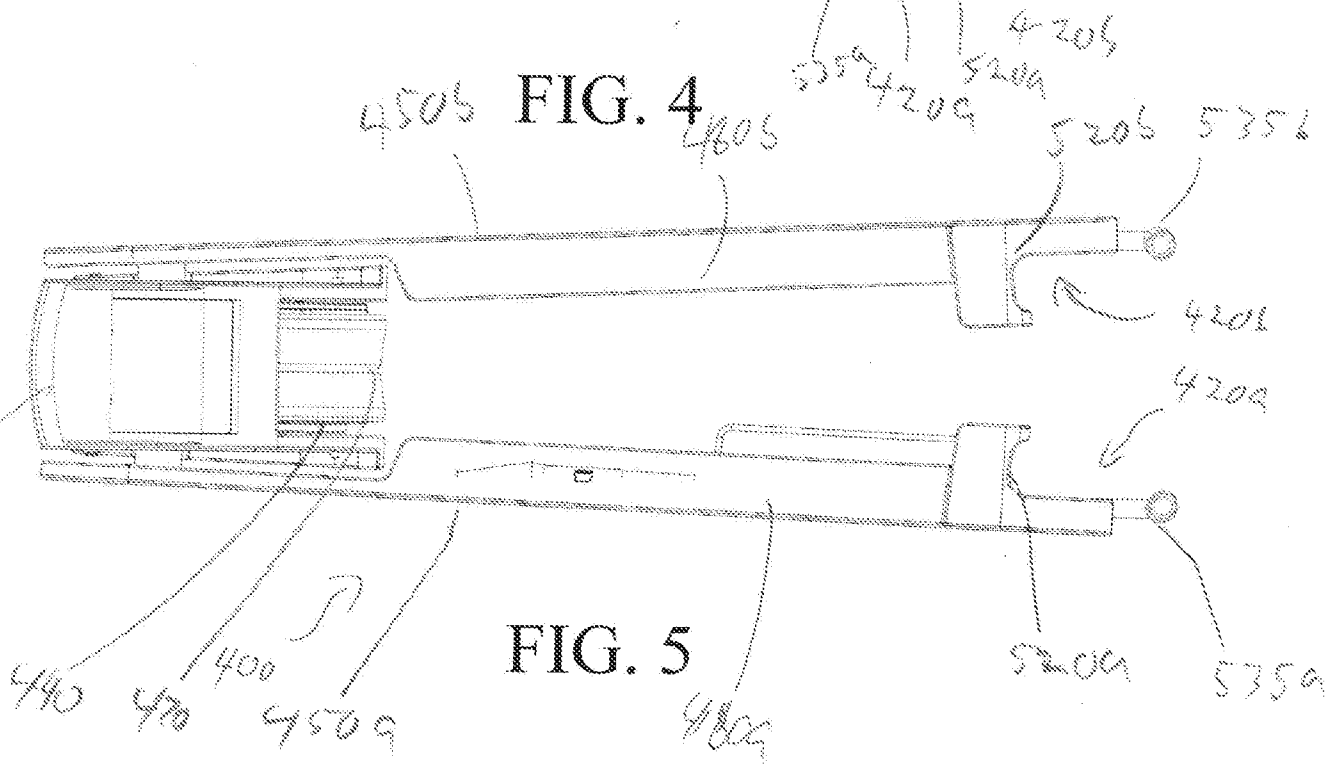
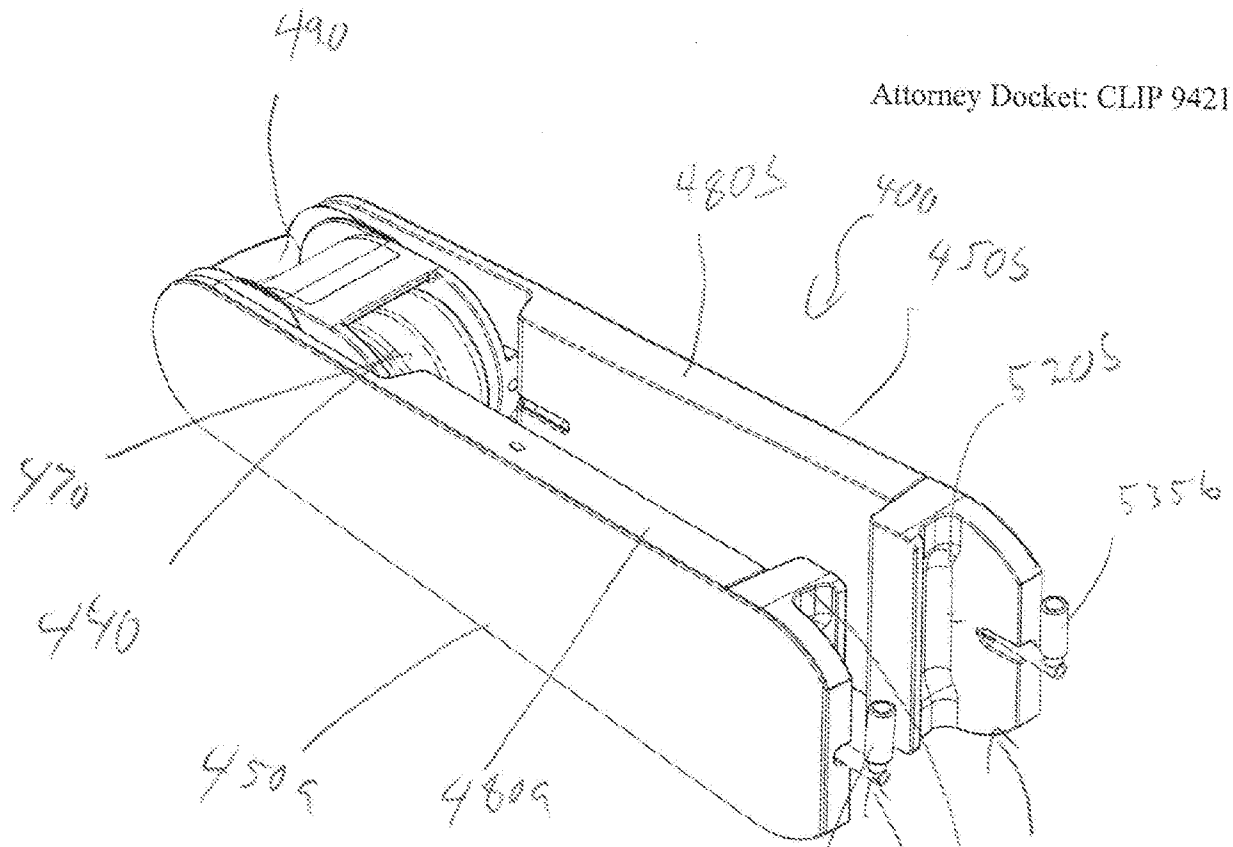
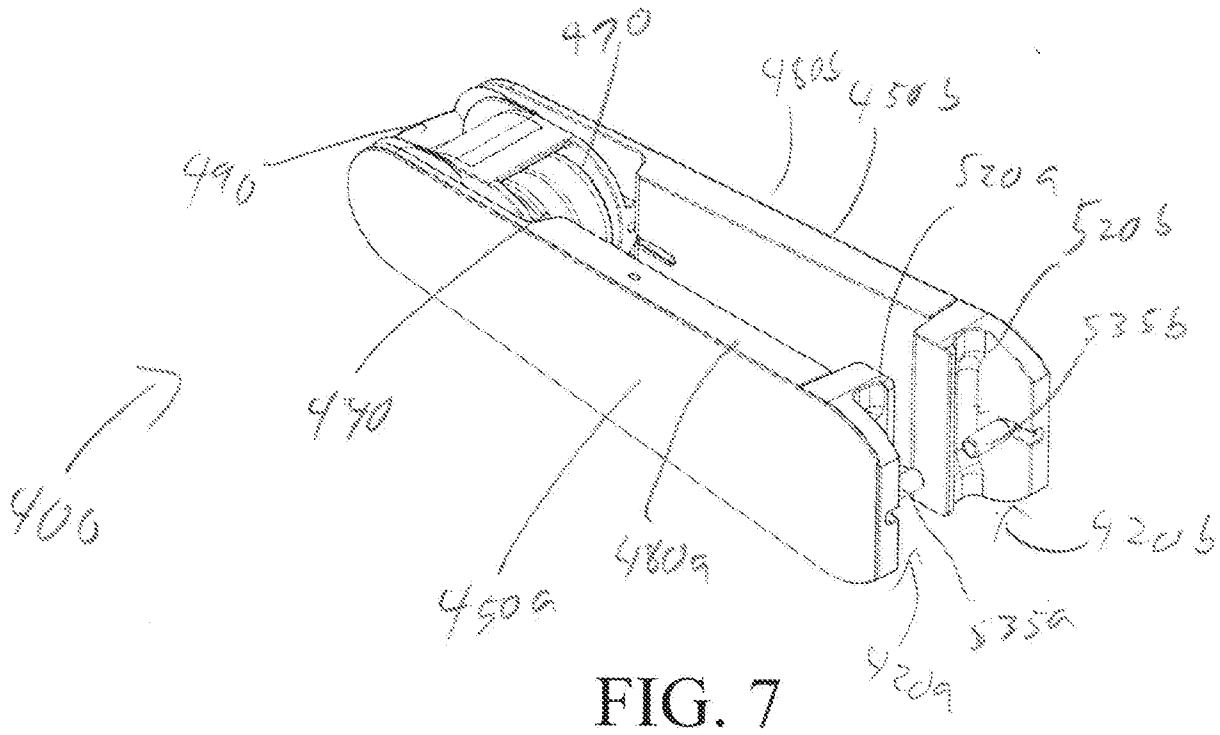
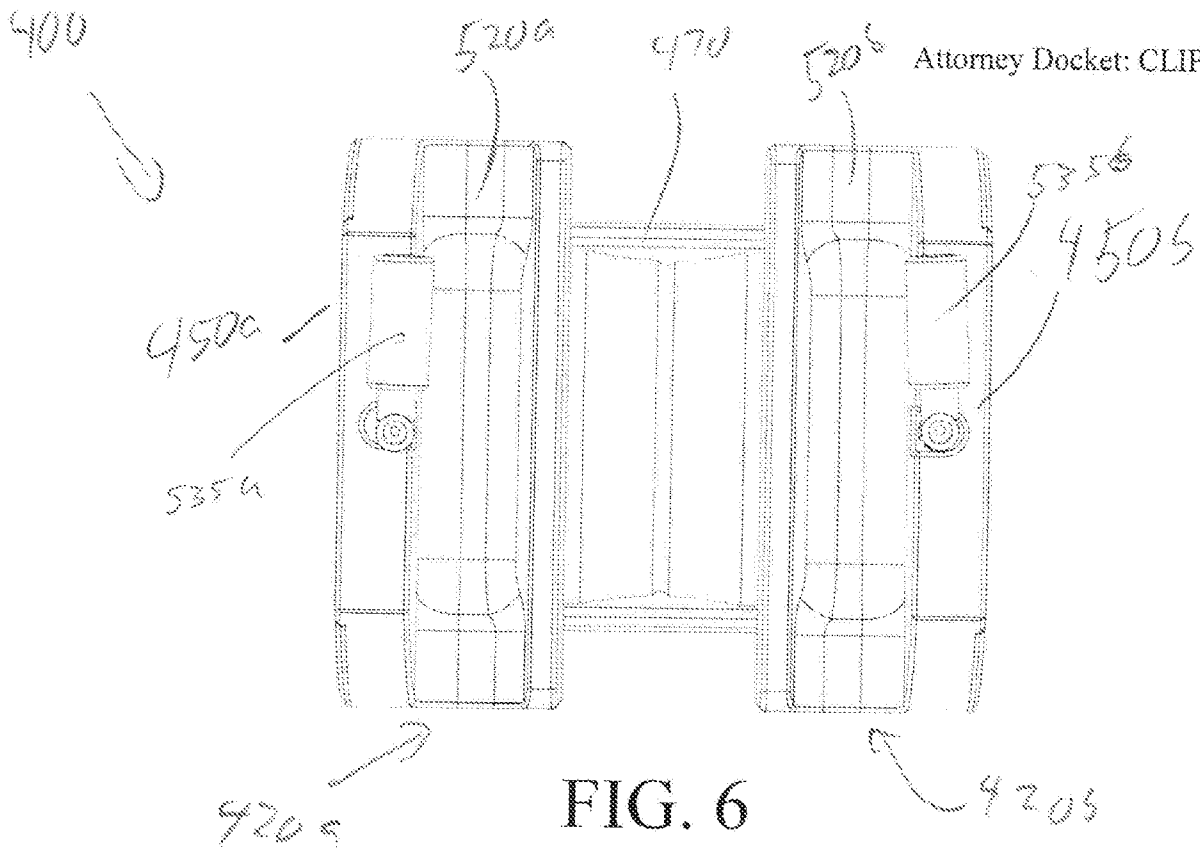


FIG. 3





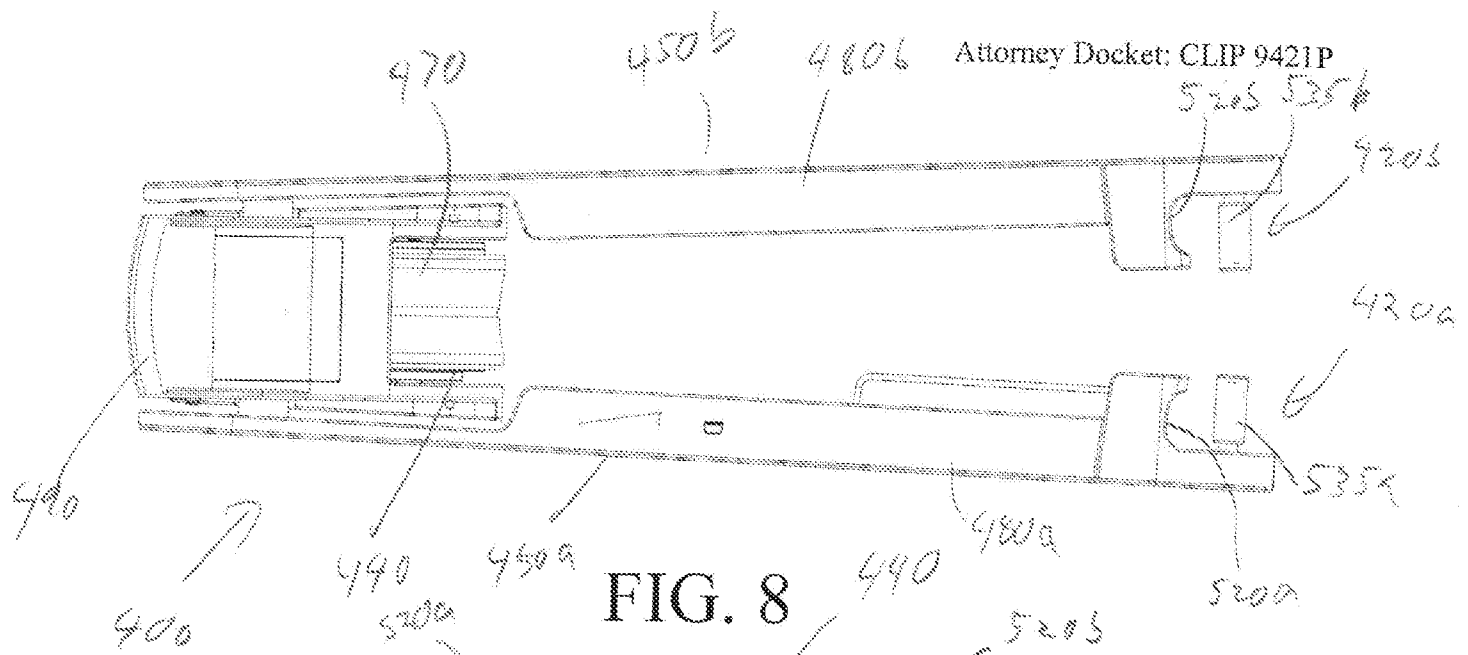


FIG. 8

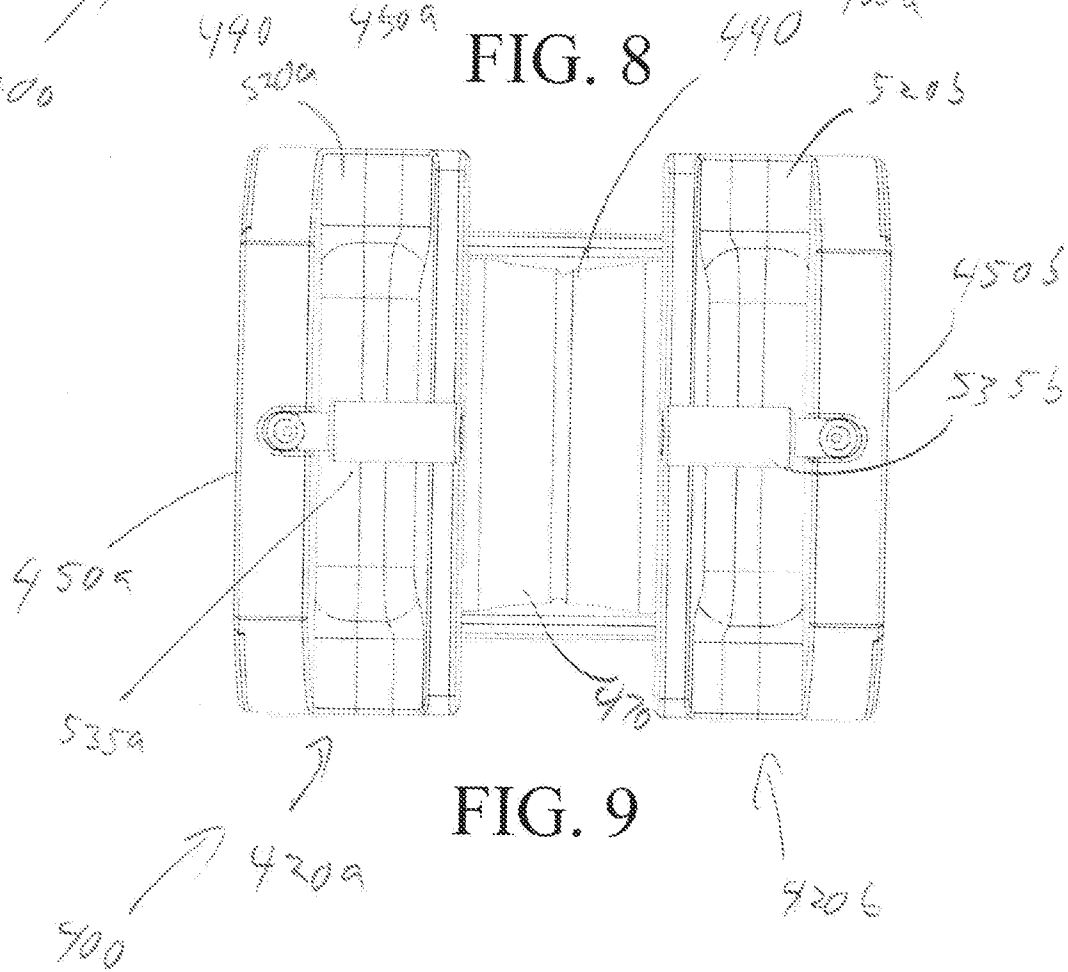
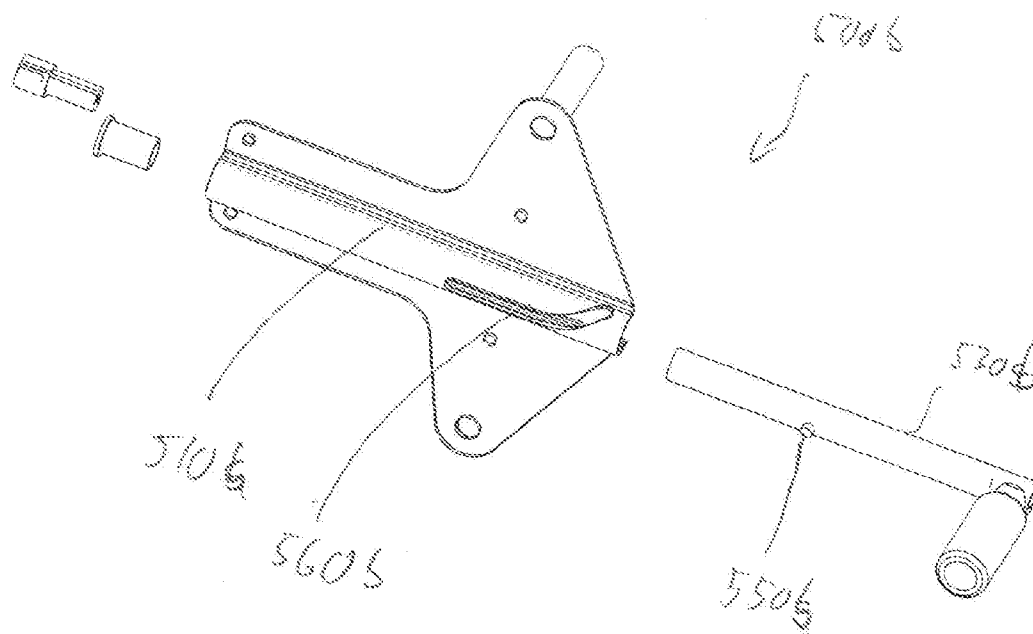
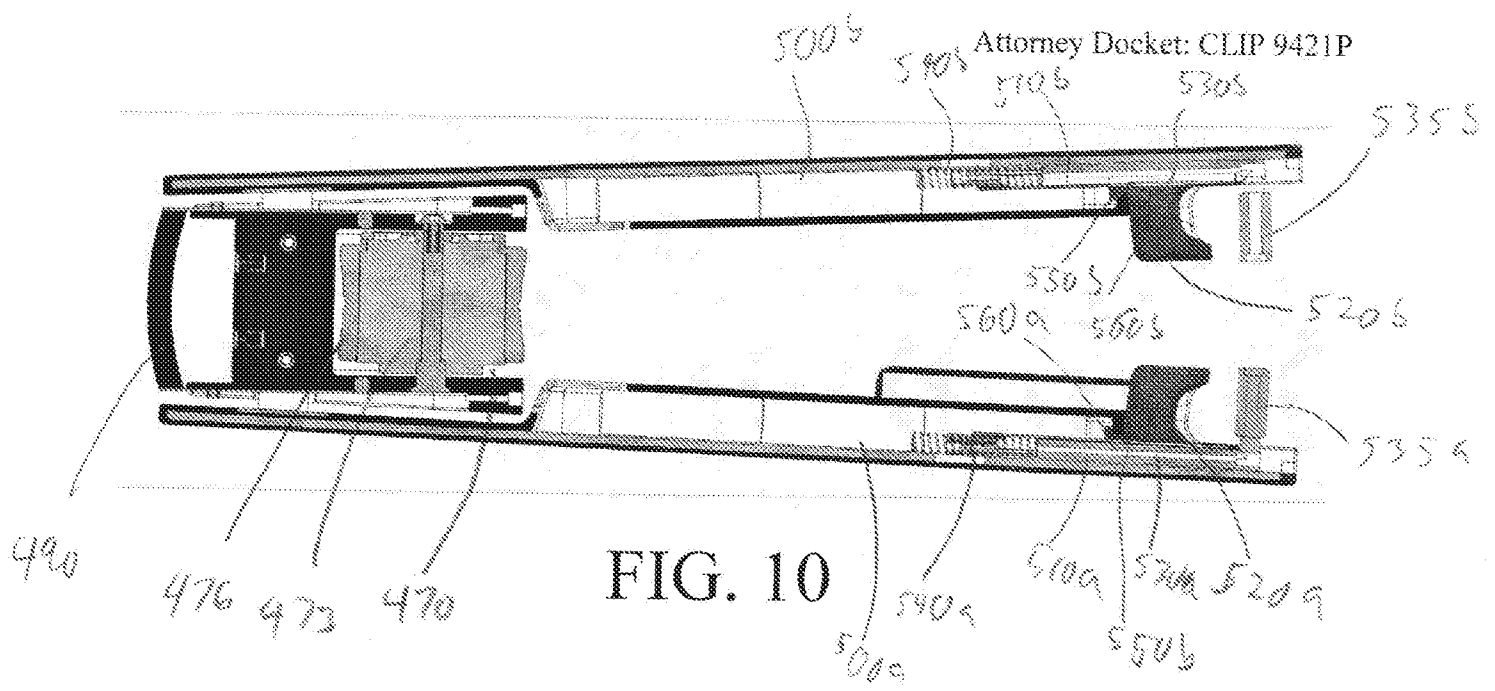


FIG. 9



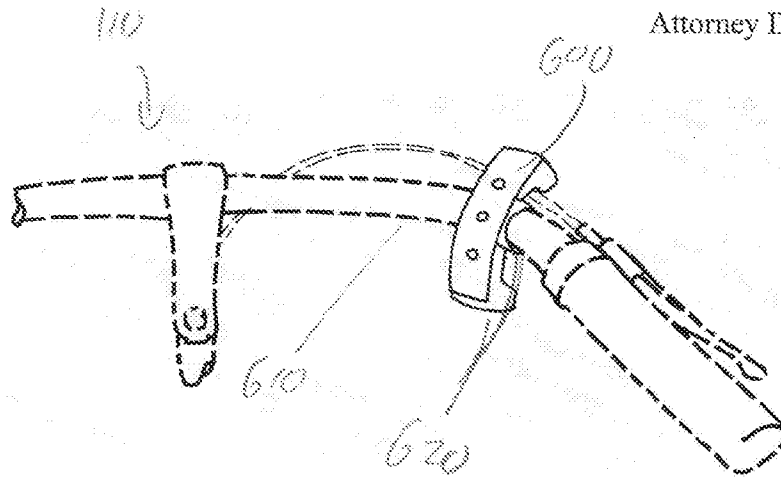


FIG. 12

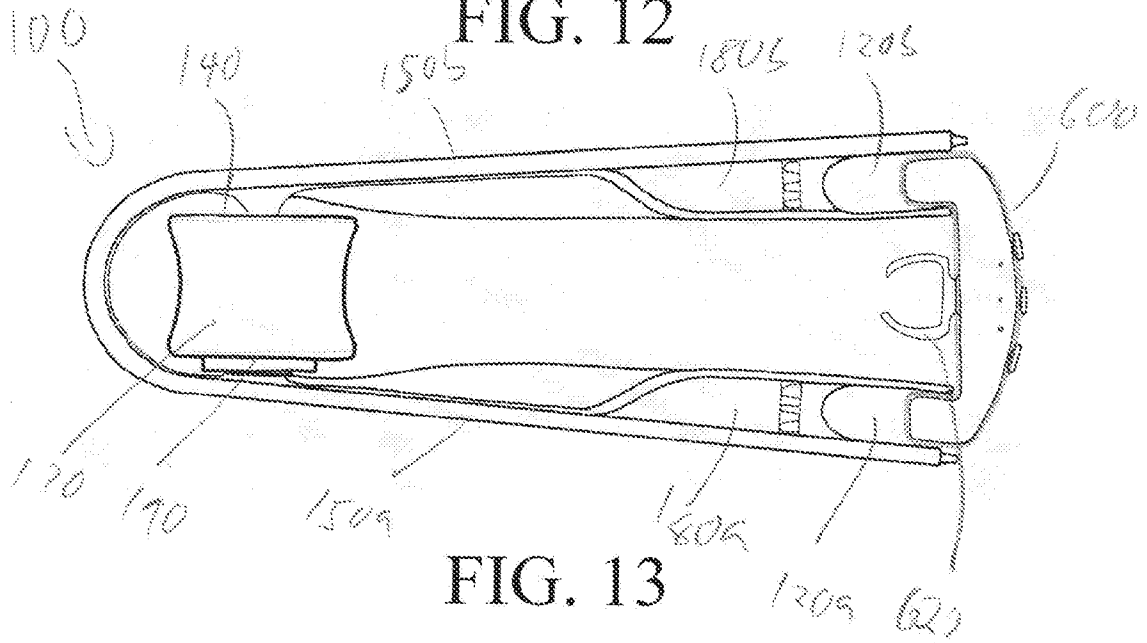


FIG. 13

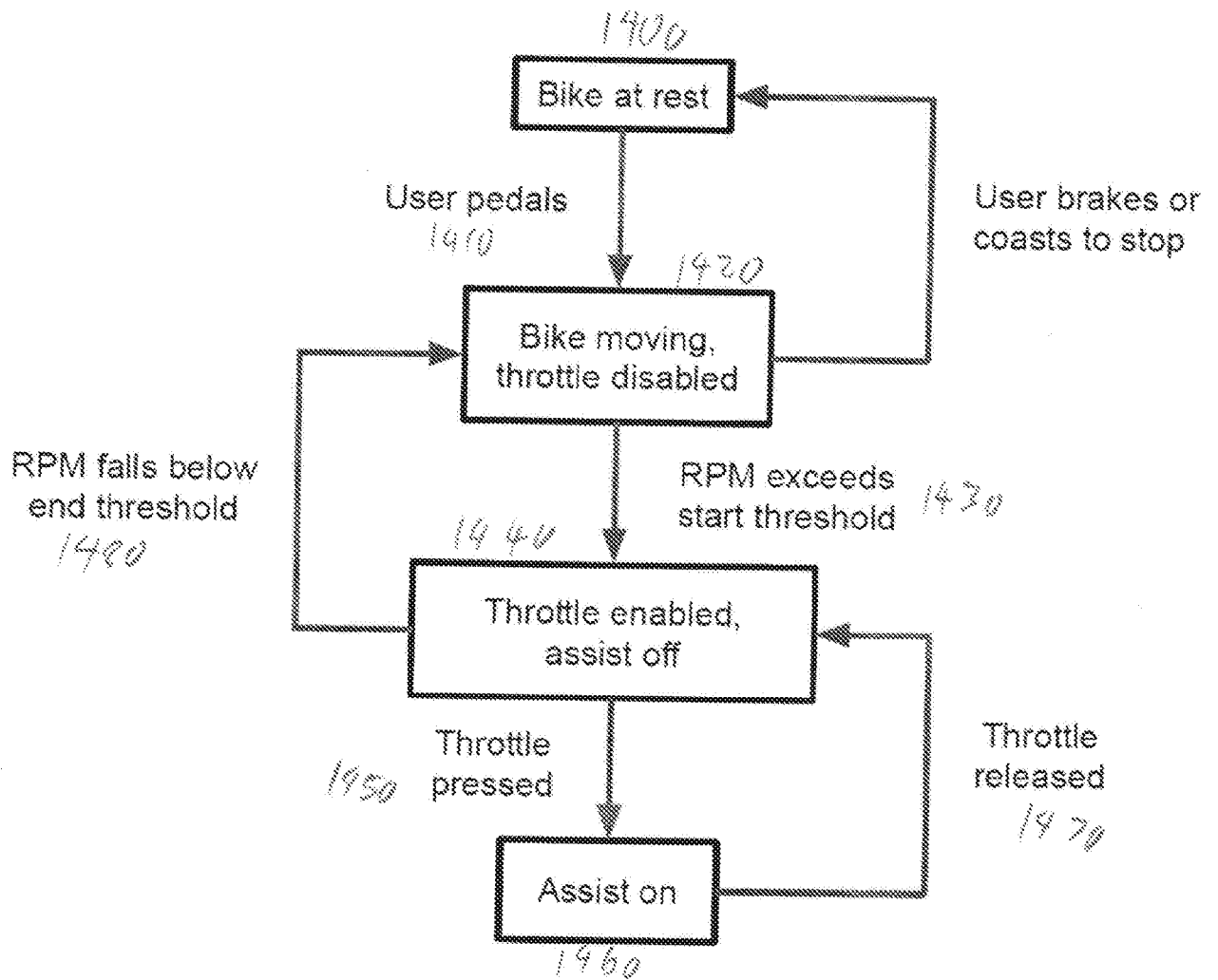


FIG. 14

ABSTRACT

To be added at non-provisional stage.

What is claimed is:

1. A clamping mechanism comprising:
a plurality of clamps;
a tensioning conduit corresponding to each of the plurality of clamps; and
an actuator for simultaneously tensioning the plurality of clamps by way of the tensioning conduits,
wherein each clamp has a bracing element and a gripping segment, and wherein when the clamps are tensioned along the tensioning conduit, the gripping segment of each clamp is drawn towards the corresponding bracing element.
2. The clamping mechanism of claim 1 wherein the bracing segment of each clamp has a consistent substantially arcuate cross section along parallel axes and is configured to grip substantially parallel posts.
3. The clamping mechanism of claim 1 wherein the clamps are spaced apart at fixed locations relative to each other, and wherein the clamps are rigidly located by their respective tensioning conduits or housings for the respective tensioning conduits.
4. The clamping mechanism of claim 3, wherein a space between the clamps is sufficient for a bicycle wheel to pass therebetween.
5. The clamping mechanism of claim 1 wherein the actuator is a lever that manually tensions two tensioning cables simultaneously.
6. The clamping mechanism of claim 1 wherein each tensioning conduit houses a rigid shaft, and wherein the rigid shaft has a pin extending radially therefrom, and wherein the tensioning conduit comprises a path that travels about a circumference of the conduit as it extends axially, such that when the pin travels along the path, the shaft rotates axially.
7. The clamping mechanism of claim 6 further comprising a spring opposing tensioning force within each tensioning conduit, such that when tensioning force is applied by the actuator, the rigid shaft is drawn in a first axial direction and

- rotates from an untensioned position and orientation to a tensioned position and orientation, and wherein when the tensioning force is released, the spring returns the shaft to the untensioned position and orientation.
8. The clamping mechanism of claim 6, wherein the rigid shaft ends in the gripping segment, and wherein the gripping segment extends radially from the shaft, such that in the tensioned orientation the gripping segment passes across the bracing element, and such that in the untensioned orientation, the gripping segment does not interfere with the bracing element when the bracing elements are applied to supports.
 9. A bicycle drive assembly comprising:
 - at least one clamp for fixing to a bicycle;
 - a drive mechanism for driving the bicycle wheel; and
 - a plurality of elongate supports extending from the drive mechanism to the at least one clamp,wherein when applied to a bicycle, a wheel of the bicycle passes partially between the elongate supports.
 10. The bicycle drive assembly of claim 9, wherein the at least one clamp is a plurality of clamps for independently engaging legs of a bicycle fork on opposite sides of the wheel of the bicycle.
 11. The bicycle drive assembly of claim 10, wherein each clamp corresponds to one of the plurality of elongate supports, and wherein the elongate supports each contain a tensioning mechanism for tensioning the corresponding clamp.
 12. The bicycle drive assembly of claim 11 further comprising a clamp actuator adjacent the drive mechanism for actuating the plurality of clamps by way of the tensioning mechanisms in the corresponding elongate supports.
 13. The bicycle drive assembly of claim 9, wherein the drive mechanism is a friction drive.

14. The bicycle drive assembly of claim 13, wherein the friction drive comprises a roller applied to a radially outer surface of the bicycle wheel, and the roller has a stone outer layer.
15. The bicycle drive assembly of claim 13, wherein the friction drive comprises a roller, and wherein the roller surface has a flared profile for maintaining an outer surface of the bicycle wheel at a center of the profile during use.
16. The bicycle drive assembly of claim 13, wherein the friction drive comprises a roller applied to a radially outer surface of the bicycle wheel, and the at least one clamp is rigidly fixed to the bicycle, such that the plurality of elongate supports generate a force directed towards the clamp, thereby providing an application force from the roller to the outer surface of the bicycle wheel greater than a weight of the bicycle drive assembly.
17. The bicycle drive assembly of claim 9, wherein the plurality of elongate supports comprise housings, and wherein batteries and electronic control systems are contained within the housings.
18. The bicycle drive assembly of claim 9 further comprising a motor in the drive assembly and an electronic controller for controller, and wherein the motor includes a Hall Effect sensor for determining a speed of the motor.
19. A method for driving a bicycle wheel using a bicycle drive assembly comprising:
 - providing a drive motor driving a friction roller;
 - monitoring a speed of the motor to determine a speed of a driven wheel of a bicycle;
 - determining of the speed of the driven wheel is above a throttle enabling threshold;
 - receiving an indication from a user that assist should be applied to the driven wheel of the bicycle;

- applying a driving force to the driven wheel of the bicycle only while the user provides an ongoing indication and the speed of the driven wheel is above the throttle enabling threshold.
20. The method of claim 19, wherein the driving force applied to the driven wheel is a constant force applied relative to the current speed of the motor.
 21. The method of claim 19, wherein the motor charges from the rotation of the driven wheel applied to the friction roller when driving force is not being applied to the driven wheel of the bicycle.
 22. The method of claim 19 further comprising providing an indication device for receiving indications from the user, wherein the indication device is linked to a controller for controlling the motor by a wireless connection.

SYSTEMS, DEVICES, AND METHODS FOR DRIVING A WHEEL OF A BICYCLE

FIELD OF THE INVENTION

[0001] This disclosure relates to systems and methods for driving a wheel of a bicycle. In particular, the disclosure relates to a friction drive for a bicycle wheel and a clamping mechanism for fixing the friction drive to the bicycle as well as a method for controlling the system for driving the wheel of the bicycle.

BACKGROUND

[0002] Bicycling uphill or long distances takes a lot of effort. Similarly, bicyclists may not want to exert so much energy when tired and returning home from work.

[0003] Existing solutions for driving a wheel of a bicycle are typically expensive e-bikes, cumbersome kits requiring “do it yourself” installation, or heavy upgrades that are incompatible with shared bikes.

[0004] Accordingly, drive assist devices generally require permanent or semi-permanent installation on the frame of conventional bicycles. Friction drive systems usually require mounting an e-motor wired to a battery or alternatively a permanent dock to attach one of several removable parts on the frame of the bicycle. Wheel drive assist systems often replace the entire front or rear wheel of the bike. These installations generate important and permanent transformations of the bicycle which may negatively impact the biking experience, especially for bike commuters, by adding new constraints in terms of convenience, aesthetics, safety, and cost. Further, existing devices typically cannot work with shared bicycles without a compatible interface for fixing the device to the bicycle.

[0005] Further, existing solutions may require external sensors to be separately installed in order to determine the current speed of a bicycle. Such a requirement further

complicates the installation of a retrofittable bicycle motor and prevents the use of an all in one device.

[0006] Further, existing solutions utilizing friction drives to drive a wheel of a bicycle typically require either the weight of the device itself or complicated motorized solutions in order to apply sufficient force to drive the wheel. Some solutions therefore place the drive unit, including battery, circuitry, and the drive mechanism itself directly above the wheel in order to increase the force available. Such a solution requires a heavy drive unit in order to apply sufficient force, and necessary requires a robust fixation mechanism to be installed.

[0007] Other solutions require secondary motors to force the roller of a friction drive against the surface of the wheel. Such approaches result in complicated structures and excessive battery drain.

[0008] Further, drive assist devices generally operate with consistent power supply. Providing a consistent supply to the electric motor requires a continuous use of the battery. This type of functioning usually requires large capacity battery packs which increase the weight, the cost and time to recharge the battery while limiting battery life cycle.

[0009] As a result, drive assist devices remain marginally used and the launch of different drive assist devices, usually expensive and cumbersome, did not generate a significant increase in the use of bikes, especially for commuting purpose.

[0010] Further, safety is a big concern, particularly when cycling infrastructure is poor.

[0011] There is a need for removing these disadvantages associated with the use of drive assist devices, described above. There is a further need to make the use of drive assist devices more convenient, especially for bike commuters, by maximizing the portability while limiting the cost of the device.

[0012] There is a further need for an application associated with a drive assist device that can enable its users to map bike-lane hazards and other bikers in the vicinity and/or alert car drivers of nearby bicyclists.

[0013] There is a further need for such a drive assist device that can attach universally to bicycles without requiring a prior installed component. There is a further need for such a device to be fully self-contained, thereby not requiring separate batteries or sensors for detecting pedal or wheel speed. There is a further need for such a device that does not rely on excessive weight of the drive unit or a complicated secondary motor to generate appropriate force or pressure on the drive wheel of a bicycle, once mounted.

SUMMARY

[0014] To be amended at non-provisional stage.

[0015] The device described herein is an all in one, lightweight and compact device, that does not require any previous installation on the frame to be quickly installed on any bike. The device aims to lower the risk of theft by being entirely and instantly removable from the bike when it is parked. The device also runs on pulse signal instead of consistent supply, so it requires lower capacity batteries. The device is composed of easy-to-assemble and economical components, and, in some embodiments, a lower capacity battery pack, to make the device inexpensive and broadly accessible. The device may interface with a mobile app that receives data from an electronic controller as well as other sensors of the phone.

[0016] The device generally comprises a friction drive electric motor, activated by pulse signals generated by a battery and regulated by an electronic controller, all of which are contained within a single drive unit or drive assembly.

[0017] The device is easily attached or detached from different front fork sizes and designs using a clamping jaw mechanism, without requiring any previous installation on any part of the bicycle frame. The device's arm can be manually adjustable to be used with different sizes of bicycle wheels.

[0018] The device further contains an electronic controller that transmits to the electric motor fast changes in the amplitude of the supply, alternating short phases of high power and phases of no power in order to optimize use of the battery. The controller may also provide data, via Bluetooth, to a mobile app.

[0019] Also described herein is a clamping device for fixing a drive assembly to a fork of a bicycle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Figure 1 provides a top view of one embodiment of a bicycle drive assembly in the context of a bicycle.

[0021] Figure 2 provides a front perspective view of the bicycle drive assembly of FIG. 1.

[0022] Figure 3 provides a side view of the bicycle drive assembly of FIG. 1.

[0023] Figure 4 provides a perspective view of a second embodiment of a bicycle drive assembly in a first configuration.

[0024] Figure 5 provides a top view of the bicycle drive assembly of FIG. 4 in the first configuration.

[0025] Figure 6 provides a back view of the bicycle drive assembly of FIG. 4 in the first configuration.

[0026] Figure 7 provides a perspective view of the bicycle drive assembly of FIG. 4 in a second configuration.

[0027] Figure 8 provides a top view of the bicycle drive assembly of FIG. 4 in the second configuration.

[0028] Figure 9 provides a back view of the bicycle drive assembly of FIG. 4 in the second configuration.

[0029] Figure 10 provides a top sectioned view of the bicycle drive assembly of FIG. 4 in the second configuration.

[0030] Figure 11 provides an exploded view of several components of the bicycle drive assembly of FIG. 4.

[0031] Figure 12 provides a view of a controller for use with a bicycle drive assembly.

[0032] Figure 13 shows a top view of the bicycle drive assembly of FIG. 1 mated with the controller of FIG. 12.

[0033] Figure 14 shows a flowchart illustrating a method for driving a wheel of a bicycle in accordance with this disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] The description of illustrative embodiments according to principles of several illustrative embodiments is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the description of embodiments disclosed herein, any reference to direction or orientation is merely intended for convenience of description and is not intended in any way to limit the scope of the present invention. Relative terms such as “lower,” “upper,” “horizontal,” “vertical,” “above,” “below,” “up,” “down,” “top” and “bottom” as well as derivative thereof (e.g., “horizontally,” “downwardly,” “upwardly,” etc.) should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description only and do not require that the apparatus be constructed or operated in a particular orientation unless explicitly indicated as such. Terms such as “attached,” “affixed,” “connected,” “coupled,” “interconnected,” and similar refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise. Moreover, the features and benefits are illustrated by reference to certain exemplified embodiments and may not apply to all embodiments. Accordingly, the invention expressly should not be limited to such exemplary embodiments illustrating some possible non-limiting combination of features that may exist alone or in other combinations of features; the scope of the claimed invention being defined by the claims appended hereto.

[0035] This disclosure describes the best mode or modes of practicing the invention as presently contemplated. This description is not intended to be understood in a limiting sense, but provides an example of the invention presented solely for illustrative purposes by reference to the accompanying drawings to advise one of ordinary skill in the art of the advantages and construction of the invention. In the various views of the drawings, like reference characters designate like or similar parts.

[0036] The various embodiments described herein provide a bicycle drive assembly for driving a wheel of a bicycle as well as a clamping mechanism for fixing a bicycle drive assembly to a bicycle so that the drive assembly can drive a wheel. Also discussed herein is a method for driving the wheel of a bicycle by way of a bicycle drive assembly.

[0037] Figure 1 provides a top view of one embodiment of a bicycle drive assembly 100 in the context of a bicycle 110. Figure 2 provides a front perspective view and FIG. 3 provides a side view of the bicycle drive assembly of FIG. 1.

[0038] As shown, the bicycle drive assembly 100 comprises at least one clamp or clamping mechanism 120a, b for fixing the drive assembly to the bicycle 110. In the embodiment shown, two clamping mechanisms 120a, b are provided for clamping the drive assembly 100 to two legs 130a, b of the front fork of the bicycle 110.

[0039] The bicycle drive assembly 100 further comprises a drive mechanism 140 for driving the bicycle wheel and a plurality of elongate supports 150a, b extending from the drive mechanism 140 to the clamps 120a, b. When the drive assembly 100 is mounted to the bicycle 110 using the clamps 120a, b, a wheel 160 of the bicycle passes at least partially between the elongate supports 150a, b.

[0040] Similarly, where two clamps 120a, b are provided for fixing the drive assembly 100 to the bicycle 110, one clamp is provided to mate with each of the two legs 130a, b of the front fork of the bicycle on opposite sides of the wheel 160.

[0041] Typically, each clamp 120a, b corresponds to one of the elongate supports 150a, b, such that each elongate support ends at its respective clamp. The elongate

support 150a, b may further provide a mechanism, or a portion of a mechanism, for actuating the corresponding clamp 120a, b.

[0042] As shown, the drive mechanism 140 is a friction drive comprising a roller 170 applied to a radially outer surface of the bicycle wheel 160. The roller 170 may comprise a wide variety of materials, and in some embodiments, may comprise a rubber or rubberized core and a stone outer layer. In some embodiments, the roller 170 may be interchangeable such that a user may select an appropriate roller for weather or surface conditions. Further, as shown in the embodiment shown, the bicycle wheel 160 is located at least partially between the roller 170 of the drive mechanism 140 and the fixation point of the clamps 120a, b on the legs 130a, b of the fork of the bicycle. Accordingly, the elongate supports 150a, b on either side of the bicycle wheel 160 is sized to generate a force directed towards the clamps 120a, b, and thereby provide pressure between the roller 170 and the outer surface of the bicycle wheel 160. In this way, the drive assembly 100 may apply a force from the roller 170 to the outer surface of the bicycle wheel 160 greater than a weight of the bicycle drive assembly.

[0043] The drive mechanism 140 may further include an electronic motor 190 to drive the roller 170. This may be embedded in the roller itself 170, as shown, or it may be provided externally to the roller. When supplied with power, the motor 190 activates the rotation of the roller 170 which engages the rotation of the front wheel 160 by friction between the roller surface and a tire surface of the wheel. Different motor speeds can be set to accelerate the rotation of the roller 170 and so accelerate the rotation of the front wheel 160. When the motor 190 is not activated, the roller spins freely with the tire, with minimum friction in the motor itself. The motor 190 may be equipped with a rotation sensor, such as a Hall Effect sensor, that constantly monitors the speed of the wheel 160, in order to adjust the speed of the roller 170 as appropriate.

[0044] In some embodiments, when the motor 190 is not engaged, it may apply some friction internally so as to function as a generator, thereby providing some power to batteries within the drive assembly 100.

[0045] As shown, the elongate supports 150a, b, or a portion of the elongate supports, may provide housings 180a, b for various components of the drive assembly 100. These components may include, for example, an electronic control system including a controller, and batteries. As discussed below in reference to FIGS. 4-10, the elongate supports 140 may further comprise tensioning mechanisms for actuating the clamps 120a, b.

[0046] Figure 4 provides a perspective view of a second embodiment of a bicycle drive assembly 400 in a first configuration. Figure 5 provides a top view and FIG. 6 provides a back view of the bicycle drive assembly 400 of FIG. 4 in the first configuration.

[0047] Figure 7 provides a perspective view of the bicycle drive assembly 400 of FIG. 4 in a second configuration. Figure 8 provides a top view and FIG. 9 provides a back view of the bicycle drive assembly 400 of FIG. 4 in the second configuration.

[0048] Figure 10 provides a top sectioned view of the bicycle drive assembly 400 of FIG. 4 in the second configuration and FIG. 11 provides an exploded view of several components of the bicycle drive assembly of FIG. 4.

[0049] As shown, the bicycle drive assembly 400 comprises at least one, and typically two, clamps or clamping mechanisms 420a, b for fixing the drive assembly to a bicycle. In the embodiment shown, two clamping mechanisms 420a, b are provided for clamping the drive assembly 400 to two legs of the front fork of the bicycle.

[0050] The bicycle drive assembly 400 further comprises a drive mechanism 440 for driving the bicycle wheel and a plurality of elongate supports 450a, b extending from the drive mechanism 440 to the clamps 420a, b. When the drive assembly 400 is mounted to the bicycle using the clamps 420a, b, a wheel of the bicycle passes at least partially between the elongate supports 450a, b.

[0051] Similarly, where two clamps 420a, b are provided for fixing the drive assembly 400 to the bicycle, one clamp is provided to mate with each of the two legs of

the front fork of the bicycle on opposite sides of the wheel, as discussed above with respect to the embodiment of FIG. 1.

[0052] Typically, each clamp 420a, b corresponds to one of the elongate supports 450a, b, such that each elongate support ends at its respective clamp. The elongate support 450a, b may further provide a mechanism, or a portion of a mechanism, for actuating the corresponding clamp 420a, b. As visible in the sectioned view of FIG. 10, for example, each elongate support 450a, b may contain a tensioning mechanism 500a, b for tensioning the corresponding clamp 420a, b. The tensioning mechanism is described in more detail below.

[0053] As shown, the drive mechanism 440 is a friction drive comprising a roller 470 applied to a radially outer surface of the bicycle wheel. The roller 470 may comprise a wide variety of materials, and in some embodiments, may comprise a rubber or rubberized core 473 and a stone outer layer 476. Such a stone outer layer 476 may provide increased friction between the roller and a surface of a tire mounted on the bicycle. Further, in some embodiments, a profile of the outer surface of the roller 470 may be shaped and provided with an arcuate form or a flared form to better cup the outer surface of the bicycle wheel or tire. Similarly, the profile of the roller 470 may be provided with a groove or V shape, such that the bicycle wheel remains centered along the surface of the roller.

[0054] Further the bicycle wheel is located at least partially between the roller 470 of the drive mechanism 440 and the fixation point of the clamps 420a, b on the fork of the bicycle. Accordingly, the elongate supports 450a, b on either side of the bicycle wheel are sized to generate a force directed towards the clamps 420a, b, and thereby provide pressure between the roller 470 and the outer surface of the bicycle wheel. In this way, the drive assembly 400 may apply a force from the roller 470 to the outer surface of the bicycle wheel greater than a weight of the bicycle drive assembly.

[0055] The drive mechanism 440 may further include an electronic motor to drive the roller 470. This may be embedded in the roller itself 470 or it may be provided

externally to the roller. When supplied with power, the motor activates the rotation of the roller 470 which engages the rotation of the front wheel by friction between the roller surface and a tire surface of the wheel. Different motor speeds can be set to accelerate the rotation of the roller 470 and so accelerate the rotation of the front wheel. When the motor is not activated, the roller 470 spins freely with the tire, with minimum friction in the motor itself. The motor may be equipped with a rotation sensor, such as a Hall Effect sensor, that constantly monitors the speed of the wheel, in order to adjust the speed of the roller 470 as appropriate.

[0056] In some embodiments, when the motor is not engaged, it may apply some friction internally so as to function as a generator, thereby providing some power to batteries within the drive assembly 400.

[0057] As shown, the elongate supports 450a, b, or a portion of the elongate supports, may provide housings 480a, b for various components of the drive assembly 100. These components may include, for example, an electronic control system including a controller, and batteries. Further, the elongate supports 450a, b may further comprise tensioning mechanisms for actuating the clamps 420a, b. In such an embodiment, the drive assembly 400 may further comprise a clamp actuator 490 adjacent the drive mechanism 440 for actuating the clamps 420a, b by way of the tensioning mechanisms 500a, b in the corresponding elongate supports 450a, b.

[0058] Accordingly, a clamping mechanism for the bicycle drive mechanism generally comprises the two clamps 420a, b discussed above, a tensioning mechanism 500a, b corresponding to each clamp, and a clamp actuator 490 for simultaneously tensioning both clamps by way of the tensioning mechanism.

[0059] Each tensioning mechanism 500a, b typically comprises a tensioning conduit 510a, b which provides a path along which tension can be loaded. Each clamp 420a, b is then provided with a bracing element 520a, b and a gripping segment 535a, b, and when the clamps are tensioned along their tensioning conduits, the gripping segment of each clamp is drawn towards the corresponding bracing element.

[0060] The bracing element 520a, b of each clamp 420a, b may be provided with a surface contour or a surface profile ideal for gripping a component of a bicycle, such as the parallel posts that make up the legs of a front fork. Accordingly, each bracing element 520a, b may have a substantially arcuate or otherwise rounded cross section that may run along parallel axes, such that it can grip the parallel posts, such as those shown in FIGS. 1-3 with respect to the first embodiment of the bicycle drive assembly 100.

[0061] In order to locate the clamps 420a, b so that they can grip the bicycle fork, the clamps are spaced apart at fixed locations relative to each other. Accordingly, the clamps 420a, b may be rigidly located by their respective tensioning conduits 510a, b or the housings 420a, b containing the conduits, which may be the elongate supports 450a, b, or which may be part of the elongate supports. Typically, when the clamps 420a, b are spaced apart from each other, sufficient space is provided between the clamps for a bicycle wheel to pass therebetween.

[0062] The clamp actuator 490 may be a lever that manually tensions two tensioning cables or other tensioning mechanisms 500a, b simultaneously. The functioning of the actuator 490 and the tensioning mechanisms 500a, b is described in reference to FIGS. 10 and 11. The mechanisms 500a, b are partially illustrated, with the tensioning cables themselves not shown. It is further noted that while the clamp actuator 490 is shown in the same position throughout the figures, it will be understood that in the first configuration, with the clamps 420a, b shown as they are in FIGS. 4-7, the clamp actuator 490 would typically be in a raised position at close to a right angle relative to the elongate supports 450a, b, and in the second configuration, with the clamps shown as they are in FIGS. 8-10, the clamp actuator would typically be provided as shown.

[0063] As shown, the tensioning conduits 510a, b house rigid shafts 530a, b. The rigid shafts are typically linked to the clamp actuator 490 by way of a tensioning cable (not shown). The tensioning cable typically draws the rigid shafts towards the actuator 490. The tensioning mechanisms 500a, b further comprise springs 540a, b opposing the tensioning force, and thereby pushing the rigid shafts 530a, b away from the actuator 490

and in the direction of the clamps 420a, b. The rigid shafts 530a, b typically further comprise the gripping segments 535a, b which extend radially at an end of the shaft adjacent the corresponding clamp 420a, b.

[0064] As shown, each of the rigid shafts 530a, b comprise a pin 550a, b extending radially therefrom. The tensioning conduits 510a, b each comprise a path 560a, b along which the corresponding pins 550a, b travel. The paths 560a, b each extend axially along the corresponding tensioning conduit 510a, b and travels about a circumference of the conduit as it extends axially. Accordingly, when the corresponding pin 550a, b travels along the path 560a, b, the corresponding rigid shaft 530a, b rotates axially.

[0065] In this way, the clamps 420a, b transition from a first, untensioned configuration, shown in FIGS. 4-6 to a second, tensioned configuration shown in FIGS. 7-10. In the first configuration, no tension is provided by the actuator 490, and therefore no tensioning force opposes the spring force provided by the springs 540a, b. As such, the rigid shafts 530a, b are fully extended, and the pins 550a, b are at the first ends of their respective paths 560a, b.

[0066] Further, in the first configuration, the gripping segments 535a, b of the clamp are rotated with the corresponding rigid shafts 530a, b so that they do not interfere with the corresponding bracing elements 520a, b. As shown, the gripping segments 535a, b may extend from the corresponding rigid shafts 530a, b in a direction parallel the axis of the bracing segment 520a, b, such that the clamps can be applied directly to corresponding parallel posts, such as the legs of a bicycle fork.

[0067] In transitioning from the first configuration to the second configuration, the actuator 490 is used to apply a tensioning force to the tensioning mechanisms 500a, b in opposition to the spring force from the springs 540a, b. Accordingly, the rigid shafts 530a, b move along the corresponding tensioning conduits 510a, b and the pins 550a, b move along the corresponding paths 560a, b. As such, the rigid shafts 530a, b move towards the actuator 490 and rotate, such that the gripping segments 535a, b extend

radially from the rigid shafts 530a, b across the corresponding bracing segments 520a, b and apply the tensioning force as a clamping force to any object braced against the bracing segments.

[0068] Accordingly, upon application of force from the actuator 490, the clamping mechanisms 420a, b transitions from the first configuration shown in FIGS. 4-7 in which the rigid shaft 530a, b is untensioned and the gripping segments 535a, b do not interfere with the bracing elements 520a, b to a second configuration, shown in FIGS. 8-10. In the second configuration, the rigid shafts 530a, b are tensioned and drawn towards the actuator 490 and are thereby rotated, such that the gripping segments 535a, b extend across the bracing elements 520a, b and apply a clamping force.

[0069] In both the embodiment shown in FIGS. 1-3 and that shown in FIGS 4-10, the bicycle drive assembly and the clamping mechanism form an all in one, lightweight and compact device that does not require any previous installation on a bicycle frame to be quickly installed on a wide variety of bicycles. In some embodiments, the length of the elongated supports are adjustable once the clamping mechanism is applied in order to adjust the amount of force applied by the drive mechanism to a tire of a bicycle wheel.

[0070] In some embodiments, instead of directly adjusting the length of the elongated supports, the effective length may be adjusted by locating the clamping mechanisms higher or lower on the fork of the bicycle. In this way, the roller may be located higher or lower on the front wheel, such that the contact patch between the roller and the front wheel is at an appropriate distance from the fork. The elongated supports may be made of aluminum or similar materials in order to limit weight and ease heat dissipation.

[0071] As shown, the roller 470 may have a curved surface, which allows is to adapt to different tire sizes and designs while optimizing the contact between roller and tire. The roller may be made of rubber or similar material covered by a stone layer to increase grip on the tire and reduce slippage.

[0072] The U-shaped clamping jaw, which comprises a variation on the overall clamping mechanism discussed above, is equipped with an adjustable closure system to match different fork and wheel sizes and designs. In some embodiments, the closure system comprises a 3-point clamping jaw, and a spring system to provide a reliable attachment system on any fork. The clamping jaw closes by moving the handle down and opens by moving the handle up. Advantages of this clamping jaw includes no need of previous installation or tool to tighten the device on nearly any fork.

[0073] In some embodiments, the clamps and/or the elongated supports are provided with adjustments that allow for varying between fork size and space between forks. Further, such adjustments may be provided to adjust for different wheel sizes or tire sizes.

[0074] A Li-ion battery capable of powering the electric motor may be wired to the motor pack via the electronic controller system. When activated, and on demand of the electronic controller, the battery powers the electric motor. The battery can be recharged from a common AC power supply. Battery, motor and electronic controller unit are mounted close together on a single support, and therefore only a short connector is required to connect them together.

[0075] Figure 12 provides a view of a remote control 600 for use with a bicycle drive assembly 100, 400. As shown, the remote control 600 can be clipped on to a handlebar 610 of a bicycle using a flexible-plastic, open ring 620 or similar basic clipping system. A rider of a bicycle can then activate the electric motor using the remote control 600. The remote control 600 may be linked to the controller using, for example, Bluetooth. The controller can then deliver current to the electric motor according to the methods discussed elsewhere herein. The remote control 600 may be chargeable directly by USB or may be charged from the bicycle drive assembly 100 when connected thereto.

[0076] In some embodiments, once the throttle remote control 600 is clipped on the handlebar 610, or another part of the frame of the bicycle, a magnetic connection allows to automatically turn on the device 100. Once the throttle remote control 600 is

unclipped from the handlebar 610 or another part of the frame and the magnetic connection is stopped, the device 100 is automatically turned off. The rider can activate the electric motor 190, using the external throttle unit or other similar sensor, connected via bluetooth to the electronic controller. The controller delivers the power to the electric motor through pulse signal, as described elsewhere herein.

[0077] Figure 13 shows a top view of the bicycle drive assembly 100 of FIG. 1 mated with the remote control 600 of FIG. 12. The mating of the assembly 100 with the remote 600 may be for storage of the device, or for easy transport when not installed on a bicycle. Once a user arrives at his destination, the device 100 can be detached from the front fork by releasing the clamping jaw. The remote 600 can then be fixed to the adjustable arm, to make the device less cumbersome and all in one. The device 100 can then be connected to the power supply to recharge the battery for further use.

[0078] Once use is concluded, the device can be detached from the front fork by releasing the clamping jaw 120a, b. The throttle remote control 610 can be attached to the back part of the adjustable arms 150a, b, to make the device 100 less cumbersome and all in one. The device 100 can be connected to the power supply to recharge the battery for further use. The mobile app, connected to the electronic controller integrated in the device and other sensors of the phone, allows riders to access and share the data collected during their journey.

[0079] While the various embodiments of the bicycle drive assembly 100, 400 are shown incorporating a variety of features, additional features and functionalities may be added as well. For example, embodiments may incorporate headlights, turn indicators, and embedded cameras. These features may be incorporated into the drive assembly 100, 400 itself, or some components may be embedded in the remote 600.

[0080] While the bicycle drive assembly 100, 400 is shown mounted on to a front wheel of a bicycle, it will be understood that in some embodiments, the assembly can be mounted to a back wheel as well.

[0081] Figure 14 shows a flowchart illustrating a method for driving a wheel of a bicycle in accordance with this disclosure.

[0082] As shown, the method generally comprises first providing a drive motor 190 driving a friction roller 170 and then monitoring the speed of a driven wheel of a bicycle. The monitoring of the speed may be by monitoring the speed of the motor itself using an RPM sensor, such as a Hall Effect sensor, for example.

[0083] Accordingly, as shown, the bike is initially at rest (at 1400). Once a user begins pedaling (at 1410), the method determines that the bike is moving, but the throttle remains disabled (at 1420) so long as the motor speed or the detected wheel speed remains below a threshold level.

[0084] Once the motor or wheel speed crosses the throttle enabling threshold level (at 1430), the throttle is enabled (at 1440), but the assist function of the bicycle drive assembly 100 remains inactive.

[0085] Once a throttle is activated (at 1450) by a user, such as by way of a remote control 600 discussed above, the assist function of the drive motor 190 is turned on (at 1460). Accordingly, assist is typically active only if the motor speed is above a threshold level and the throttle is activated.

[0086] If the throttle is released by the user (at 1470), the throttle remains enabled so long as the motor speed is above the throttle enabling threshold, but the assist functionality is turned off (at 1440). Similarly, if the motor speed falls below the throttle assist threshold (at 1480), the throttle is disabled (at 1420) and the user may apply brakes or coast to a stop without affecting the drive assembly.

[0087] In use, the motor may be applied in a variety of ways. Because the motor speed is known by way of the RPM sensor discussed above, when the motor is actuated, it may be actuated at a speed relative to the current motor speed such that the wheel is driven relative to the current wheel speed, thereby operating more efficiently. For example, if the motor speed is known, the application of force may be at a speed some percentage higher than the current speed in order to apply a constant predictable

acceleration at any speed. Similarly, in some embodiments, the motor may be applied at the current speed, such that the current speed is maintained. A variety of potential options and algorithms may be selectable by way of a smartphone application.

[0088] Accordingly, the electronic controller system may be composed of an electronic controller mounted on the arm of the device, connected to Rotation Per Minute sensors, integrated in the motor. The electronic controller can then be provided with a unique algorithm that constantly monitors the hall sensors inside the motor for changes in rpm (revolutions per minute) and adjusts the amount of current delivered to the motor based on the speed of the bicycle at the time. This optimizes battery life and solves a common problem of slipping roller on friction drive transmissions. The electronic controller also provides data via bluetooth, to a mobile app.

[0089] As such, in some embodiments, the drive assembly may be linked to a user application, such as on a smartphone. The application may then enable users to map bike-lane hazards and alert other bikers in the vicinity. It may also allow for alerting car-drivers of nearby bicyclists.

[0090] In some embodiments, the mobile application receives data via bluetooth, from the electronic controller of the device and other sensors of the phone. The mobile application may feature basic options such as the visualization of rider's performance (speed, miles, calories, Co2 footprint etc.) and motor information (speed, battery level, power output, etc.) and advanced options such as:

[0091] Hazard mapping: A rider can add location pins on the map by pushing a hazard button on the remote, attached on the bike's handlebar, while the phone is in rider's pocket.

[0092] When the rider approaches a pin dropped by someone else - the app will alert the device to signal the rider.

[0093] Virtual bell mounted: A rider will press the button on handlebar device and will be able to relay her real-time location to other navigation or mapping applications.

[0094] In some embodiments, A Li-ion battery capable of powering the electric motor is wired to the motor pack via the electronic controller system. When activated, and on demand of the electronic controller only, the battery powers the electric motor. The battery can be recharged from a common AC power supply. Battery, motor and electronic controller unit are mounted close together on a single support, only a short connector is required to connect them together.

[0095] In some embodiments, the electronic control unit is capable of managing the delivery of power generated from the battery to the electric motor. The electronic controller is set by software to operate only on pulse signal, transmitting to the electric motor fast changes in the amplitude of supply generated by the battery. After an increase of supply, the controller immediately stops transmitting power to the electric motor.

[0096] While the present invention has been described at some length and with some particularity with respect to the several described embodiments, it is not intended that it should be limited to any such particulars or embodiments or any particular embodiment, but it is to be construed with references to the appended claims so as to provide the broadest possible interpretation of such claims in view of the prior art and, therefore, to effectively encompass the intended scope of the invention. Furthermore, the foregoing describes the invention in terms of embodiments foreseen by the inventor for which an enabling description was available, notwithstanding that insubstantial modifications of the invention, not presently foreseen, may nonetheless represent equivalents thereto.