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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,483	10/29/2020	Keith George Ferry	90608.01000	7585

125632 7590 12/05/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

EXAMINER
JENKINS, JERMAINE L

ART UNIT	PAPER NUMBER
2855	

NOTIFICATION DATE	DELIVERY MODE
12/05/2023	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPLADOCKET@swlaw.com
glangton@swlaw.com
lcoyle@swlaw.com

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 001

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	ISSUE DATE	PATENT NO.
17/084,483	05-Dec-2023	11835421

Snell & Wilmer (LA)
1 East Washington Street
Phoenix, AZ 85004

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at https://patentcenter.uspto.gov

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit https://www.uspto.gov/electronicgrants

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 002

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,483	12/05/2023	11835421	90608.01000	7585

125632 7590 11/15/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at https://patentcenter.uspto.gov/. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at https://certifiedcopycenter.uspto.gov/index.html. The Certified Copy Center may be reached at (800)972-6382.

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

The Patent Term Adjustment is 219 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

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

Applicant will be able to obtain more detailed information by accessing the Patent Center (https://patentcenter.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 003

INVENTOR(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional inventors):

Keith George Ferry, Burbank, CA;

APPLICANT(s) (Please see PATENT CENTER site https://patentcenter.uspto.gov for additional applicants):

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 004

Electronic Patent Application Fee Transmittal

Application Number:	17084483
Filing Date:	29-Oct-2020
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Filer:	Grant T. Langton/Lauren Coyle
Attorney Docket Number:	90608.01000

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**480**

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

125632 7590 07/27/2023
Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

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

Certificate of Mailing or Transmission

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

Lauren Coyle	(Typed or printed name)
/Lauren Coyle/	(Signature)
October 26, 2023	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,483	10/29/2020	Keith George Ferry	90608.01000	7585

TITLE OF INVENTION: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	10/27/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
JENKINS, JERMAINE L	2855	073-146800

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

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

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

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

1 _____
2 Snell & Wilmer L.L.P.
3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

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

4a. Fees submitted: ☒ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via Patent Center or EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 19-2814

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Grant T. Langton/ Date October 26, 2023

Typed or printed name Grant T. Langton Registration No. 39,739

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 007

FILED VIA EFS WEB

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT

First Named Inventor:	Keith George Ferry	Docket No.:	90608.01000
Serial No.:	17/84,483	Group Art Unit:	2855
Filed:	October 29, 2020	Examiner:	Jenkins, Jermaine L.
Title:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	Confirmation No.:	7585

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

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

Dear Commissioner:

Applicant thanks the Examiner for the Notice of Allowance mailed on July 27, 2023, and in reply presents the following Comments on Statement of Reasons for Allowance.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 008

REMARKS

Applicant acknowledges the Examiner's statements of reasons for allowance of the above-referenced patent application and agrees that the claimed subject matter is patentably distinct over the references cited. However, Applicant takes no position regarding the reasons for allowance presented by the Examiner other than the positions Applicant may have previously taken during prosecution. Therefore, the Examiner's reasons for allowance should not be attributed to Applicant as an indication of the basis for Applicant's belief that the claims are patentably distinct. Furthermore, it is respectfully asserted that there may also be additional reasons for patentability of the claimed subject matter not explicitly stated in this record and Applicant does not waive their right to such arguments by not further addressing such reasons herein.

Respectfully submitted,

Dated: October 26, 2023

/Grant T. Langton/
Grant T. Langton
Reg. No. 39,739

SNELL & WILMER L.L.P.
1 East Washington Street
Suite 2700
Phoenix, Arizona 85004
Phone: 213-929-2505
Fax: 213-929-2525
Email: glangton@swlaw.com

Electronic Acknowledgement Receipt

EFS ID:	48769157
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	90608.01000
Receipt Date:	26-OCT-2023
Filing Date:	29-OCT-2020
Time Stamp:	19:45:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$480
RAM confirmation Number	E20230PJ45358701
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Authorized User	

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	102623_IFT_as_filed_90608_01000.pdf	155599 b7fc9517fb7f31184b05a9d03d3d045f0e64e3e8	no	1
Warnings:					
Information:					
2	Miscellaneous Incoming Letter	102623_CSRA_as_filed_90608_01000.pdf	91309 71f54e908392f0c6c237e08d8f0800255f8f1e31	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	38199 3eb3a6aea5080b0c9300a23c4320cb9e51b66d2a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	285107		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

EFS Web 2.1.18

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

	1	Non-Final Office Action dated May 18, 2023 in corresponding U.S. Application No. 16/671,105 filed October 31, 2019; total 8 pages

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/JERMAINE L JENKINS/	Date Considered	08/28/2023

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 013

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-08-16
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 014

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 015

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,483	10/29/2020	Keith George Ferry	90608.01000	7585

125632 7590 09/06/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

EXAMINER	
JENKINS, JERMAINE L	

ART UNIT	PAPER NUMBER
2855	

NOTIFICATION DATE	DELIVERY MODE
09/06/2023	ELECTRONIC

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

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

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IPLADOCKET@swlaw.com
glangton@swlaw.com
lcoyle@swlaw.com

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 016

Corrected ***Notice of Allowability***	**Application No.** 17/084,483	**Applicant(s)** Ferry, Keith George	
	Examiner JERMAINE L JENKINS	**Art Unit** 2855	**AIA (FITF) Status** Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to printer rush filed on 08/24/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-57 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/J.L.J/ Examiner, Art Unit 2855	/PETER J MACCHIAROLO/ Supervisory Patent Examiner, Art Unit 2855

Revvo's Exhibit 1002
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IPR2025-00632 - Page 017

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

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

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

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Revvo v. Cerebrum
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2855
	Examiner Name	Jenkins, Jermaine L.
	Attorney Docket Number	90608.01000

	1	Non-Final Office Action dated May 18, 2023 in corresponding U.S. Application No. 16/671,105 filed October 31, 2019; total 8 pages

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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Revvo v. Cerebrum
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-08-16
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 021

Electronic Acknowledgement Receipt

EFS ID:	48451696
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	90608.01000
Receipt Date:	16-AUG-2023
Filing Date:	29-OCT-2020
Time Stamp:	20:03:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$104
RAM confirmation Number	E20238FK03459300
Deposit Account	
Authorized User	

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

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	081623_IDS_as_filed_90608_01000.pdf	1263368 a2d925ced5aa9c4af2f42fd208f82b47c2aaf4bd	no	4
Warnings:					
Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Other reference-Patent/Application/ Search Documents	16671105_051823_NFOA_90608_00700.pdf	425705 866ad394f1e0cd42d43e667f7fa1f52daf9a553c	no	8
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	37900 551ff7c84c1d0b54419e04609b555b4a848c5b02	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1726973		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Patent Application Fee Transmittal

Application Number:	17084483
Filing Date:	29-Oct-2020
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Filer:	Grant T. Langton/Lauren Coyle
Attorney Docket Number:	90608.01000

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	104	104
		Total in USD ($)		**104**

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/671,105	10/31/2019	Keith George Ferry	90608.00700	2653

125632 7590 05/18/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

EXAMINER	
ALLEN, ANDRE J	

ART UNIT	PAPER NUMBER
2855	

NOTIFICATION DATE	DELIVERY MODE
05/18/2023	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPLADOCKET@swlaw.com
glangton@swlaw.com
lcoyle@swlaw.com

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Office Action Summary	Application No. 16/671,105	Applicant(s) Ferry, Keith George	
	Examiner ANDRE J ALLEN	Art Unit 2855	AIA (FITF) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☑ Responsive to communication(s) filed on 4-25-2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

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

Disposition of Claims*

5) ☑ Claim(s) 1-55 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☑ Claim(s) 25-38 is/are allowed.

7) ☑ Claim(s) 1-4,6-24 and 39-55 is/are rejected.

8) ☑ Claim(s) 5 is/are objected to.

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

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

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

11)☑ The drawing(s) filed on 3-18-2020 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

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

4) ☐ Other: _____.

Revvo's Exhibit 1002
Revvo v. Cerebrum
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DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 4-25-2023 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van*

Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

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

The filing of a terminal disclaimer by itself is not a complete reply to a nonstatutory double patenting (NSDP) rejection. A complete reply requires that the terminal disclaimer be accompanied by a reply requesting reconsideration of the prior Office action. Even where the NSDP rejection is provisional the reply must be complete. See MPEP § 804, subsection I.B.1. For a reply to a non-final Office action, see 37 CFR 1.111(a). For a reply to final Office action, see 37 CFR 1.113(c). A request for reconsideration while not provided for in 37 CFR 1.113(c) may be filed after final for consideration. See MPEP §§ 706.07(e) and 714.13.

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

Claims 1-4, 6-24 and 39-55 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-57 of copending Application No. 17/084,483 (reference application). Although the claims at issue are not identical, they are not patentably distinct from each other because the cited copending application teaches allof the basic features of the claimed invention. Regarding claim 1, the '483 application does not explicitly teach a housing comprising "one or more surface features that are configured to contact the electrical sensor device".

Since co-pending application 17/084,483 at the very least discloses preventing movement of the device within the cavity of a housing (claim 1), it would have been obvious to a person having ordinary skill in the art of manufacturing TPMS devices at the time the invention was made to implement one or more surface features configured to contact the electrical sensor device for the purpose of preventing movement of the electrical.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claim Rejections - 35 USC § 102

4. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis (i.e., changing from AIA to pre-AIA) for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Claim(s) 1 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Marques et al (US 9,950,575)

Regarding 1 Marques et al teaches a housing (combination of 1 2 4 7) comprising a structure 1 2 4 7 having an internal cavity therein (pocket / enveloping like structure Figs. 1-2) ; an electrical sensor device 10 that is disposed within the internal cavity 1 2 4 7, wherein the housing (combination of 1 2 4 7) comprises one or more surface features (interpreted as internal surface of 1 2 4 7) that are configured to contact the electrical sensor device 10 to prevent movement (device 10 held in place by 1 2 4 7) of the electrical sensor device 10 within the internal cavity (pocket / enveloping like structure Figs. 1-2) , wherein the electrical sensor device 10 is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with a vulcanized rubber article 20; and a retaining member 3 that is configured to accommodate attachment of the housing (combination of 1 2 4 7) therewith, wherein the retaining member has an outside surface configured for attachment with the vulcanized rubber article (figs. 1, 2-4).

Claims 2-4, 6-24 are rejected due to their dependency of rejected claim 1.

Allowable Subject Matter

5. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The cited prior art does not anticipate nor render obvious an internal cavity that includes an unfilled open space above or below the electrical sensor device inside the housing.

6. Claims 25-38 are allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 25 the cited prior art does not anticipate nor render obvious an internal cavity that includes an unfilled open space above or below the electrical sensor device inside the housing.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDRE J ALLEN whose telephone number is (571)272-2174. The examiner can normally be reached Mon-Fri. 9am-5PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Macchiarolo can be reached on (571)272-2375. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/ANDRE J ALLEN/
Primary Examiner, Art Unit 2855

Bibliographic Data

Application No: 17/084,483

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /JERMAINE L JENKINS/ Examiner's Signature | Initials

Title: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/29/2020	073	2855	
RULE			

APPLICANTS

INVENTORS

Keith George Ferry, Burbank, CA, UNITED STATES

CONTINUING DATA

This application is a CIP of 16671105 10/31/2019

FOREIGN APPLICATIONS

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11/06/2020

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UNITED STATES

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

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	1	20210181063	A1	2021-06-17	DODANI et al.	

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	1	2020036859	WO	A1	2020-02-20	REVVO TECHNOLOGIES, INC.		

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EFS Web 2.1.18

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First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-03-28
Name/Print	Grant T. Langton	Registration Number	39,739

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Revvo v. Cerebrum
IPR2025-00632 - Page 038

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent 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.

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IPR2025-00632 - Page 039

Patents sensor assemblies; dynamic objec

(sensor assemblies; dynamic object; housing; retaining member; tire);

About 14,208 results

Sort by · Relevance Group by · None Deduplicate by · Family Results / page · 100

Sensor assemblies and systems for monitoring a dynamic object

WO EP US CN JP *KR* AU CA · US20210131916A1 · Keith George Ferry · Keith George Ferry

Priority 2019-10-31 · Filed 2020-10-29 · Published 2021-05-06

Sensor assemblies and systems comprise a housing configured with an electrical sensor device retai the sensor device. The housing may include display indicia relating to some aspect of the sensor asse sensor device include electrical components useful for ...

Motor vehicle chassis sensor

WO US CN JP DE · CN106441377B · D·韦特 · Cts公司

Priority 2012-08-17 · Filed 2013-08-15 · Granted 2020-02-21 · Published 2020-02-21

A vehicle chassis sensor assembly (18) includes a housing member (20) defining a sen a rotatable shaft (46) having a magnet (60) and retained in a sleeve (22), and a rotatabl the shaft. A sensor cartridge (138) is mounted in the slot through an interior ...

Sensor assemblies and systems for monitoring a dynamic object

US · US20210129601A1 · Keith George Ferry · Keith George Ferry

Priority 2019-10-31 · Filed 2019-10-31 · Published 2021-05-06

Sensor assemblies and systems comprise a housing configured to accommodate an electrical senso mechanically retain the same, and provide a protective surrounding thereto. The housing may include relating to some aspect of the sensor assembly. The electrical sensor ...

Accessory mounting system for a vehicle

WO ~~EP~~ US ~~AU~~ · US9637053B2 · Kenneth Schofield · Magna Electronics Inc.

Priority 1999-11-04 · Filed 2015-12-16 · Granted 2017-05-02 · Published 2017-05-02

An accessory system for a vehicle includes an attachment element bonded to an in-cab at a first windshield location and an attachment member attached at the in-cabin winds second windshield location. An interior rearview mirror assembly has a mirror support ...

Mobility support device

WO EP JP AU CA DK *MX* · JP2023062166A · エム、コールター スチュワート・デカ・プロダクツ・リーシップ

Priority 2016-05-20 · Filed 2023-02-22 · Published 2023-05-02

devices, methods, etc.

Smartphone-based vehicular interface

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 040

US • US9211811B2 • David S. Breed • Intelligent Technologies International, Inc.
Priority 2002-06-11 • Filed 2011-10-11 • Granted 2015-12-15 • Published 2015-12-15
Method for enabling interaction with a vehicle including coupling a smartphone to the v element whereby the smartphone is removable from the coupling element and thus rem vehicle, and transferring data between the smartphone and the vehicle while the smartp

Cargo monitoring method and arrangement

US • US8786437B2 • David S. Breed • Intelligent Technologies International, Inc.
Priority 2000-09-08 • Filed 2013-03-28 • Granted 2014-07-22 • Published 2014-07-22
Method and arrangement for monitoring cargo includes coupling an inertial measureme such that accelerations of the cargo are detected by the inertial measurement unit, mor processor, the accelerations of the cargo as detected by the inertial measurement unit,

Asset monitoring with content discrepancy detection

US • US9082103B2 • David S. Breed • Intelligent Technologies International, Inc.
Priority 2000-09-08 • Filed 2013-11-20 • Granted 2015-07-14 • Published 2015-07-14
Method for monitoring assets that include a sensor system that obtains data about con processor that derives information about the contents from the sensor data, and a com that, when linked to a communications network, wirelessly transmits the information de

Unmanned aerial vehicle picks up and delivers system

WO EP US CN CA • CN109153450B • J·吉尔 • 美国联合包裹服务公司
Priority 2016-04-29 • Filed 2017-04-28 • Granted 2022-05-10 • Published 2022-05-10
The systems and methods include UAVs for assisting carrier personnel by reducing the of the transportation and delivery process. Generally, a UAV (100) includes a UAV chass upper portion, a plurality of propulsion members (102) configured to provide lift ...

Forward facing imaging system

EP US AT BE • US9827918B2 • Barry W. Hutzel • Donnelly Corporation
Priority 1999-11-24 • Filed 2012-01-19 • Granted 2017-11-28 • Published 2017-11-28
A forward facing imaging system for a vehicle includes an interior rearview mirror asser interior portion of a vehicle and a camera disposed at the interior rearview mirror assem forward field of view through a windshield of the vehicle. The camera captures ...

Mobility device

US • US11679044B2 • Stewart M. Coulter • Deka Products Limited Partnership
Priority 2016-02-23 • Filed 2020-12-01 • Granted 2023-06-20 • Published 2023-06-20
A powered balancing mobility device that can provide the user the ability to safely navig environments of daily living including the ability to maneuver in confined spaces and to and other obstacles, and to travel safely and comfortably in vehicles. The mobility ...

Mobile robot platform

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 041

US · US7348747B1 · Daniel Theobold · Vecna

Priority 2006-03-30 · Filed 2006-03-30 · Granted 2008-03-25 · Published 2008-03-25

A mobile articulated robot platform is provided where the platform comprises a payloac attaching a torso, the platform having two opposing sides, where the platform includes and a left leg assembly, with each leg assembly having an upper leg and a lower ...

Methods of photo matching and photo confirmation for parcel pickup anc

US · US11472552B2 · Julio Gil · United Parcel Service Of America, Inc.

Priority 2016-04-29 · Filed 2020-06-19 · Granted 2022-10-18 · Published 2022-10-18

Systems and methods include UAVs that serve to assist carrier personnel by reducing tl of the transportation and delivery process. A UAV generally includes a UAV chassis incl portion, a plurality of propulsion members configured to provide lift to the UAV chassis,

Rearview mirror assembly for vehicle

WO US · US10829052B2 · John T. Uken · Donnelly Corporation

Priority 2003-05-19 · Filed 2019-10-21 · Granted 2020-11-10 · Published 2020-11-10

A vehicular interior rearview mirror assembly includes a prismatic mirror reflective elem substrate with a planar front surface and a circumferential edge along the periphery of t plastic molding is circumferentially disposed about the circumferential edge of ...

Monitoring using cellular phones

US · US8014789B2 · David S. Breed · Intelligent Technologies International, Inc.

Priority 2002-06-11 · Filed 2007-10-30 · Granted 2011-09-06 · Published 2011-09-06

Method for locating a cell phone or PDA, e.g., arranged in or on a movable asset, include information at the cell phone or PDA relating to reception of signals, transmitting the inf cell phone or PDA to a remote facility and determining the location of the cell phone or .

Remote monitoring of fixed structures

US · US8384533B2 · David S. Breed · Intelligent Technologies International, Inc.

Priority 2002-06-11 · Filed 2007-10-26 · Granted 2013-02-26 · Published 2013-02-26

Arrangement and method for monitoring a structure at a fixed location, e.g., a house, pa airplane, includes a monitoring or sensor system arranged to obtain information about t exterior of the structure and/or an interior of the structure different than the ...

Perimeter monitoring techniques

US · US7961094B2 · David S. Breed · Intelligent Technologies International, Inc.

Priority 2002-06-11 · Filed 2007-11-29 · Granted 2011-06-14 · Published 2011-06-14

Method for monitoring borders or peripheries of installations includes arranging sensor the border at least partially in the ground, the sensors being sensitive to vibrations, infra or other disturbances, programming the sensors to wake-up upon detection of ...

Asset system control arrangement and method

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 042

US • US7663502B2 • David S. Breed • Intelligent Technologies International, Inc.
Priority 1992-05-05 • Filed 2004-09-13 • Granted 2010-02-16 • Published 2010-02-16
System and method for wirelessly controlling systems in an asset, such as a house or t movable device, such as a PDA, cellular telephone or vehicle, includes a transmitter arra signals, and a control unit is arranged on or in connection with the asset and includes ...

Sensor assemblies

US • US7089099B2 • Oleksandr T. Shostak • Automotive Technologies International, Inc.
Priority 2004-07-30 • Filed 2005-08-22 • Granted 2006-08-08 • Published 2006-08-08
Sensor assembly capable of obtaining and providing a measurement of a physical quar measurement of temperature and/or pressure of a vehicular tire, includes an antenna c radio frequency signal, a radio frequency identification (RFID) device coupled to the ant

Mobility Device

US • US20210276540A1 • Susan D. Dastous • Deka Products Limited Partnership
Priority 2016-02-23 • Filed 2021-01-15 • Published 2021-09-09
A powered balancing mobility device that can provide the user the ability to safely navig environments of daily living including the ability to maneuver in confined spaces and to and other obstacles, and to travel safely and comfortably in vehicles. The mobility ...

Mobility device

US • US11399958B2 • David E. Collins • Deka Products Limited Partnership
Priority 2016-02-23 • Filed 2018-07-13 • Granted 2022-08-02 • Published 2022-08-02
A powered balancing mobility device that can provide the user the ability to safely navig environments of daily living including the ability to maneuver in confined spaces and to and other obstacles, and to travel safely and comfortably in vehicles. The mobility ...

Asset monitoring using the internet

US • US8482399B2 • David S. Breed • Intelligent Technologies International, Inc.
Priority 2000-09-08 • Filed 2010-02-12 • Granted 2013-07-09 • Published 2013-07-09
Asset including an arrangement for monitoring objects in an interior of the asset includ arranged on or in the asset to obtain data about the asset or an object in the asset and system arranged on the asset and coupled to the sensor system. The communication ...

Torque arm assembly for a motorized wheel

US • US9884548B2 • Assaf Biderman • Superpedestrian, Inc.
Priority 2014-04-04 • Filed 2015-11-24 • Granted 2018-02-06 • Published 2018-02-06
A support block for a torque arm on a vehicle can include a first indentation and a secor having an opening adapted to accept a portion of a torque arm, the first indentation and indentation each having a relief cut opposite the opening into which a portion of a torqu

System for obtaining vehicular information

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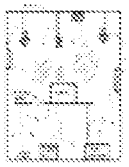
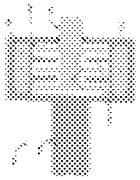


US · US7421321B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 1995-06-07 · Filed 2005-03-17 · Granted 2008-09-02 · Published 2008-09-02
System for obtaining information about a vehicle or a component therein includes sens generate and transmit a signal upon receipt and detection of a radio frequency (RF) sig element, switchable directional antenna array. Each antenna element is directed toward

Dynamic motion control system using magnetorheological fluid clutch ap



WO EP US CN CA · CN107614297B · 吉恩·豪巴斯蒂安·普兰特 · 埃索欧耐迪克赫动力
Priority 2015-05-26 · Filed 2016-05-26 · Granted 2021-05-07 · Published 2021-05-07
An active suspension system comprising: at least one biasing device configured to sup structure; and at least one motor. A Magnetorheological (MR) fluid clutch apparatus is c one motor to receive torque therefrom, the MR fluid clutch apparatus ...

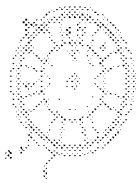
Cargo theft prevention system and method

WO US · US9033116B2 · David S. Breed · Intelligent Technologies International, Inc.
Priority 2011-03-14 · Filed 2013-09-11 · Granted 2015-05-19 · Published 2015-05-19
Arrangement and method for monitoring a structure at a fixed location, e.g., a house, pa airplane, includes a monitoring or sensor system arranged to obtain information about t exterior of the structure and/or an interior of the structure different than the ...

Devices and methods of thermal management for a motorized wheel

US · US10005317B2 · Assaf Biderman · Superpedestrian, Inc.
Priority 2014-04-04 · Filed 2015-11-24 · Granted 2018-06-26 · Published 2018-06-26
A method of thermal management for an electrically motorized wheel, the method can i thermally conductive path from at least one component, the at least one component be operation of the electrically motorized wheel, providing the path with a thermally ...

Apparatus and method for a motor vehicle wheel



WO EP US CN JP CA · CN107206907B · A·拜德曼 · 极步公司
Priority 2014-11-24 · Filed 2015-11-24 · Granted 2020-02-14 · Published 2020-02-14
The present invention relates to a user interface, a torque arm assembly, a method of as wheel, a battery maintenance method and a method for thermal management, respecti vehicle wheel.

Technique for ensuring safe travel of a vehicle or safety of an occupant ...

US · US8768573B2 · David S. Breed · American Vehicular Sciences, LLC
Priority 2003-08-11 · Filed 2012-10-11 · Granted 2014-07-01 · Published 2014-07-01
Vehicle with an occupant safety system includes an occupant safety system designed t occupant during an accident involving the vehicle and a processor coupled to the safety receives at least one inertial property of the vehicle and information about a portion ...

Method of reinforced cementitious constrauction by high speed extrusior

Revvo's Exhibit 1002
Revvo v. Cerebrum
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WO EP US CN JP KR AU BR CA CL EA IL MA SA SG TN ZA • US20180071949A1 • Brian C
Priority 2016-09-14 • Filed 2017-09-13 • Published 2018-03-15
The present invention relates to methods and apparatuses for an automated reinforced construction system for onsite slip-form molding and casting a variety of cementitious place leave in place externally moldable flexible reinforced containment sleeve providin

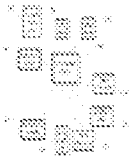
Arrangement for sensing weight of an occupying item in vehicular seat

US • US8820782B2 • David S. Breed • American Vehicular Sciences Llc
Priority 1995-06-07 • Filed 2012-08-03 • Granted 2014-09-02 • Published 2014-09-02
Vehicle including a seat support structure, a cushion arranged thereon and having an up supporting an occupying item and that deflects downward as a function of weight of th a sensor system including a force-measuring device that responds to downward deflect

Wireless transmission system for vehicular component control and monit

US • US8169311B1 • David S. Breed • Automotive Technologies International, Inc.
Priority 1999-12-15 • Filed 2007-03-05 • Granted 2012-05-01 • Published 2012-05-01
Vehicle with wireless sensors includes a frame, at least one sensor assembly fixed to th including a sensor arranged to obtain data about a condition or property of the vehicle o environment in or around the vehicle, and a wireless transmission component coupled .

Coastal monitoring techniques



US • US8581688B2 • David S. Breed • Intelligent Technologies International, Inc.
Priority 2002-06-11 • Filed 2007-11-12 • Granted 2013-11-12 • Published 2013-11-12
Method and system for monitoring coastlines includes arranging sensors proximate the data about the coastline via the sensors, analyzing the data to determine the presence o condition relating to passage of an object proximate the coastline, and transmitting the

Positioning device

WO EP US JP KR • EP2845052B1 • Michael Scott SHANNAHAN • Threat Spectrum Inc.
Priority 2012-04-30 • Filed 2013-04-30 • Granted 2018-01-17 • Published 2018-01-17
A positioning device (101; 201; 301; 401) comprising: a housing (111; 211; 311) having volume; a flat-mount turntable bearing (131,391) mounted within the hollow centre volu (111; 211; 311), the first flat-mount turntable having an inner ring (133), an outer ring (...

Vehicle component control methods and systems

US • US9593521B2 • David S. Breed • American Vehicular Sciences Llc
Priority 1995-06-07 • Filed 2015-04-14 • Granted 2017-03-14 • Published 2017-03-14
Control system for controlling at least one part of a vehicle includes a plurality of senso different locations on the vehicle, each sensor system providing a measurement related system or a measurement related to a state of the mounting location. A processor ...

Tire monitoring with passive and active modes

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 045

US • US7760080B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 2000-09-08 • Filed 2006-07-13 • Granted 2010-07-20 • Published 2010-07-20
Movable vehicular assembly including an electricity generating system includes a mova
a tire, a power generating system arranged on, in connection with or within the substrat
energy from movement of the substrate, and a circuit coupled to the power generating .

Vehicular component control using wireless switch assemblies

US • US7889096B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 2000-09-08 • Filed 2007-02-22 • Granted 2011-02-15 • Published 2011-02-15
Control system for controlling adjustable components in a vehicle using wireless switch
input devices which provide input to the control system to enable the control system to
components based on the input. The control system includes an interrogator arranged t

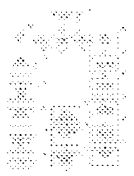
Augmented Reality Display Systems With Variable, Directional Light Trans

US • US20200026076A1 • Christopher V. Beckman • Christopher V. Beckman
Priority 2011-12-14 • Filed 2019-07-02 • Published 2020-01-23
New augmented reality display systems are provided, including a new form of mediated
known as shifted-reality techniques. In some embodiments, an augmented reality displ
matrix of light-augmenting pixels within a variable-transmission, semi-transparent scree

Vehicle computer design and use techniques for receiving navigation sof

US • US10573093B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 1995-06-07 • Filed 2007-11-15 • Granted 2020-02-25 • Published 2020-02-25
Vehicle with computer networking capability includes a display visible to an occupant o
board computer coupled to the display; and a communications device for enabling the c
communicate with other computers apart from the vehicle via a communications netwo

Smart Interactive and Autonomous Robotic Property Maintenance Appar



US • US20180035606A1 • Romello Burdoucci • Romello Burdoucci
Priority 2016-08-05 • Filed 2016-08-05 • Published 2018-02-08
The present invention relates to an intelligent interactive apparatus, system and metho
property trimming and cutting tools such as pole saws, lawnmowers or unmanned aeri
particularly, the present invention relates to a pole saw or autonomous lawnmower with

Method and system for generating exchangeable user profiles

US • US20160277528A1 • Sam Guilaume • Invensense, Inc.
Priority 2015-03-16 • Filed 2016-03-16 • Published 2016-09-22
A profile of a user may be constructed having at least one profile entry. A device having
assembly including at least one sensor may be associated with the user and operated a
configuration. Sensor data may be processed to extract a feature. Entry data may ...

Self-powered tire monitoring system

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 046

US • US7603894B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 2000-09-08 • Filed 2007-10-30 • Granted 2009-10-20 • Published 2009-10-20
Vehicular tire monitoring system includes an energy providing system arranged on the t
system arranged on the tire and coupled to the energy providing system to be provided
energy providing system. The sensor system obtains data about at least one property o

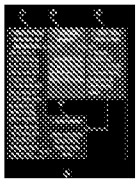
Vehicular tire monitoring based on sensed acceleration

US • US7693626B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 2000-09-08 • Filed 2007-02-22 • Granted 2010-04-06 • Published 2010-04-06
Vehicle with tire monitoring capabilities includes at least one wheel, each including a rir
the rim, a sensor system for sensing angular, radial, tangential and/or lateral acceleratic
providing acceleration signals based thereon, and an antenna arranged on the ...

Switch assemblies and method for controlling vehicular components

US • US7880594B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 2000-09-08 • Filed 2006-07-03 • Granted 2011-02-01 • Published 2011-02-01
Vehicle including a switch assembly includes a vehicular component subject to control
passenger compartment, and a switch assembly for controlling the component based c
the occupant of the vehicle to an exposed surface of the vehicle. The switch assembly .

Autonomous media capturing

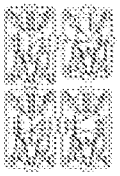


US • US20230156319A1 • Robert John Gove • Robert John Gove
Priority 2014-11-03 • Filed 2022-11-01 • Published 2023-05-18
A media capture device (MCD) that provides a multi-sensor, free flight camera platform
learning technology to replicate the desires and skills of the purchaser/owner is provide
algorithms may uniquely enable many functions for autonomous and revolutionary phot

System and method for controlling a bicycle trainer

EP US TW • US11090542B2 • Harold M. Hawkins, III • Wahoo Fitness Llc
Priority 2012-08-27 • Filed 2018-08-13 • Granted 2021-08-17 • Published 2021-08-17
A system and method for controlling an exercise device are provided herein. The systen
having computer-executable instructions and at least one processor to execute the com
instructions to wirelessly connect the exercise device, receive a training mode, receive a

Transportation system of combined vehicles multi-coupled at highway sp



~~US~~ • US9527394B1 • Dershuen Allen Tang • Dershuen Allen Tang
Priority 2013-05-02 • Filed 2015-02-14 • Granted 2016-12-27 • Published 2016-12-27
The transportation system in this invention provides vehicle coupling units which allow
connections and reconfigurations of two or more vehicles together at highway speeds.
provides for the bidirectional exchange of electrical power between these vehicles to m

Sensor Device And Modular Unit Therefor

WO EP US CN ~~KR~~ DE • CN104675270B • 托马斯·埃格斯 • 霍弗·霍斯贝克及弗斯特两合公司
Priority 2009-07-17 • Filed 2010-07-16 • Granted 2017-05-03 • Published 2017-05-03

The invention relates to a modular unit (10) comprising a sensor device (11) for actuating a movable particular a flap (1) of a motor vehicle. Said unit comprises a support element (12), on which the sens comprising at least one sensor (21, 22, 23) is situated, in ...

System and method for controlling a bicycle trainer

US • US10576348B1 • Harold M. Hawkins, III • Wahoo Fitness, LLC

Priority 2012-08-27 • Filed 2017-09-22 • Granted 2020-03-03 • Published 2020-03-03

A system and method for controlling an exercise device are provided herein. The systen having computer-executable instructions and at least one processor to execute the com instructions to wirelessly connect the exercise device, receive a training mode, receive a

Wheel-mounted tire pumping and energy generating system and method

US • US7408453B2 • David S. Breed • Automotive Technologies International, Inc.

Priority 2001-02-16 • Filed 2006-05-04 • Granted 2008-08-05 • Published 2008-08-05

Wheel for a vehicle includes a wheel rim, a tire mounted on the wheel rim to define an in compartment, a pump for pumping air into the compartment, and an energy generating energy upon rotation of the wheel to power the pump and cause the pump to pump air ...

Automatic vehicle equipment monitoring, warning, and control system

WO EP US CN • EP2539197B1 • Jon H. Bechtel • Gentex Corporation

Priority 2010-02-26 • Filed 2011-02-25 • Granted 2020-12-16 • Published 2020-12-16

An automatic vehicle equipment control system (106) comprising: at least one imager c continuous sequence of high dynamic range single frame images, and said at least one pixel array; a processor in communication with said at least one imager, and ...

Tire monitoring techniques

US • US7467034B2 • David S. Breed • Automotive Technologies International, Inc.

Priority 2002-11-04 • Filed 2006-10-30 • Granted 2008-12-16 • Published 2008-12-16

Method for obtaining information about tires on a vehicle includes arranging a tire moni arranging an interrogator on the vehicle, arranging antennas on the vehicle, each antenn from one another and associated with some tires and further being spaced different ...

Vehicle with crash sensor coupled to data bus

US • US7527288B2 • David S. Breed • Automotive Technologies International, Inc.

Priority 1995-06-07 • Filed 2006-09-05 • Granted 2009-05-05 • Published 2009-05-05

Vehicle including sensors one of which is a motion-detecting crash sensor, a processing processing data generated by the sensors, the module being separate from most if not a data bus coupling the sensors and the module together and enabling transfer of data

Autonomous surface cleaning robot for wet and dry cleaning

Revvo's Exhibit 1002
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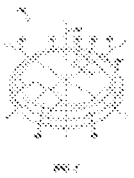


WO EP US JP KR AT AU DE DK ES · EP2289384B1 · Andrew Ziegler · iRobot Corporation
Priority 2005-02-18 · Filed 2006-02-21 · Granted 2013-07-03 · Published 2013-07-03
A surface treatment robot (100), comprising: a robot body (200) having an outer perime substantially as a shape of constant width, driven forward by at least one circulating me material compartment (S) that holds material to be dispensed by the robot (100); a wet

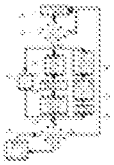
System and method for vehicle diagnostics

US · US7103460B1 · David S. Breed · Automotive Technologies International, Inc.
Priority 1994-05-09 · Filed 2005-09-06 · Granted 2006-09-05 · Published 2006-09-05
Method and system for diagnosing whether vehicular components are operating abnorr obtained from sensors arranged on a vehicle. In a training stage, output from the senso operation of the components is obtained, each component is adjusted to induce abnorr

Tire-mounted energy generator and monitor

US · US7493227B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 2001-02-16 · Filed 2006-05-08 · Granted 2009-06-23 · Published 2009-06-23
Tire monitoring arrangement including at least one tire condition sensor arranged on th condition of the tire and an energy generating mechanism or device arranged on the tre generating electricity upon rotation of the tire. The energy generating mechanism is ...

Vehicle diagnostic and prognostic methods and systems



US · US8019501B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 1995-06-07 · Filed 2007-08-02 · Granted 2011-09-13 · Published 2011-09-13
Method for predicting failures in vehicular components includes mounting sensors on t provide data affected by the operation of the components, obtaining data from the sens patterns in the obtained data on the vehicle, analyzing the detected patterns to predict ..

Vehicle communications using the internet

US · US7672756B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 1995-06-07 · Filed 2006-06-01 · Granted 2010-03-02 · Published 2010-03-02
Vehicle including a data generating system which obtains or generates information abo communications system coupled to the data generating system for communicating dire Internet service provider (ISP) to enable the information obtained or generated by the ...

Information management and monitoring system and method

US · US7630802B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 1995-06-07 · Filed 2006-06-05 · Granted 2009-12-08 · Published 2009-12-08
Information management and monitoring system and method for monitoring compone its operation includes a monitoring system including sensors for monitoring the compo thereof, and a processing module arranged on the vehicle and to receive and process d

Auxiliary device for moving

WO EP US CN JP · CN104540489B · 罗伯特·卡尔·盖维奇 · 罗伯特·卡尔·盖维奇
Priority 2012-08-17 · Filed 2013-08-08 · Granted 2018-04-03 · Published 2018-04-03

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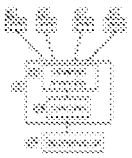
A kind of mobile auxiliary equipment includes：It is placed in the left side of user and first and secon side；It is linked to the hinge arm mechanism of the first and second frameworks；And it is linked to or walking seat of framework; so that from least a ...

Method and system for obtaining information about RFID-equipped objec



US • US7911324B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 2001-02-16 • Filed 2007-05-30 • Granted 2011-03-22 • Published 2011-03-22
Method and arrangement for obtaining information about a radio-frequency identificatic object on which the RFID device is mounted when the RFID device is in a space defined arranging a plurality of antennas on the frame to enable transmission of signals ...

Controller and method and vehicle for controlling the operation of an unm

WO EP US CN JP • JP6062079B2 • ミンユワン, • エスゼットディージェイアイ テクノロジー カンパ
Ｄｊｉ Ｔｅｃｈｎｏｌｏｇｙ Ｃｏ．，Ｌｔｄ
Priority 2014-05-30 • Filed 2014-05-30 • Granted 2017-01-18 • Published 2017-01-18
A controller for controlling the operation of an unmanned air transport aircraft (UAV), the controller co more user input components, wherein the one or more user input components are in or on a vehicle a of water; Receiving said signals from a user input ...

Vehicle diagnostic techniques

US • US8024084B2 • David S. Breed • Automotive Technologies International, Inc.
Priority 1995-06-07 • Filed 2007-10-31 • Granted 2011-09-20 • Published 2011-09-20
Vehicle with diagnostic capability includes different vehicle-resident sensors, each prov related to a state of the sensor or a measurement related to a state of the mounting loc vehicle-resident diagnostic processor coupled to the sensors and arranged to ...

Unmanned air transport storage device, vehicle, and method for storing u

JP • JP6445510B2 • ミンユワン, • エスゼットディージェイアイ テクノロジー カンパニー リミテ
ｃｈｎｏｌｏｇｙ Ｃｏ．，Ｌｔｄ
Priority 2016-12-13 • Filed 2016-12-13 • Granted 2018-12-26 • Published 2018-12-26
An unmanned air transport (UAV) storage device, A mounting component configured to be attached t connection component configured to form a connection with the UAV to prevent detachment of the U storage device; A cover configured to at least partially surround ...

System and method for automatically updating the software of a network

WO EP US JP KR AU TW • US8839224B2 • Steven Michael Adler • Bby Solutions, Inc.
Priority 2006-08-24 • Filed 2012-08-28 • Granted 2014-09-16 • Published 2014-09-16
A method for automatically updating software executed by an electronic device is disclo method includes receiving, at the electronic device, an update indication from a server t is available for the electronic device. The method further includes modifying, in ...

Management of biomechanical achievements

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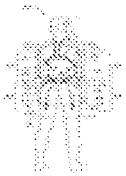


US • US20190282131A1 • Andrew Robert Chang • Seismic Holdings, Inc.
Priority 2018-03-15 • Filed 2019-03-15 • Published 2019-09-19
Systems and methods and media for managing biomechanical achievements are provic other suitable sensor assembly worn by a user can be utilized by a system to monitor s factors that may characterize the user's movement and any changes in the user's move

Integration of Customer-Stored Information with Media Enabled Shoppinç

US • US20200211088A1 • Saul Stawar • Media Cart Holdings, Inc
Priority 2007-03-26 • Filed 2020-03-10 • Published 2020-07-02
A media enhanced shopping cart system comprises a shopping cart comprising a fram a base tray, a plurality of wheels, a read component for performing a proximity scan of t locationing component for determining a location of the shopping cart within a store ...

Media enhanced shopping systems with data mining functionalities

US • US11538090B2 • Steve Carpenter • Media Cart Holdings, Inc.
Priority 2007-03-26 • Filed 2021-03-09 • Granted 2022-12-27 • Published 2022-12-27
A media enhanced shopping cart system comprises a shopping cart, a locationing com component for displaying at least one advertisement for a product based on the locatio within the store, wherein the locationing component is further operable to determine ...

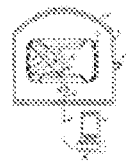
Breast pump system

WO EP US CN JP AU CA DE SG • CN215798371U • 乔纳森·奥雷尔 • 奇亚梦科技有限公司
Priority 2017-06-15 • Filed 2018-06-15 • Granted 2022-06-24 • Published 2022-06-24
The utility model relates to a self-contained wearable breast pump in a breast shield, co housing containing a rechargeable battery, control electronics, and an air pump; (b) a br comprising a flange and a nipple tunnel; (c) a diaphragm retaining portion located on a .

Wireless sensing and communication system for traffic lanes

US • US9014953B2 • David S. Breed • Intelligent Technologies International, Inc.
Priority 2000-09-08 • Filed 2008-01-28 • Granted 2015-04-21 • Published 2015-04-21
Wireless sensing and communication system including sensors located on the vehicle, the vicinity of the vehicle or roadway and which provide information which is transmitte interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate

Non-destructive testing and imaging



WO US • US7436504B2 • Eugene L. Shaw • Shear Graphics, Llc
Priority 2003-09-10 • Filed 2005-02-25 • Granted 2008-10-14 • Published 2008-10-14
A method of non-destructive testing includes non-destructively testing an object over a directing coherent light onto the object, directly receiving the coherent light substantiall from the object, and capturing the reflected coherent light over the ...

System for controlling vehicle equipment

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US · US8120652B2 · Jon H Bechtel · Gentex Corporation
Priority 1997-04-02 · Filed 2008-09-16 · Granted 2012-02-21 · Published 2012-02-21
A system for automatically controlling vehicle equipment includes a controller to gener
The control signals are derived based on information obtained from the image sensor a
detected parameters pertaining to the detected light source(s), the vehicle having the ...

Vehicle diagnostic or prognostic message transmission systems and me

US · US8036788B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 1995-06-07 · Filed 2007-08-09 · Granted 2011-10-11 · Published 2011-10-11
System and method for monitoring the condition of a vehicle includes a communicatior
interface with a wireless communications network, at least one sensor for monitoring a
component or subsystem of the vehicle and which is coupled to the communications ur

Vehicle component control methods and systems based on vehicle stabil

US · US8060282B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 1995-06-07 · Filed 2007-08-02 · Granted 2011-11-15 · Published 2011-11-15
Control system for controlling at least one part of a vehicle includes sensor systems me
each providing a measurement of a state of the sensor system or a state of the mountir
sensor system and generating a signal representative of the measurement, and a ...

Side-by-side vehicle

US · US10246153B2 · Aaron D. Deckard · Polaris Industries Inc.
Priority 2012-10-11 · Filed 2013-10-11 · Granted 2019-04-02 · Published 2019-04-02
The present invention relates to all terrain vehicles having at least a pair of laterally spac
surfaces.

Patient interface

WO EP US CN JP NZ · CN108348722B · A·S 阿马拉辛哈 · 瑞思迈私人有限公司
Priority 2015-09-23 · Filed 2016-09-23 · Granted 2021-07-16 · Published 2021-07-16
A patient interface, comprising: a frame assembly (16100) including a connector operat
headband; a bumper assembly (16175) including a housing (161800) and a seal-formin
configured to form a seal with a patient's nose and/or mouth; and an air delivery connec

Interior rearview mirror system for vehicle

EP US AT DE · US7926960B2 · Timothy G. Skiver · Donnelly Corporation
Priority 1999-11-24 · Filed 2009-12-07 · Granted 2011-04-19 · Published 2011-04-19
An interior rearview mirror system for a vehicle includes a mirror assembly having a vari
element. The variable reflectance element includes a metallic mirror reflector on one sic
the metallic mirror reflector being partially transmissive to visible light. The ...

Reproducing method for battery module

WO EP US CN · CN105431973B · 佩里·M·怀亚特 · 约翰逊控制技术公司
Priority 2013-07-30 · Filed 2014-03-12 · Granted 2019-05-03 · Published 2019-05-03

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This application discloses the various methods for remanufacturing used battery module and includir battery module remanufactured of new and used component.Battery module remanufacture and usec power assembly with the stacking of battery cell assemblies, ...

On-board tool tracking system and methods of computer assisted surger

WO EP US CN JP AU ~~CA~~ • AU2017201866B2 • Ibrahim Al-Shawi • Board Of Regents Of The University

Priority 2011-06-27 • Filed 2017-03-20 • Granted 2018-10-18 • Published 2018-10-18

Abstract for 2017201866 An on tool tracking and guidance device for use with a surgical tool during a surgical procedure, comprising: a housing defining an enclosure and having a surface for releasable e portion of the surgical tool; a first camera and a second ...

Systems and methods for martial arts training devices with force, pressu

WO EP US JP BR CA DK ~~EA~~ ES *IL* MX *PL PT* • ES2741023T3 • David Daniels • David Daniels

Priority 2013-03-15 • Filed 2014-03-18 • Granted 2020-02-07 • Published 2020-02-07

A training device, comprising: a set of simulated human body parts, including one or more than one a shape, weight, and density: head, neck, leg, arm, hand, foot, or torso, wherein at least one of the set of includes a simulated mechanical or ...

Wireless coded communication (WCC) devices for tracking retail interacti

US • US9911290B1 • Gary M. Zalewski • Gary M. Zalewski

Priority 2015-07-25 • Filed 2016-12-12 • Granted 2018-03-06 • Published 2018-03-06

Devices, systems, and method are provided for tracking items in a store for processing purchase transaction. In one example, a method includes receiving sensor data regardi with shelves of a store. The method also includes identifying a user entering the store.

System and method for managing container or its content

WO CN JP KR AU ~~CA~~ *CL PE PH* • CN105934395B • R.迪亚斯 • 膳魔师有限公司

Priority 2013-11-07 • Filed 2014-11-06 • Granted 2019-02-05 • Published 2019-02-05

Specific embodiment of the invention includes retainer, lid and sensor, wherein the sensor is configure the detection in relation to the content in the retainer, the lid or the retainer.The sensor can also be co communicate with internal or external computer system, ...

Vehicular restraint system control system and method using multiple opti

US • US7164117B2 • David S. Breed • Automotive Technologies International, Inc.

Priority 1992-05-05 • Filed 2004-08-31 • Granted 2007-01-16 • Published 2007-01-16

System and method for obtaining information about occupancy of a compartment in a which at least first and second optical imagers obtain images of a common area of the spaced apart from one another. Processing circuitry derives information from the image

Revvo's Exhibit 1002
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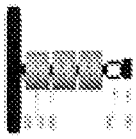
Apparatus and method for rapidly deflating tires to disable a land vehicle



US · US9340935B2 · Mynor J. Castro · Pacific Scientific Energetic Materials Company (
Priority 2008-10-06 · Filed 2015-08-10 · Granted 2016-05-17 · Published 2016-05-17
An apparatus and a method for disabling a ground engaging traction device of a land ve one penetrator configured to breach the traction device, an articulated strap configured apparatus between a retracted arrangement and an extended arrangement, a mass ...

Dynamic stead LIDAR adapted to the shape of the vehicle

WO US JP GB · JP6860656B2 · オキーフェ, ジェームス · オキーフェ, ジェームスO'KEE
Priority 2016-05-18 · Filed 2017-05-15 · Granted 2021-04-21 · Published 2021-04-21
A laser range finder placed in a vehicle that has a field of view, Beam guide and it is a sy The beam guide The first end that receives the laser beam in the input direction from th and A lens provided at the second end of the beam guide for sending a laser ...

Electric bicycle

US CN GB MX RU · CN105314034B · 詹姆斯·诺伊格鲍尔 · 福特全球技术公司
Priority 2014-08-01 · Filed 2015-07-31 · Granted 2020-03-20 · Published 2020-03-20
A bicycle includes a frame including first and second sections pivotable relative to each folded position and an unfolded position. The first section has a first face and the secor second face facing the first face in the open position. The hinge is disposed between ...

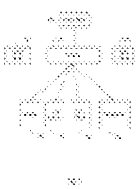
Telematics system

US · US7050897B2 · David S. Breed · Automotive Technologies International, Inc.
Priority 1992-05-05 · Filed 2004-03-22 · Granted 2006-05-23 · Published 2006-05-23
Vehicle telematics system including an occupant sensing system arranged to determin properties or characteristics of occupancy of the vehicle, a crash sensor system for det vehicle experiences a crash and a communications device arranged to enable a commu

3 D-printing system and apparatus assembly

WO EP US CN JP KR AU BR CA DK ES *HK IN MX* RU · CN104640686B · J 于 · 阿普雷奇亚制药公司
Priority 2012-09-05 · Filed 2013-08-30 · Granted 2018-01-30 · Published 2018-01-30
Provide a kind of 3 D-printing system and apparatus assembly for being used to manufacture 3 D-prin assembly includes 3 D-printing constructing system, optionally de- liquid system and optional harvest system.Constructing system includes conveyer, multiple structure ...

Autonomous coverage robot with liquid applicator



WO EP US · EP2661209B1 · JR Duane L. GILBERT · iRobot Corporation
Priority 2011-01-03 · Filed 2011-12-29 · Granted 2016-12-28 · Published 2016-12-28
A surface treatment robot (10) comprising: a robot body (100) having a forward portion the forward portion preceding the rear portion as the robot (10) moves in a forward dire surface; a differential drive system mounted on the robot body and configured to ...

Wearable devices for protecting against musculoskeletal injuries and enh

Revvo's Exhibit 1002
Revvo v. Cerebrum
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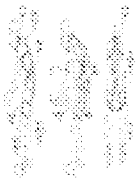

WO EP US CN JP KR CA • US20210007874A1 • Ignacio Galiana Bujanda • President And College

Priority 2018-02-17 • Filed 2019-02-15 • Published 2021-01-14

Wearable devices protect against musculoskeletal injuries and enhance performance. S provide wearable devices to assist with human motion during physical activities, such a movements (e.g., lifting) and holding static poses (e.g., crouching, or holding a tool whil

The computing device and method being used together with lighting ...

WO EP US CN JP KR AU BR CA EA HK IN MX • CN104662999B • 休·马丁 • 赛西蒂系统股份有限公司

Priority 2012-06-12 • Filed 2013-06-12 • Granted 2018-09-18 • Published 2018-09-18

The present invention relates to the method, apparatus and system for implementing lighting infrastru framework and network and associated based revenue model.In one embodiment, computing device request of data of the access from lighting infrastructure application ...

The equipment and system of model are used for generating vehicle

US CN DE • CN105139475B • 刘亿民 • 福特全球技术公司

Priority 2014-06-03 • Filed 2015-06-02 • Granted 2019-06-25 • Published 2019-06-25

A kind of equipment and system using model for generating vehicle.A kind of vehicle computer syste being communicated with mobile device, and the vehicle computer system includes the wireless trans configured as being communicated with mobile device.The vehicle ...

Baseplate assembly for use with toy pieces

WO US CN JP KR CA • CN103930182B • 阿朱那·拉吉纳·卡鲁纳拉特纳 • 技术第一公司

Priority 2012-02-17 • Filed 2013-02-06 • Granted 2017-02-15 • Published 2017-02-15

A baseplate assembly, used with releasably coupleable playing pieces, includes a baseplate operably generating device. The baseplate includes a display region, having playing pieces coupling elements, transmitting images generated by the image generating device to ...

Movement monitoring, tracking with it is synchronous

WO EP US CN JP KR BR • CN104122994B • A·梅斯塔斯 • 耐克创新有限合伙公司

Priority 2013-02-22 • Filed 2014-02-24 • Granted 2018-06-05 • Published 2018-06-05

A kind of physical activity monitoring method and system can include requiring contest component o various measurement contests.The challenge can be specific for equipment, specific to Activity Type, etc..In some examples, only when described information is ...

Self-stabilizing skateboard

WO EP US JP KR CA • JP2022520781A • ショナサン・エルクセン、カイル・フューチャ コーポレイテッド

Priority 2019-02-11 • Filed 2020-01-29 • Published 2022-04-01

Self-stabilizing one-wheel electric skateboards may include improved features. In some vehicle includes a status indicator visible through a slot formed on the top surface of th embodiments, the vehicle comprises a variable carrying handle that can be transitioned

Wheel for non power driven vehicle

WO EP US CN BR CA ES • CN105008142B • 约翰·C·曼凯 • 霍门人系统公司

Priority 2013-03-06 • Filed 2014-02-25 • Granted 2017-07-28 • Published 2017-07-28

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One kind can include housing unit and tread package for the wheel of non power driven vehicle (for ex cart).Housing unit can be configured to holding electronic device or miscellaneous part in a sealing m can coordinate with housing unit in a removable manner so ...

Method and apparatus for vehicle maneuver planning and messaging

WO EP US CN KR TW · TW202106545A · 丹 法希洛夫斯基 · 美商高通公司

Priority 2019-04-29 · Filed 2020-04-16 · Published 2021-02-16

Techniques are provided which may be implemented using various methods and/or app to utilize vehicle external sensor data, vehicle internal sensor data, vehicle capabilities a input to determine, send, receive and utilize data elements to determine inter- ...

Elbow pipe assembly

WO EP US CN JP · CN108348723B · L·R·吉尔德斯届克 · 瑞思迈私人有限公司

Priority 2015-09-23 · Filed 2016-09-23 · Granted 2021-01-15 · Published 2021-01-15

A bent pipe component, comprising: a swivel part (6610) connected to the patient interf of spring arms (6650) and coupled to the elbow part (6620) by a ball joint and a hinge jo joint allowing pivoting about a single axis. The hinge joint prevents the elbow ...

Production, transport and use of prefabricated components in shoreline a

US · US7373892B2 · Sidney E. Veazey · Veazey Sidney E

Priority 2001-02-05 · Filed 2006-03-06 · Granted 2008-05-20 · Published 2008-05-20

Novel prefabricated structural components such as precast concrete boxes having form rectangular parallelepipeds and hexagonal cylinders are disclosed which can be assem with structural shapes disclosed in U.S. Pat. Nos. 5,697,736 and 5,697,473 to form wate

Multifunctional vehicle

WO EP US CN AU CA DK HK · CN104661903B · 亚当·J·施兰根 · 北极星工业有限公司

Priority 2012-09-20 · Filed 2013-09-20 · Granted 2017-11-10 · Published 2017-11-10

In one embodiment, multifunctional vehicle (1200) includes being configured to the multiple ground-e (6,10) for contacting ground and the powertrain assembly (600) for being operably coupled to ground member.Multifunctional vehicle also includes framework (1210), and the ...

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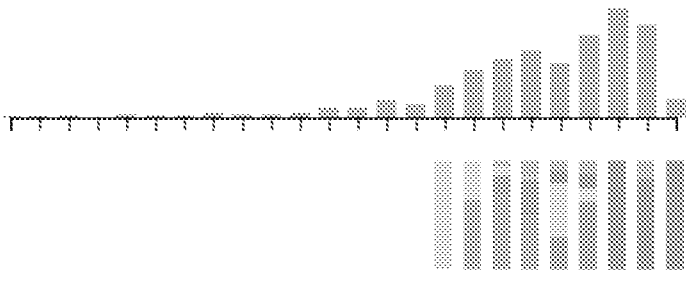

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Relative count of top 5 values

Assignees	Inventors
Automotive Technologies International, Inc.	
Intelligent Technologies International, Inc.	
Gentex Corporation	
Fox Factory, Inc.	
Media Cart Holdings, Inc.	

Expand

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	**Art Unit**
	JERMAINE L JENKINS	2855

CPC						
Symbol					**Type**	**Version**
G01M	/	17	/	02	F	2013-01-01
G01C	/	19	/	5783	I	2013-01-01
B60C	/	23	/	0422	I	2013-01-01
B60C	/	23	/	0488	I	2013-01-01
B60C	/	23	/	041	I	2013-01-01
G01S	/	19	/	01	I	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

/JERMAINE L JENKINS/ Examiner, Art Unit 2855	13 July 2023	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	57	
/PETER J MACCHIAROLO/ Supervisory Patent Examiner, Art Unit 2855	21 July 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230713

Revvo's Exhibit 1002
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	**Art Unit**
	JERMAINE L JENKINS	2855

INTERNATIONAL CLASSIFICATION					
CLAIMED					
G01M17/02	/	17	/	02	
G01C19/5783	/	19	/	5783	
B60C23/04	/	23	/	04	
G01S19/01	/	19	/	01	

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

/JERMAINE L JENKINS/ Examiner, Art Unit 2855	13 July 2023	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	57	
/PETER J MACCHIAROLO/ Supervisory Patent Examiner, Art Unit 2855	21 July 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20230713

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	**Art Unit**
	JERMAINE L JENKINS	2855

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	10	10	19	19	28	28	36	37	46	46	55	55		
2	2	11	11	20	20	29	29	37	38	47	47	56	56		
3	3	12	12	21	21	40	30	38	39	48	48	57	57		
4	4	13	13	22	22	30	31	39	40	49	49				
5	5	14	14	23	23	31	32	41	41	50	50				
6	6	15	15	24	24	32	33	42	42	51	51				
7	7	16	16	25	25	33	34	43	43	52	52				
8	8	17	17	26	26	34	35	44	44	53	53				
9	9	18	18	27	27	35	36	45	45	54	54				

/JERMAINE L JENKINS/ Examiner, Art Unit 2855 (Assistant Examiner)	13 July 2023 (Date)	**Total Claims Allowed:** 57	
/PETER J MACCHIAROLO/ Supervisory Patent Examiner, Art Unit 2855 (Primary Examiner)	21 July 2023 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No.: 20230713

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Revvo v. Cerebrum
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UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

125632 7590 07/27/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

EXAMINER
JENKINS, JERMAINE L

ART UNIT	PAPER NUMBER
2855	

DATE MAILED: 07/27/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,483	10/29/2020	Keith George Ferry	90608.01000	7585

TITLE OF INVENTION: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	10/27/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

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

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

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

125632 7590 07/27/2023
Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

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

Certificate of Mailing or Transmission

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

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,483	10/29/2020	Keith George Ferry	90608.01000	7585

TITLE OF INVENTION: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	10/27/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
JENKINS, JERMAINE L	2855	073-146800

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

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

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

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

1 _____
2 _____
3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

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

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via Patent Center or EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/084,483	10/29/2020	Keith George Ferry	90608.01000	7585

125632 7590 07/27/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

EXAMINER	
JENKINS, JERMAINE L	
ART UNIT	PAPER NUMBER
2855	

DATE MAILED: 07/27/2023

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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

PTOL-85 (Rev. 02/11)

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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

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

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

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

Notice of Allowability	Application No. 17/084,483	Applicant(s) Ferry, Keith George	
	Examiner JERMAINE L JENKINS	Art Unit 2855	AIA (FITF) Status Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to arguments filed on 05/22/2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-57 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/J.L.J/ Examiner, Art Unit 2855	/PETER J MACCHIAROLO/ Supervisory Patent Examiner, Art Unit 2855

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 065

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Arguments

2. Applicant's arguments, see Pages 12-18, filed 05/22/2023, with respect to claims 1-29 & 31-57 have been fully considered and are persuasive. The rejection of claims 1-29 & 31-57 has been withdrawn.

Allowable Subject Matter

3. Claims 1-57 are allowed.

4. The following is an examiner's statement of reasons for allowance: Regarding claim 1, the Applicant's arguments filed on 05/22/2023 are persuasive and examiner is withdrawing the 112, 102, 103 & nonstatutory double patenting rejections to Atty. Grant T. Langton. Since no other prior art has been found, the reasons for allowance are the same as recited in the Applicant's reply on Pages 12-18.

a) Regarding claims 28, 30 & 41, the reasons for allowance are the same as discussed for claim 1 above.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Breed et al (US 7693626 B2) – The present invention relates to a vehicle with tire monitoring capabilities including at least one wheel, each including a rim, a tire mounted on the rim, a sensor system for sensing angular, radial, tangential and/or lateral acceleration of the tire and providing acceleration signals based thereon, and an antenna arranged on the rim or tire and coupled to the sensor system for communicating data about the sensed acceleration. A processor receives acceleration signals provided by the sensor system and determines the existence of an anomaly in the tire based thereon. When arranged on the wheel, the processor provides a signal indicative or representative of the determination of the existence of the anomaly via the antenna to a receiving antenna which conveys it to a reactive system. The reactive system may provide a visual and/or audible warning to the driver of the vehicle or to personnel at a vehicle or tire monitoring facility.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JERMAINE L JENKINS whose telephone number is (571)272-2179. The examiner can normally be reached M-F 7-3 EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Macchiarolo can be reached on 571-272-2375. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J.L.J/
Examiner, Art Unit 2855

/PETER J MACCHIAROLO/
Supervisory Patent Examiner, Art Unit 2855

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	Art Unit
	JERMAINE L JENKINS	2855

CPC - Searched*		
Symbol	Date	Examiner
SEE SEARCH HISTORY FOR CPC	11/08/2022	JJ
SAME AS ABOVE	07/13/2023	JJ

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Conducted PE2E SEARCH, TEXT SEARCH, INVENTOR NAME SEARCH, IP.COM, SIMILARITY SEARCH, GOOGLE PATENTS, Consulted with A. ALLEN on allowability, See SEARCH HISTORY	11/08/2022	JJ
SAME AS ABOVE	07/13/2023	JJ

/J.L.J/ Examiner, Art Unit 2855	/PETER J MACCHIAROLO/ Supervisory Patent Examiner, Art Unit 2855

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	Art Unit
	JERMAINE L JENKINS	2855

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
G01M	17/02	07/13/2023	JJ
B60C	23/041, 23/0422, 23/0488	07/13/2023	JJ
G01C	19/5783	07/13/2023	JJ
G01S	19/01	07/13/2023	JJ

/J.L.J/ Examiner, Art Unit 2855	/PETER J MACCHIAROLO/ Supervisory Patent Examiner, Art Unit 2855

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Revvo v. Cerebrum
IPR2025-00632 - Page 070

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

	1	International Preliminary Report on Patentability dated May 3, 2022 in corresponding International Application No. PCT/US2020/058402 filed October 30, 2020; total 14 pages.

If you wish to add additional non-patent literature document citation information please click the Add button [Add]

EXAMINER SIGNATURE

Examiner Signature	/JERMAINE L JENKINS/	Date Considered	07/12/2023

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-03-28
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 074

Notice of References Cited	Application/Control No. 17/084,483	Applicant(s)/Patent Under Reexamination Ferry, Keith George	
	Examiner JERMAINE L JENKINS	Art Unit 2855	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-7693626-B2	04-2010	Breed; David S.	B60C23/0408	73/146.2
	B					
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 075

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	3	"17084483"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/07 10:27 AM
L2	38	(Artificial Intelligence) More like doc: US-20210131916-A1 Text: (AU-2020375038-A1 OR EP-4051515-A1 OR WO-2021087391-A1 OR CA-3156583-A1 OR US-20210129601-A1 OR CN-115210085-A OR US-20190184773-A1 OR US-11065921-B2 OR DE-112017004489-T5 OR CN-109641492-B OR JP-6617666-B2 OR WO-2018047781-A1 OR JP-2018039377-A OR CN-109641492-A OR EP-3492289-B1 OR JP-6676134-B2 OR JP-2019099146-A OR GB-2602012-A OR US-20190160895-A1 OR RU-2762050-C1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/07 10:27 AM
L3	33	(Artificial Intelligence) Similar to: 17/084,483 with 0 CPC Selections and 0 Text Selections Text: (CA-3156583-A1 OR WO-2021087391-A1 OR EP-4051515-A1 OR AU-2020375038-A1 OR US-20210131916-A1 OR US-20210129601-A1 OR FR-3063041-A1 OR ES-2322056-T3 OR MX-2019003548-A OR EP-3582980-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/11/08 06:58 AM

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 076

		FR-3063041-B1 OR MX-PA05007477-A OR CA-2513553-A1 OR BR-112019005469-A2 OR RU-2020129959-A OR AU-2004212496-B2 OR ES-2361804-T3 OR EP-1592569-B1 OR JP-6798781-B2 OR WO-2018065846-A1 OR EP-3523144-A1 OR BR-PI0407371-A OR FR-3028451-A1 OR EP-3523144-B1 OR AU-2004212496-A1 OR EP-3020577-A1 OR BR-112020016901-A2 OR JP-2016097964-A OR EP-3582980-A1 OR WO-2018150141-A1 OR US-20210039451-A1 OR US-20190329609-A1 OR AU-2015258159-B2 OR AU-2015258159-A1 OR US-20160229237-A1 OR JP-2021518301-A OR EP-3543042-B1 OR RU-2019109045-A OR WO-2019179707-A1 OR AU-2019238814-A1 OR CA-3093737-A1 OR EP-3543042-A1 OR RU-2742062-C2 OR EP-1714806-A3 OR BR-PI0407371-B1 OR CA-2513553-C OR CN-110290947-A OR EP-3020577-B1 OR US-20200055354-A1 OR US-11065924-B2).did.					
L4	35	(Artificial Intelligence) Similar to: 17/084,483 with 0 CPC Selections and 9 Text Selections Text: (DE-2713451-A1 OR US-7242284-B2 OR FR-2492742-B1 OR GB-2399416-B OR DE-102005035183-B4 OR EP-0455636-B1 OR GB-2416846-B OR US-20070080795-A1 OR JP-S5073682-A OR US-11052712-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/11/08 08:01 AM

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Revvo v. Cerebrum
IPR2025-00632 - Page 077

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L5	14	((("FERRY") near3 ("Keith"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/11/08 08:06 AM
L6	6	("20110025487" OR "20160332493" OR "20180186200" OR "20190160895" OR "20190184773" OR "20190187027").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/08 08:36 AM
L7	29	("10119876" OR "10712238" OR "20020029626" OR "20030221766" OR "20130167999" OR "20170232806" OR "4862486" OR "5181975" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/08 08:37 AM

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Revvo v. Cerebrum
IPR2025-00632 - Page 078

		"5500065" OR "5562787" OR "5573610" OR "5573611" OR "5731754" OR "5971046" OR "6030478" OR "6208244" OR "6217683" OR "6255940" OR "6257289" OR "6309494" OR "6688353" OR "6788192" OR "7770444" OR "7900665" OR "8248225" OR "8657975" OR "8776590" OR "8874386" OR "9950575").pn.					
L8	21588954	(bearing rolling rotary rotary rotate rotation rotating rotated rotatably pivot pivoted pivoting spin spinning spinnability spinnable spun span) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 08:52 AM
L9	22036639	(container containing contain contained bag tank canister sack storage vessel vase capsule carton encapsulate	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/11/08 09:03 AM

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		encapsulated encapsulating housing housed enclosure enclosed enclosing chamber reservoir well compartment) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8).clm.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L10	3357265	(detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing) WITH (tire wheel object).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 09:18 AM
L11	4	L8 & L9 & L10 & L5	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/11/08 09:26 AM

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			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L12	30318370	(replaceable changeable swappable switchable exchangeable interchangeable interconvertible transposable portable replace replacing replaced change changing changed changability swap swapped swapping switch switched switching switchability exchange exhanging exchanged exchangability interchange interchanged interchanging interchangability interconvert interconverting interconverted interconvertibility transposing transpose transposed transposability portability replaceability swappability) WITH (battery power source energy generator generating generation voltage wattage current)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM
L13	17079322	((detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM

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		inspection inspecting inspected test tested testing) WITH (tire wheel object))					
L14	59702573	((container containing contain contained bag tank canister sack storage vessel vase capsule carton encapsulate encapsulated encapsulating housing housed enclosure enclosed enclosing chamber reservoir well compartment) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM
L15	45731130	(bearing rolling rotary rotary rotate rotation rotating rotated rotatably pivot pivoted pivoting spin spinning spinnability spinnable spun span) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM

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		fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8)					
L16	996496	L12 & L13 & L14 & L15	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:41 AM
L17	40706896	(communicat$8 intel$8 info$8 meassag$8 data) WITH (detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:06 AM
L18	4870920	(communicat$8 intel$8 info$8 meassag$8 data) WITH (detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:07 AM

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		sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing) WITH (electric electrically electricity magnet magnetic magnetically magnetized magnetism magnetize magnetizing electromagnetic electro$2magnetic)					
L19	195947	L16 & L18	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:07 AM
L20	5538	L19 AND ((G01M13/045 OR G01M13/028 OR G01M13/00 OR G01M17/007 OR G01M13/04 OR G01M17/02 OR G01M99/00 OR G01M7/08 OR G01M13/021 OR G01M99/005 OR G01M15/14 OR G01M17/013 OR G01M10/00 OR G01M15/02 OR G01M15/00 OR G01M17/08 OR G01M3/26 OR G01M5/0033 OR G01M5/0066 OR G01M5/0091 OR G01M99/008 OR G01M13/02 OR G01M17/00 OR G01M5/0008 OR G01M5/0025 OR G01M13/025 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:10 AM

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		G01M3/005 OR G01M3/02 OR G01M3/40 OR G01M7/02 OR G01M1/22 OR G01M15/05 OR G01M17/06 OR G01M7/00 OR G01M3/04 OR B60C23/0408 OR B60C23/041 OR B60C23/0411 OR B60C23/04 OR B60C23/0416 OR B60C23/0493 OR B60C19/00 OR B60C23/0433 OR B60C23/0488 OR B60C23/0413 OR B60C23/00 OR B60C23/0494 OR B60C23/0496 OR B60C11/24 OR B60C23/0444 OR B60C5/005 OR B60C9/00 OR B60C23/0401 OR B60C23/043 OR B60C23/02 OR B60C23/0406 OR B60C23/00354 OR B60C23/0462 OR B60C23/135 OR B60C23/126 OR B60C11/246 OR B60C23/064 OR B60C23/0447 OR B60C23/0483 OR B60C23/0479 OR B60C23/0488 OR B60C23/20 OR B60C23/00363 OR b60c23/0422 OR B60C23/007 OR B60C2019/004 OR B60C23/0425 OR B60C2200/12 OR B60C23/001 OR B60C23/0442 OR B60C23/0486 OR B60C23/123 OR B60C23/009 OR B60C23/004 OR B60C23/0455 OR B60C23/00336 OR B60C23/00318 OR B60C23/0474 OR B60C23/061 OR					

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		B60C23/0437 OR B60C23/0449 OR B60C11/243 OR B60C23/0471 OR B60C23/006 OR B60C23/0498 OR B60C23/06 OR B60C23/00372 OR G01C21/20 OR G01C21/00 OR G01C21/206 OR G01C21/26 OR G01C21/165 OR G01C17/38 OR G01C21/16 OR G01C21/36 OR G01C21/3407 OR G01C15/002 OR G01C21/12 OR G01C21/362 OR G01C15/00 OR G01C22/00 OR G01C22/006 OR G01C21/005 OR G01C21/3453 OR G01C5/00 OR G01C21/3664 OR G01C21/3697 OR G01C9/00 OR G01C21/32 OR G01C25/005 OR G01C19/00 OR G01C23/00 OR G01C21/3691 OR G01C17/28 OR G01C21/1654 OR G01C21/3632 OR G01C11/02 OR G01C17/30 OR G01C9/06 OR G01C21/1656 OR G01C21/30 OR G01C3/08 OR G01C21/3469 OR G01C21/265 OR G01C21/166 OR G01C21/28 OR G01C11/00 OR G01C9/02 OR G01C21/3415 OR G01C21/34 OR G01C21/3484 OR G01C21/367 OR G01C21/3688 OR G01C15/06 OR G01C21/188 OR G01C22/002 OR G01C25/00 OR				

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		G01C21/3461 OR G01C13/00 OR G01C21/3667 OR G01C21/203 OR G01C21/3492 OR G01C1/00 OR G01C21/3602 OR G01C21/3617 OR G01C19/42 OR G01C21/08 OR G01C21/3629 OR G01C21/3841 OR G01C21/365 OR G01C21/3673 OR G01C17/00 OR G01C21/1652 OR G01C21/18 OR G01C21/183 OR G01C19/38 OR G01C19/5783 OR G01S19/01).cpc.)					
L21	4575	L20 & @ad<="20191031"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:11 AM
L22	0	L2 & L21	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:12 AM
L23	0	L3 & L21	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:12 AM
L24	3	L4 & L21	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2022/11/08 11:12 AM

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			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L25	39613525	(container containing contain contained bag tank canister sack storage vessel vase capsule carton encapsulate encapsulated encapsulating housing housed reservoir) WITH (gap aperture break breach cut crack void hole orifice puncture cavity port trench pocket opening through$2hole recess chamber volume well slit)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:35 PM
L26	5325714	(gap aperture break breach cut crack void hole orifice puncture cavity port trench pocket opening through$2hole recess chamber volume well slit) WITH (detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing) WITH (electric electrically electricity magnet magnetic magnetically magnetized magnetism	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:36 PM

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		magnetize magnetizing electromagnetic electro$2magnetic)					
L27	86244	L19 & L25 & L26	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:37 PM
L28	1813	(L27 AND ((G01M13/045 OR G01M13/028 OR G01M13/00 OR G01M17/007 OR G01M13/04 OR G01M17/02 OR G01M99/00 OR G01M7/08 OR G01M13/021 OR G01M99/005 OR G01M15/14 OR G01M17/013 OR G01M10/00 OR G01M15/02 OR G01M15/00 OR G01M17/08 OR G01M3/26 OR G01M5/0033 OR G01M5/0066 OR G01M5/0091 OR G01M99/008 OR G01M13/02 OR G01M17/00 OR G01M5/0008 OR G01M5/0025 OR G01M13/025 OR G01M3/005 OR G01M3/02 OR G01M3/40 OR G01M7/02 OR G01M1/22 OR G01M15/05 OR G01M17/06 OR G01M7/00 OR G01M3/04 OR B60C23/0408 OR B60C23/041 OR B60C23/0411 OR B60C23/04 OR B60C23/0416 OR B60C23/0493 OR B60C19/00 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:37 PM

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		B60C23/0433 OR B60C23/0488 OR B60C23/0413 OR B60C23/00 OR B60C23/0494 OR B60C23/0496 OR B60C11/24 OR B60C23/0444 OR B60C5/005 OR B60C9/00 OR B60C23/0401 OR B60C23/043 OR B60C23/02 OR B60C23/0406 OR B60C23/00354 OR B60C23/0462 OR B60C23/135 OR B60C23/126 OR B60C11/246 OR B60C23/064 OR B60C23/0447 OR B60C23/0483 OR B60C23/0479 OR B60C23/0488 OR B60C23/20 OR B60C23/00363 OR b60c23/0422 OR B60C23/007 OR B60C2019/004 OR B60C23/0425 OR B60C2200/12 OR B60C23/001 OR B60C23/0442 OR B60C23/0486 OR B60C23/123 OR B60C23/009 OR B60C23/004 OR B60C23/0455 OR B60C23/00336 OR B60C23/00318 OR B60C23/0474 OR B60C23/061 OR B60C23/0437 OR B60C23/0449 OR B60C11/243 OR B60C23/0471 OR B60C23/006 OR B60C23/0498 OR B60C23/06 OR B60C23/00372 OR G01C21/20 OR G01C21/00 OR G01C21/206 OR G01C21/26 OR G01C21/165 OR G01C17/38 OR G01C21/16 OR G01C21/36 OR					

		G01C21/3407 OR G01C15/002 OR G01C21/12 OR G01C21/362 OR G01C15/00 OR G01C22/00 OR G01C22/006 OR G01C21/005 OR G01C21/3453 OR G01C5/00 OR G01C21/3664 OR G01C21/3697 OR G01C9/00 OR G01C21/32 OR G01C25/005 OR G01C19/00 OR G01C23/00 OR G01C21/3691 OR G01C17/28 OR G01C21/1654 OR G01C21/3632 OR G01C11/02 OR G01C17/30 OR G01C9/06 OR G01C21/1656 OR G01C21/30 OR G01C3/08 OR G01C21/3469 OR G01C21/265 OR G01C21/166 OR G01C21/28 OR G01C11/00 OR G01C9/02 OR G01C21/3415 OR G01C21/34 OR G01C21/3484 OR G01C21/367 OR G01C21/3688 OR G01C15/06 OR G01C21/188 OR G01C22/002 OR G01C25/00 OR G01C21/3461 OR G01C13/00 OR G01C21/3667 OR G01C21/203 OR G01C21/3492 OR G01C1/00 OR G01C21/3602 OR G01C21/3617 OR G01C19/42 OR G01C21/08 OR G01C21/3629 OR G01C21/3841 OR G01C21/365 OR G01C21/3673 OR G01C17/00 OR G01C21/1652 OR					

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		G01C21/18 OR G01C21/183 OR G01C19/38 OR G01C19/5783 OR G01S19/01).cpc.))					
L29	1459	(L28 & @ad<="20191031")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:37 PM
L30	0	L6 & L29	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:40 PM
L31	1	L7 & L29	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:40 PM
L32	1	("20210181063").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/12 08:11 AM
L33	1	("20210370726").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/12 08:39 AM
L34	39	(Artificial Intelligence) More like doc: US-20210370726-A1 Text: (US-11420487-B2 OR FR-3098588-A1 OR EP-3763552-A1 OR JP-H0867117-A OR DE-69925350-T2 OR JP-2005233968-A OR US-20080083482-A1 OR US-5971046-A OR EP-0906839-B1 OR US-20210129601-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2023/07/13 09:54 AM

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		CA-2247556-C OR EP-0906839-A2 OR JP-4610835-B2 OR US-6444069-B1 OR EP-1006010-B1 OR US-6443198-B1 OR DE-102007048018-A1 OR FR-3098588-B1 OR US-6722192-B2 OR US-20030172729-A1).did.	JPO; DERWENT; IBM_TDB)				
L35	34	(Artificial Intelligence) More like doc: US-20210181063-A1 Text: (WO-2020036859-A1 OR EP-1711354-A4 OR EP-1711354-A1 OR JP-2007522987-A OR EP-1716008-A4 OR EP-1716008-A2 OR WO-2005069993-A2 OR JP-4585525-B2 OR MX-PA06008221-A OR JP-2007519123-A OR MX-PA06008220-A OR CA-2553349-A1 OR CA-2553349-C OR CA-2553404-A1 OR US-20180238760-A1 OR US-10495537-B2 OR EP-1711354-B1 OR JP-4937759-B2 OR ES-2323318-T3 OR CA-2553404-C).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/13 09:54 AM
L36	0	L29 & L34	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/13 09:54 AM
L37	0	L29 & L35	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2023/07/13 09:54 AM

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			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L38	6	N7 & L29	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/07/13 09:55 AM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N1	1316205	(bearing rolling rotary rotary rotate rotation rotating rotated rotatably pivot pivoted pivoting spin spinning spinnability spinnable spun span) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 09:11 AM

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		clamping clip clipped clipping grip gripper gripped gripping retain$8).clm.					
N2	2265609	(container containing contain contained bag tank canister sack storage vessel vase capsule carton encapsulate encapsulated encapsulating housing housed enclosure enclosed enclosing chamber reservoir well compartment) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 09:11 AM
N4	508150	(detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 09:11 AM

		inspection inspecting inspected test tested testing) WITH (tire wheel object).clm.					
N5	1017753	(replaceable changeable swappable switchable exchangeable interchangeable interconvertible transposable portable replace replacing replaced change changing changed changability swap swapped swapping switch switched switching switchability exchange exhanging exchanged exchangability interchange interchanged interchanging interchangability interconvert interconverting interconverted interconvertibility transposing transpose transposed transposability portability replaceability swappability) WITH (battery power source energy generator generating generation voltage wattage current).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 09:12 AM
N6	3692	((G01M17/02 OR B60C23/041 OR B60C23/0422 OR B60C23/0488 OR G01C19/5783 OR G01S19/01).cpc.)	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 09:51 AM
N7	15	N1 & N2 & N4 & N5 & N6	(US-PGPUB; USPAT)	OR	ON	ON	2023/07/13 09:51 AM

PE2E SEARCH - Search History (Similarity Search)

Ref #	Sort and Retrieval Information	Text Selections	CPC Selections
L3	Sort results by: Similarity to Application # 17/084,483 Retrieve results by: Application # 17/084,483	No selections	No selections

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L4	Sort results by: Similarity to Application # 17/084,483 Retrieve results by: Application # 17/084,483	(Specification) sensor assembly (Specification) housing (Specification) cavity (Specification) electrical sensor device (Specification) retaining member (Specification) retainer (Specification) wall structure (Specification) tire (Specification) rotational direction	No selections

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17084483 - IP

Report Run Date: 2023-07-13
Results included: 250
Results Priority Date Range: 1994-05-09 to 2020-12-15
Results Publication Date Range: 1996-01-03 to 2023-04-18

Main Concept Document: US20210131916 (Sensor assemblies and systems for monitoring a dynamic object)
Collections (169): US Patents, US Designs, US Applications, EPO Patents, EPO Applications, China Patents, China Applications, Japan Patents, Japan Applications, Korea Patents, Korea Applications, WIPO Applications,...

Publication contains information from a representative family member.

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Search Criteria

Main Concept Document: US20210131916 (Sensor assemblies and systems for monitoring a dynamic object)

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Collections (169): US Patents, US Designs, US Applications, EPO Patents, EPO Applications, China Patents, China Applications, Japan Patents, Japan Applications, Korea Patents, Korea Applications, WIPO Applications, Argentina Patents, Argentina Applications, Brazil Patents, Brazil Applications, Canada Patents, Canada Applications, Chile Patents, Chile Applications, Colombia Applications, Costa Rica Applications, Cuba Patents, Cuba Applications, Dominican Republic Applications, Ecuador Patents, Ecuador Applications, El Salvador Applications, Guatemala Applications, Honduras Applications, Mexico Patents, Mexico Applications, Nicaragua Patents, Panama Applications, Peru Applications, Trinidad & Tobago Patents, Uruguay Applications, Austria Patents, Austria Applications, Belarus Patents, Belgium Patents, Belgium Applications, Bosnia & Herzegovina Patents, Bosnia & Herzegovina Applications, Bulgaria Patents, Bulgaria Applications, Croatia Patents, Croatia Applications, Czech Republic Patents, Czech Republic Applications, Czechoslovakia Patents, Czechoslovakia Applications, Denmark Patents, Denmark Applications, Estonia Patents, Estonia Applications, EUIPO Patents, Finland Patents, Finland Applications, France Patents, France Applications, Germany Patents, Germany Applications, Great Britain Patents, Great Britain Applications, Greece Patents, Greece Applications, Hungary Patents, Hungary Applications, Iceland Patents, Iceland Applications, Ireland Patents, Ireland Applications, Italy Patents, Italy Applications, Latvia Patents, Latvia Applications, Lithuania Patents, Lithuania Applications, Luxembourg Patents, Luxembourg Applications, Malta Patents, Monaco Patents, Montenegro Patents, Montenegro Applications, Netherlands Patents, Netherlands Applications, Norway Patents, Norway Applications, Poland Patents, Poland Applications, Portugal Patents, Portugal Applications, Republic of Moldova Patents, Republic of Moldova Applications, Romania Patents, Romania Applications, San Marino Patents, San Marino Applications, Serbia Patents, Serbia Applications, Slovakia Patents, Slovakia Applications, Slovenia Patents, Spain Patents, Spain Applications, Sweden Patents, Sweden Applications, Switzerland Patents, Switzerland Applications, Ukraine Patents, Yugoslavia/Serbia and Montenegro Patents, Yugoslavia/Serbia and Montenegro Applications, Armenia Patents, Australia Patents, Australia Applications, Cyprus Patents, Gulf Cooperation Council Patents, Hong Kong Patents, India Patents, India Applications, Indonesia Patents, Indonesia Applications, Israel Patents, Israel Applications, Jordan Patents, Jordan Applications, Kyrgyzstan Patents, Macao Applications, Malaysia Patents, Mongolia Patents, New Zealand Patents, Philippines Patents, Philippines Applications, Saudi Arabia Patents, Saudi Arabia Applications, Singapore Patents, Singapore Applications, Taiwan Patents, Taiwan Applications, Tajikistan Patents, Tajikistan Applications, Thailand Patents, Thailand Applications, Uzbekistan Patents, Vietnam Patents, Algeria Patents, ARIPO Patents, ARIPO Applications, Egypt Patents, Kenya Patents, Malawi Patents, Morocco Patents, Morocco Applications, OAPI Patents, South Africa Patents, Tunisia Applications, Zambia Patents, Zimbabwe Patents, EAPO Patents, EAPO Applications, Georgia Patents, Georgia Applications, Kazakhstan Patents, Kazakhstan Applications, Russia Patents, Russia Applications, Turkey Patents, Turkey Applications

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EP4051515A1 | **Publication Date: 2022-09-07** | **Priority Date: 2019-10-31**

Sensor assemblies and systems for monitoring a dynamic object

Image not currently available

Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

WO2021087391A1 | **Publication Date: 2021-05-06** | **Priority Date: 2019-10-31**

Sensor assemblies and systems for monitoring a dynamic object

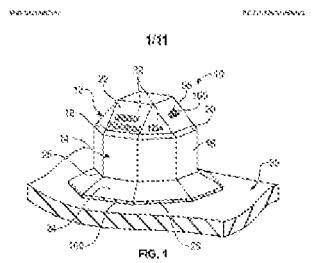

FIG. 1

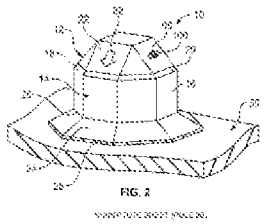
FIG. 2

Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

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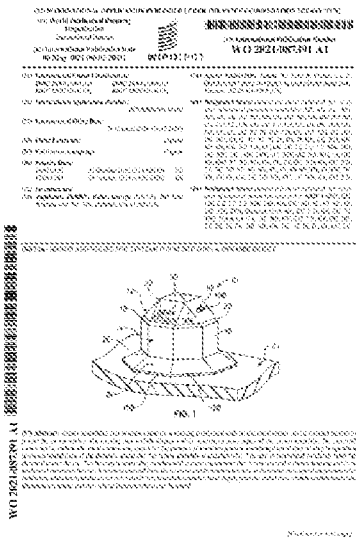
AU2020375038A1 | **Publication Date: 2022-05-19** | **Priority Date: 2019-10-31**

Sensor assemblies and systems for monitoring a dynamic object

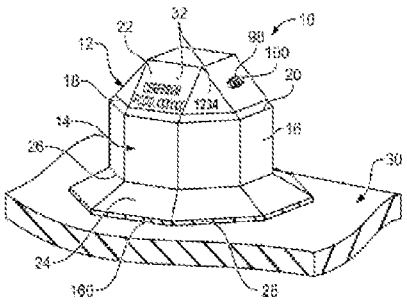


Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

KR20220128610A | **Publication Date: 2022-09-21** | **Priority Date: 2019-10-31**

Sensor Assemblies and Systems for Monitoring Dynamic Objects



Abstract:
Sensor assemblies and systems include a housing configured with an electrical sensor device held therein to protect the sensor device. The housing may include display indicia relating to certain aspects of the sensor assembly. The electrical sensor device includes electrical components useful for the purpose of monitoring and transmitting desired data related to operating parameters/states of a dynamic article to which the sensor assembly is attached. Data is transmitted wirelessly from the electrical sensor device. The housing is removably attached to the dynamic article or element connected thereto and a retaining member to which it is also attached. A receiver that is external to the dynamic article receives the data so that when the dynamic article is a vehicle tire, behavior such as outer diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment deviations, and tire/vehicle position Determine parameters and/or states, which may be stored.

Current Assignees: FERRY KEITH GEORGE

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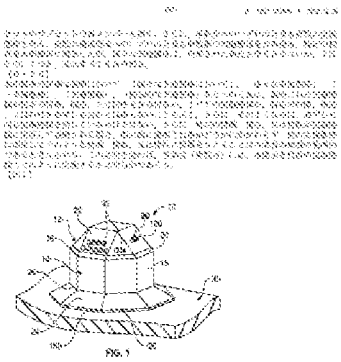
JP2022553819A | **Publication Date: 2022-12-26 | Priority Date: 2019-10-31**

Sensor assembly and system for monitoring dynamic objects

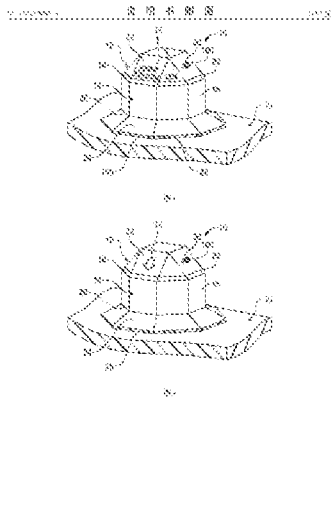


Abstract:
The sensor assembly and system includes a housing configured to hold the electrical sensor device therein to protect the sensor device. The housing can include indicia associated with some aspect of the sensor assembly. Electrical sensor devices comprise electrical components useful for monitoring and transmitting desired data related to operating parameters/conditions of a dynamic article to which the sensor assembly is attached. Data is wirelessly transmitted from the electrical sensor device. The housing is removably attached using a retaining member, which is also attached to the dynamic article or elements connected thereto. A receiver external to the dynamic article receives data and identifies such operating parameters and/or conditions, if the dynamic article is a vehicle tire, outer diameter, tread depth, pressure, radial load, Determining vehicle camber and/or toe alignment changes and tire/vehicle position. [Selection drawing] Fig. 1

Current Assignees: FERRY KEITH GEORGE

CN115210085A | **Publication Date: 2022-10-18 | Priority Date: 2019-10-31**

Sensor assembly and system for monitoring dynamic objects



Abstract:
Sensor assemblies and systems include a housing configured to retain an electrical sensor device therein to protect the sensor device. The housing may include display indicia associated with some aspects of the sensor assembly. The electrical sensor device includes electrical components that can be used to monitor and transmit desired data related to an operating parameter/condition of a dynamic article to which the sensor assembly is attached. The data is wirelessly transmitted from the electrical sensor device. The housing is removably attached to a retaining member that is also attached to the dynamic article or an element connected to the dynamic article. A receiver external to the dynamic article receives data to determine such operating parameters and/or conditions that may be stored: when the dynamic article is a vehicle tire, such operating parameters and/or conditions as outer diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment changes, and...

Current Assignees: JI SIQIAOZHIFEILI

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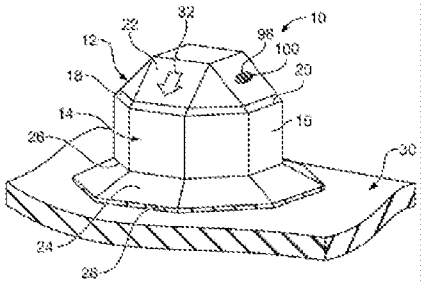
US20210129601 | **Publication Date: 2021-05-06** | **Priority Date: 2019-10-31**

Sensor assemblies and systems for monitoring a dynamic object

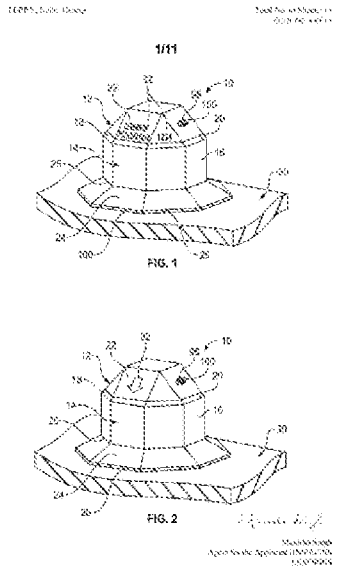


Abstract:
Sensor assemblies and systems comprise a housing configured to accommodate an electrical sensor device therein, mechanically retain the same, and provide a protective surrounding thereto. The housing may include display indicia relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with, e.g., a vehicle tire. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article. A receiver external from the dynamic article receives the data for the purpose of determine such operating parameter/or conditions, when the dynamic article is a vehicle tire, as tire tread depth, tire pressure, vehicle camber and toe alignment variations, and tire/vehicle location, which...

Current Assignees: FERRY KEITH GEORGE

IN202217028791A | **Publication Date: 2022-09-02** | **Priority Date: 2019-10-31**

Sensor assemblies and systems for monitoring a dynamic object



Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

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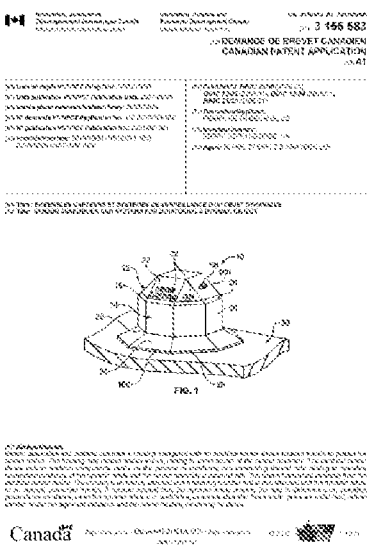
CA3156583A1 | **Publication Date: 2021-05-06** | **Priority Date: 2019-10-31**

Sensor assemblies and systems for monitoring a dynamic object

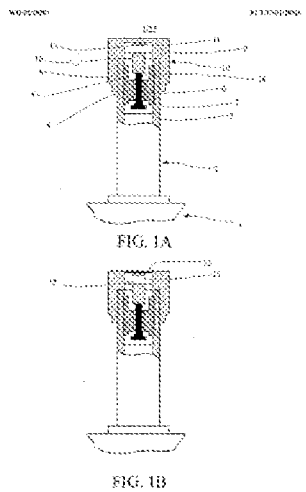


Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

WO2002020287A1 | **Publication Date: 2002-03-14** | **Priority Date: 2000-09-08**

Vehicle wireless sensing and communication system



Abstract:
Valve cap (10) for monitoring pressure and/or temperature of a tire (1) having a valve stem (2) including a valve assembly (5) having a valve pin (6). A body (9) of the valve cap (10) mates with the valve stem (2) and defines a chamber (12) upon such mating. A valve pin depressor (14) is arranged in the body (9) and depresses the valve pin (6) upon mating of the body (9) with the valve stem (2) to open the valve assembly (5) and enable flow communication between an interior of the tire (1) and the chamber (12). At least one SAW sensor (11) is arranged in the chamber (12) for receiving a signal and returning a signal modified by virtue of the temperature and/or pressure of the tire (1).

Current Assignees: AUTOMOTIVE TECH INTL INC

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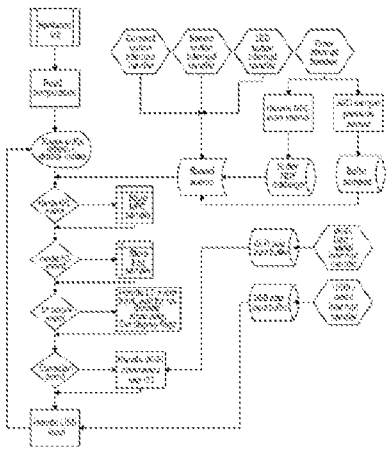
US9604508 | **Publication Date: 2017-03-28** | **Priority Date: 2015-03-10**

Method for communicating data between an NFC-enabled device on a vehicle and a driver indentification device

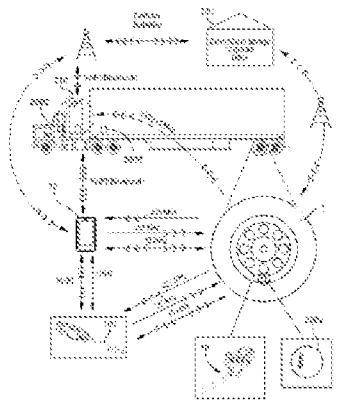


Abstract:
A method for communicating data between a vehicle and a mobile computing device includes locating at least one NFC-enabled device on the vehicle. Vehicle user data is wirelessly transferred between the NFC-enabled device and the mobile computing device. Using the vehicle user data, the NFC-enabled device on the vehicle and the mobile computing device are paired.

Current Assignees: ITIRE LLC

US20160343178 | **Publication Date: 2016-11-24** | **Priority Date: 2015-03-10**

Method for communicating data between an nfc-enabled device on a vehicle and a driver identification device



Abstract:
A method for communicating data between a vehicle and a mobile computing device includes locating at least one NFC-enabled device on the vehicle. Vehicle user data is wirelessly transferred between the NFC-enabled device and the mobile computing device. Using the vehicle user data, the NFC-enabled device on the vehicle and the mobile computing device are paired.

Current Assignees: ITIRE LLC

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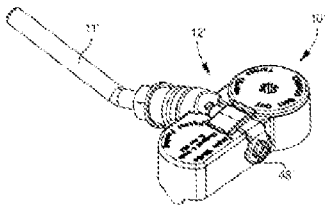
US20160339748 | **Publication Date: 2016-11-24** | **Priority Date: 2015-03-10**

Smart tag assembly for mounting on an object to be tracked

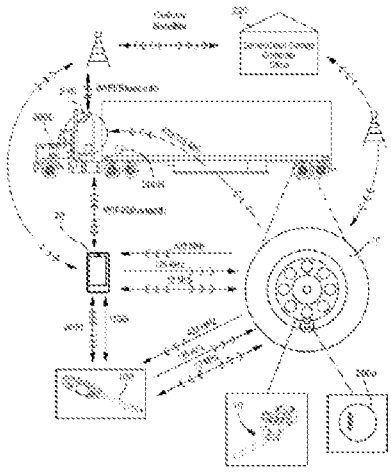


Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

US9682598 | **Publication Date: 2017-06-20** | **Priority Date: 2015-03-10**

Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

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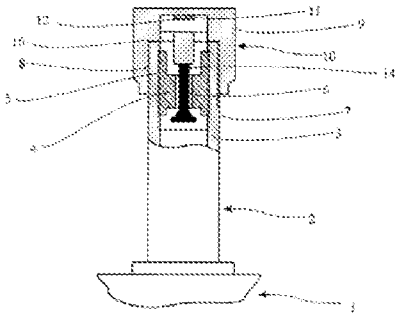
US6758089 | **Publication Date: 2004-07-06** | **Priority Date: 2001-07-09**

Wireless sensing and communication system of roadways

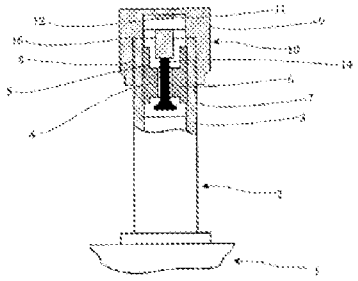


Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

US20030005759 | **Publication Date: 2003-01-09** | **Priority Date: 2001-07-09**

Wireless sensing and communication system of roadways



Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

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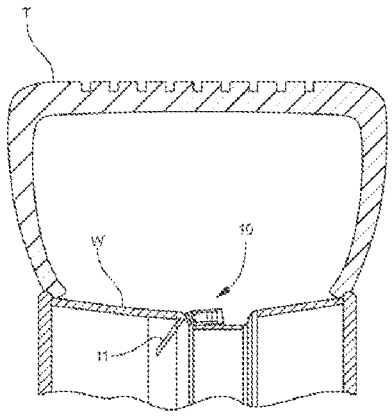
US20170206446 | **Publication Date: 2017-07-20** | **Priority Date: 2014-10-06**

Smart tag assembly for mounting on an object to be tracked

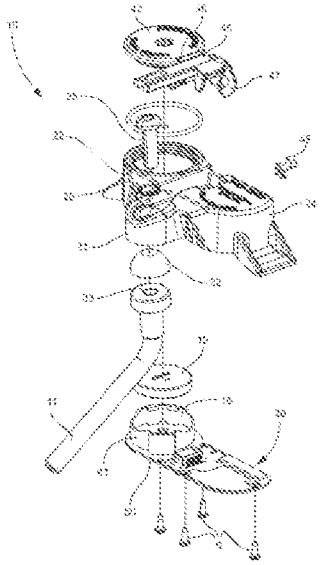


Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

US10204297 | **Publication Date: 2019-02-12** | **Priority Date: 2014-10-06**

Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

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Revvo v. Cerebrum
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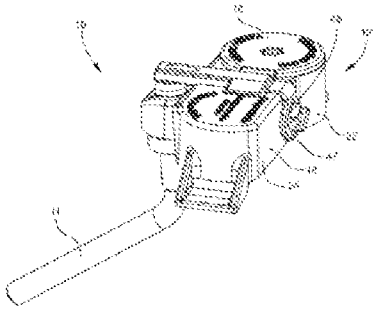
US20180072114 | **Publication Date: 2018-03-15** | **Priority Date: 2014-03-10**

Smart tag assembly for mounting on an object to be tracked

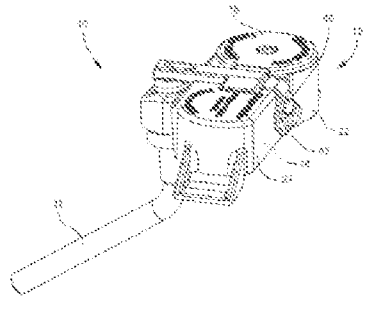


Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate.

Current Assignees: ITIRE LLC

US20160375733 | **Publication Date: 2016-12-29** | **Priority Date: 2014-03-10**

Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate.

Current Assignees: ITIRE LLC

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Revvo v. Cerebrum
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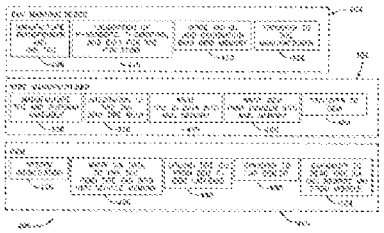
US7104438 | **Publication Date: 2006-09-12** | **Priority Date: 2003-10-22**

Method of integrating tire identification into a vehicle information system

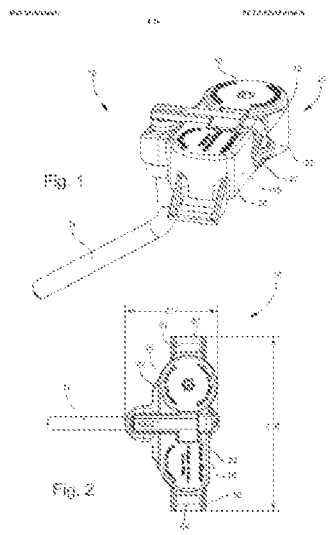


Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage for storing tire identification data; connecting the tire stored data to a vehicle electronic control unit (ECU) having ECU data storage; reading tire identification data from the stored tire data into the ECU stored data; and uploading the tire identification data from the ECU stored data to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU stored data and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an end-of-line diagnostic test on the vehicle.

Current Assignees: GOODYEAR TIRE & RUBBER CO

WO2015138431A2 | **Publication Date: 2015-09-17** | **Priority Date: 2014-03-10**

Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate.

Current Assignees: ITIRE LLC

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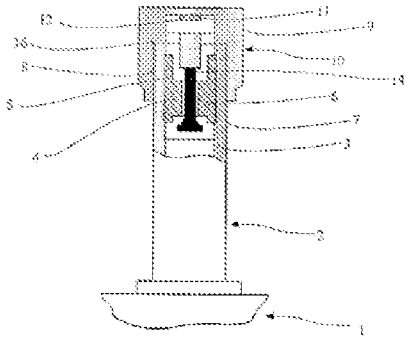
Revvo v. Cerebrum
IPR2025-00632 - Page 111

US20020121132 | **Publication Date: 2002-09-05** | **Priority Date: 2000-09-08**

Vehicle wireless sensing and communication system

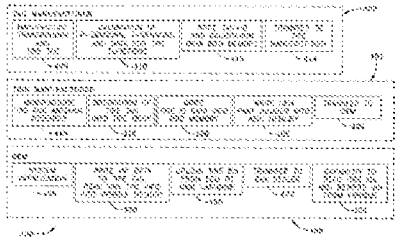


Abstract:
Wireless sensing and communication system including sensors located on the vehicle or in the vicinity of the vehicle and which provide information which is transmitted to one or more interrogators in the vehicle using wireless radio frequency transmission technology. Power to operate the sensor may be supplied by the interrogator. The sensors include tire pressure, temperature and acceleration monitoring sensors, weight or load measuring sensors, switches, temperature, acceleration, angular position, angular rate, angular acceleration, proximity, rollover, occupant presence, humidity, presence of fluids or gases, strain, road condition and friction, chemical sensors and other similar sensors providing information to a vehicle system, vehicle operator or external site. The sensors provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20050087593 | **Publication Date: 2005-04-28** | **Priority Date: 2003-10-22**

Method of integrating tire identification into a vehicle information system



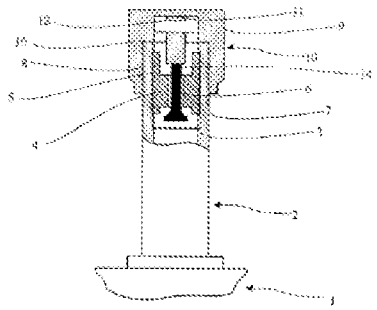
Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage means for storing tire identification data; connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means; reading tire identification data from the tire data storage means into the ECU data storage means; and uploading the tire identification data from the ECU data storage means to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU data storage means and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an...

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 112

US6662642 | **Publication Date: 2003-12-16** | **Priority Date: 2000-09-08**

Vehicle wireless sensing and communication system



Abstract:
Wireless sensing and communication system including sensors located on the vehicle or in the vicinity of the vehicle and which provide information which is transmitted to one or more interrogators in the vehicle using wireless radio frequency transmission technology. Power to operate the sensor may be supplied by the interrogator. The sensors include tire pressure, temperature and acceleration monitoring sensors, weight or load measuring sensors, switches, temperature, acceleration, angular position, angular rate, angular acceleration, proximity, rollover, occupant presence, humidity, presence of fluids or gases, strain, road condition and friction, chemical sensors and other similar sensors providing information to a vehicle system, vehicle operator or external site. The sensors provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

WO2009070665A1 | **Publication Date: 2009-06-04** | **Priority Date: 2007-11-30**

Wheel-monitoring apparatus

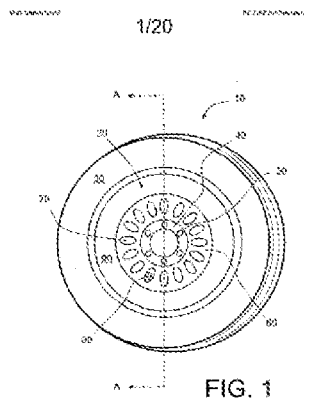


FIG. 1

Abstract:
There is provided a wheel-monitoring apparatus (600, 680, 690, 2200) for monitoring operation of a wheel (10, 2500, 3000) of a vehicle (900). The apparatus (600, 680, 690, 2200) includes a sensor module (400) operatively mounted to revolve with the wheel (10, 2500, 3000). The module (400) is coupled in communication with a processing arrangement (710, ECU 950) of the vehicle (900). The module (400) senses at least one physical parameter of the wheel (10, 2500, 3000) and generates a corresponding sensor signal for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signal to compute information indicative of operation of the wheel (10, 2500, 3000). The apparatus (600, 680, 690, 2200) includes a sensor (118) for sensing an angular orientation (ϑ) of the wheel (600, 680, 690, 2200). The processing arrangement (710, ECU 950) is operable to process the sensor signal in respect of the angular orientation (ϑ, ω). Moreover, the module...

Current Assignees: VOLVO LASTVAGNAR AB

Revvo's Exhibit 1002
Revvo v. Cerebrum
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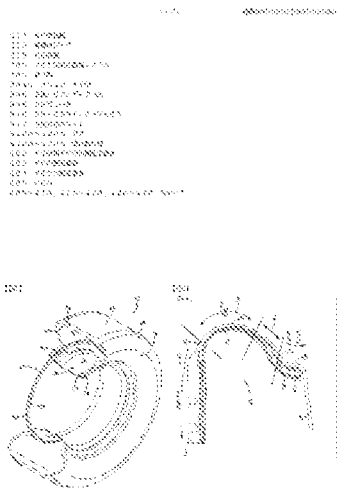
JP2005162192A | **Publication Date: 2005-06-23** | **Priority Date: 2003-10-22**

Unifying method of tire discrimination information to vehicle information system



Abstract:
PROBLEM TO BE SOLVED: To provide a method for integrating tire data into a vehicle information system. A method for integrating tire identification data into a vehicle information system includes attaching a tire having tire data storage means for storing tire identification data to a vehicle chassis of a production line; Connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means, and reading tire identification data from the tire data storage means into the ECU data storage means And uploading the tire identification data from the ECU data storage means to the OEM database. [Selection] Figure 15

Current Assignees: GOODYEAR TIRE & RUBBER CO

CA2482242A1 | **Publication Date: 2005-04-22** | **Priority Date: 2003-10-22**

Method of integrating tire identification into a vehicle information system

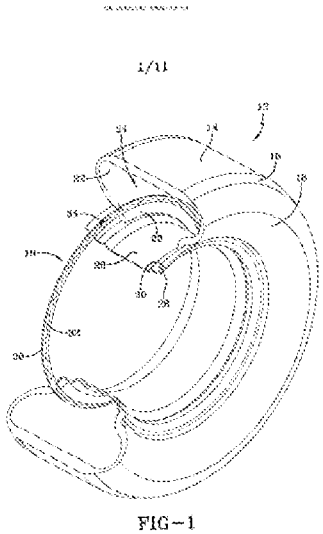


FIG-1

Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage means for storing tire identification data; connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means; reading tire identification data from the tire data storage means into the ECU data storage means; and uploading the tire identification data from the ECU data storage means to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU data storage means and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an...

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
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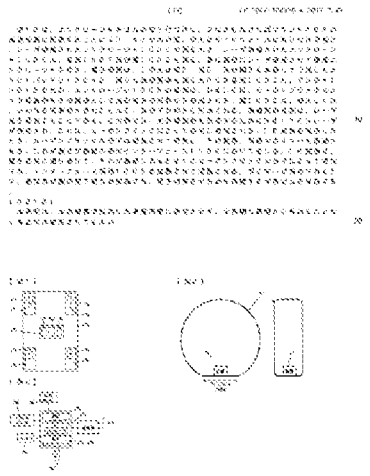
JP2017128326A | **Publication Date: 2017-07-27** | **Priority Date: 2015-12-22**

Advanced tire monitoring system

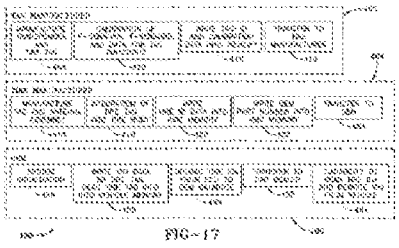


Abstract:
An advanced tire monitoring system is provided. A tire pressure monitoring system includes a tire pressure monitoring device that is attached to an inner surface of a tire and includes a pressure sensor that monitors a pressure of fluid in the tire. The system has an RFID tag placed on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from the fluid pressure monitoring, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device. [Selection] Figure 6

Current Assignees: SCHRADER ELTNC LTD

EP1526467A1 | **Publication Date: 2005-04-27** | **Priority Date: 2003-10-22**

Method of integrating tire identification data into a vehicle informating system



Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage means for storing tire identification data; connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means; reading tire identification data from the tire data storage means into the ECU data storage means; and uploading the tire identification data from the ECU data storage means to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU data storage means and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an...

Current Assignees: GOODYEAR TIRE & RUBBER CO

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Revvo v. Cerebrum
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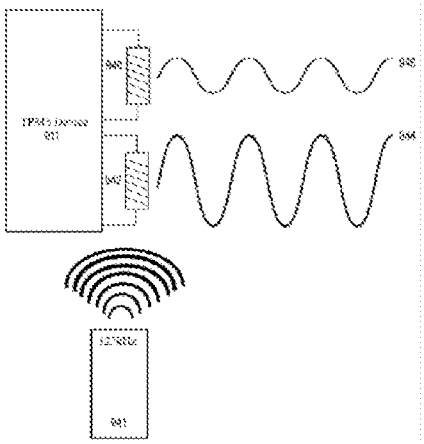
US11099091 | **Publication Date: 2021-08-24** | **Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

BRPI0722237A2 | **Publication Date: 2014-06-03** | **Priority Date: 2007-11-30**

Wheel monitoring module

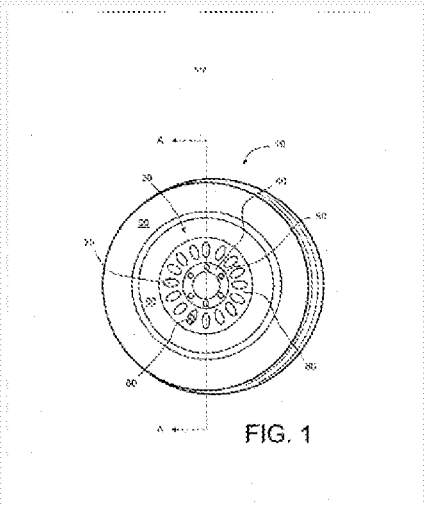


FIG. 1

Abstract:
A module is operable to monitor at least a pressure within a tire of a wheel, the module being operatively mounted to said wheel, the module including: (a) a pressure sensor for measuring the pressure (P) and generating a corresponding pressure signal; and b1) an associated data memory including a data field containing data relevant to the functional status of the tyre.

Current Assignees: VOLVO LASTVAGNAR AB

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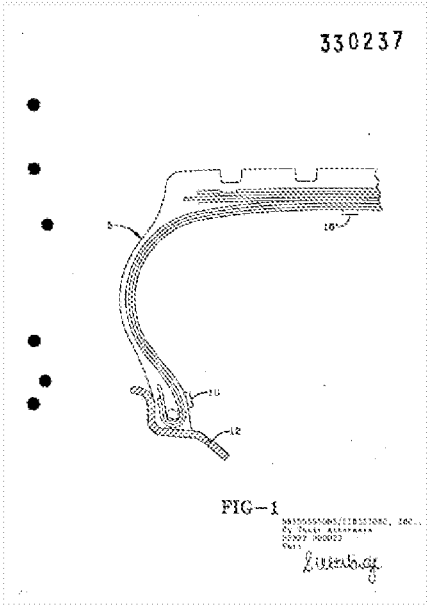
Revvo v. Cerebrum
IPR2025-00632 - Page 116

NZ330237A | **Publication Date: 1998-06-26 | Priority Date: 1994-06-03**

Tire condition sensor/transmitter adhered to inner surface of tire

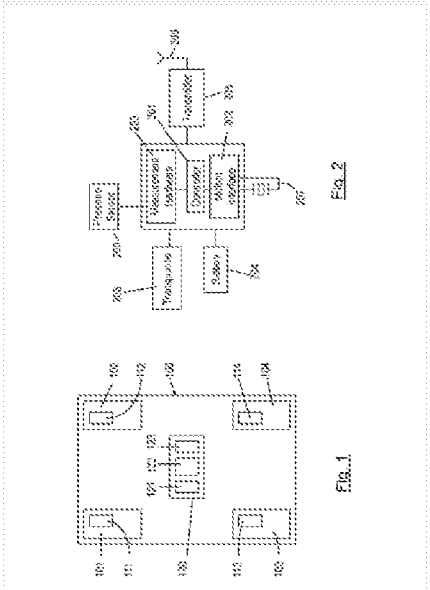


Abstract:

Current Assignees: BRIDGESTONE AMERICAS INC

US20170174014 | **Publication Date: 2017-06-22 | Priority Date: 2015-12-22**

Advanced Tire Monitoring System



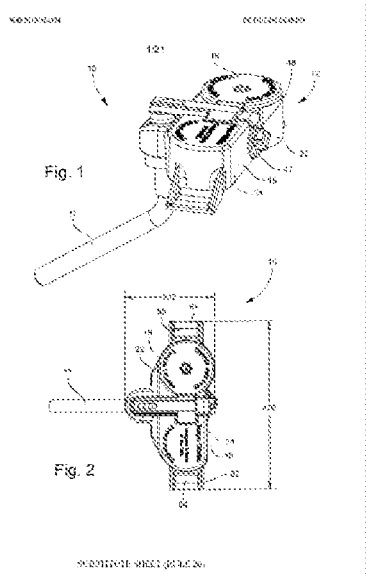
Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 117

WO2013152294A1 | **Publication Date: 2013-10-10** | **Priority Date: 2012-04-06**

Tire data collection and communication device, multi-purpose handheld data collection and communication tool, and method for communicating tire data between a vehicle tire and a remote computing device

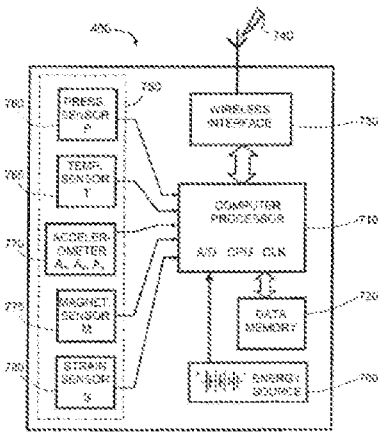


Abstract:
A direct tire data collection and communication device is adapted for use in a pneumatic vehicle tire. The device incorporates a tire-mounted electronics module comprising a microcontroller, and at least one tire property sensor in electronic communication with the microcontroller and capable of measuring at least one operational property of the vehicle tire. The threshold operational property value defines a positive tire safety condition and a negative tire safety condition. The electronics module calculates accumulated travel data of the vehicle tire while in the negative tire safety condition. A transmitter transmits the travel data to an electronic remote terminal.

Current Assignees: ITIRE LLC

US10035387 | **Publication Date: 2018-07-31** | **Priority Date: 2007-11-30**

Wheel-monitoring module



Abstract:
A module is operable to monitor at least a pressure within a tire of a wheel, the module being operatively mounted to said wheel, the module including (a) a pressure sensor for measuring the pressure (P) and generating a corresponding pressure signal; and b1) an associated data memory including a data field containing data relevant to the functional status of the tire.

Current Assignees: VOLVO TRUCKS CORP, VOLVO TECH AB

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 118

EP0689950B1 | **Publication Date: 1999-04-28** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein

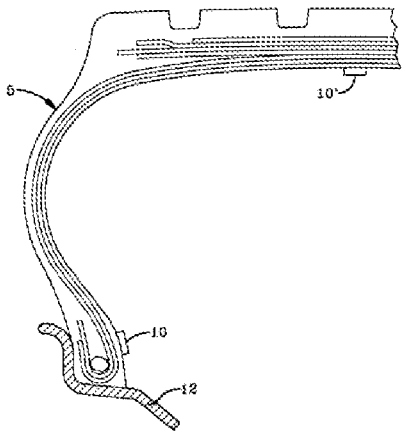


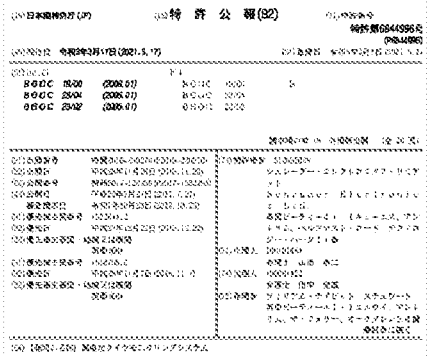
FIG – 1

Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

JP6844996B2 | **Publication Date: 2021-03-17** | **Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

Revvo's Exhibit 1002
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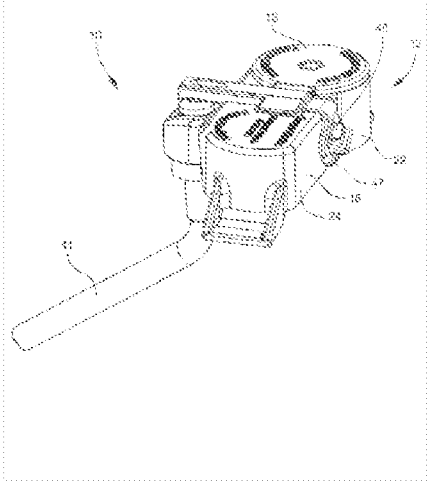
US20210252921 | **Publication Date: 2021-08-19** | **Priority Date: 2012-04-06**

Tire data collection and communication device, multi-purpose handheld data collection and communication tool, and method for communicating tire data between a vehicle tire and a remote computing device

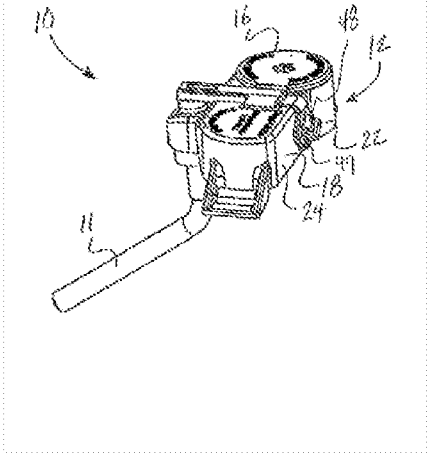


Abstract:
A direct tire data collection and communication device is adapted for use in a pneumatic vehicle tire. The device incorporates a tire-mounted electronics module comprising a microcontroller, and at least one tire property sensor in electronic communication with the microcontroller and capable of measuring at least one operational property of the vehicle tire. The threshold operational property value defines a positive tire safety condition and a negative tire safety condition. The electronics module calculates accumulated travel data of the vehicle tire while in the negative tire safety condition. A transmitter transmits the travel data to an electronic remote terminal.

Current Assignees: ITIRE LLC

US20150029016 | **Publication Date: 2015-01-29** | **Priority Date: 2012-04-06**

Tire data collection and communication device, multi-purpose handheld data collection and communication tool, and method for communicating tire data between a vehicle tire and a remote computing device

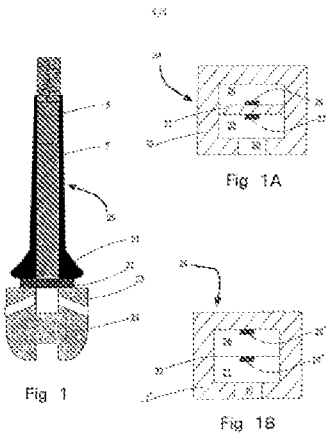


Abstract:
A direct tire data collection and communication device is adapted for use in a pneumatic vehicle tire. The device incorporates a tire-mounted electronics module comprising a microcontroller, and at least one tire property sensor in electronic communication with the microcontroller and capable of measuring at least one operational property of the vehicle tire. The threshold operational property value defines a positive tire safety condition and a negative tire safety condition. The electronics module calculates accumulated travel data of the vehicle tire while in the negative tire safety condition. A transmitter transmits the travel data to an electronic remote terminal.

Current Assignees: ITIRE LLC

GB2406171A | **Publication Date: 2005-03-23** | **Priority Date: 2000-09-08**

Tyre valve with SAW sensors to measure pressure and temperature

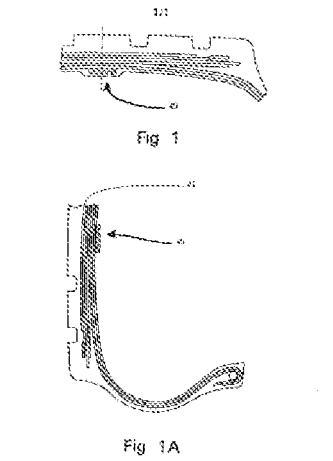


Abstract:
A valve stem assembly for a tyre has an elongate metallic (eg brass) valve stem 7, a rubber body 23 attached to the end of the stem 7 within the interior space of the tyre and a sensor capsule 24 within the rubber body 23 which includes a SAW absolute pressure sensor 27,29' in a chamber 25 in flow communication with the inside of the tyre and also a SAW temperature sensor 28,28' in another chamber 26 isolated from the inside of the tyre by a flexible or rigid membrane 31,33.

Current Assignees: AUTOMOTIVE TECH INTL INC

GB2406170A | **Publication Date: 2005-03-23** | **Priority Date: 2000-09-08**

Tyre monitor which measures acceleration of tyre tread



Abstract:
A tyre monitor 40 is either cemented to the inner surface of the tyre opposite the tread, or is inserted into the tyre during manufacture. The monitor includes pressure and/or temperature sensors. The monitor also includes an accelerometer to measure the tangential and/or radial acceleration of the tyre tread adjacent the monitor. The sensors may be SAW devices. Pressure, temperature and acceleration data is transmitted from the monitor via an antenna. The measured acceleration signals can be used to detect tyre wear, delamination, embedded nails and debris attached to the tyre. The length of the tyre footprint can be calculated from the length of time that the tread opposite the monitor is in contact with the road. This can provide an indication of tyre overloading.

Current Assignees: AUTOMOTIVE TECH INTL INC

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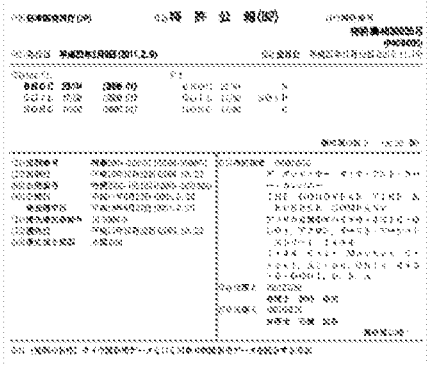
JP4630035B2 | **Publication Date: 2011-02-09** | **Priority Date: 2003-10-22**

Method for integrating tire identification data and OEM vehicle identification data



Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage for storing tire identification data; connecting the tire stored data to a vehicle electronic control unit (ECU) having ECU data storage; reading tire identification data from the stored tire data into the ECU stored data; and uploading the tire identification data from the ECU stored data to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU stored data and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an end-of-line diagnostic test on the vehicle.

Current Assignees: GOODYEAR TIRE & RUBBER CO

NZ330238A | **Publication Date: 1998-07-28** | **Priority Date: 1994-06-03**

Fixing pressure sensor transmitter to inner surface of tire

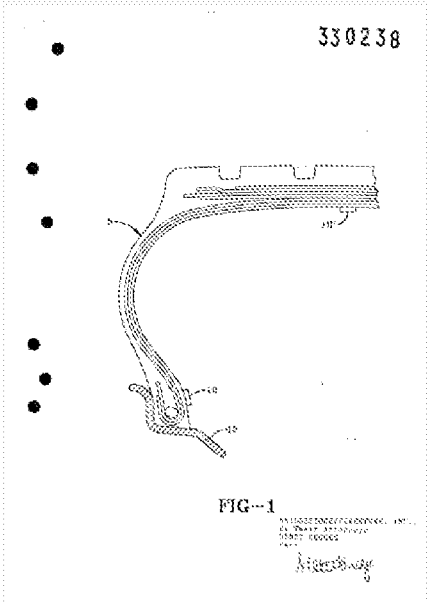


FIG--1

Abstract:

Current Assignees: BRIDGESTONE AMERICAS INC

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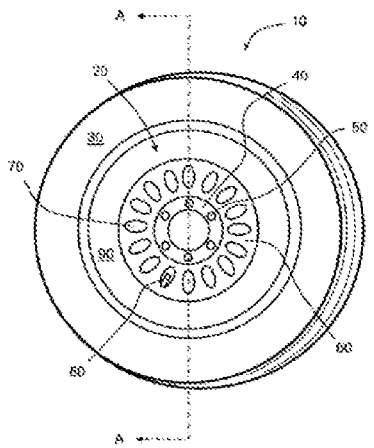
US20100256946 | **Publication Date: 2010-10-07** | **Priority Date: 2007-11-30**

Wheel-monitoring module

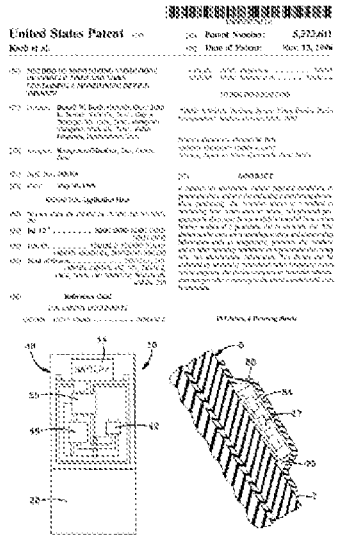


Abstract:
A module is operable to monitor at least a pressure within a tire of a wheel, the module being operatively mounted to said wheel, the module including: (a) a pressure sensor for measuring the pressure (P) and generating a corresponding pressure signal; and b1) an associated data memory including a data field containing data relevant to the functional status of the tyre.

Current Assignees: VOLVO TRUCKS CORP, VOLVO TECH AB

US5573611 | **Publication Date: 1996-11-12** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein



Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

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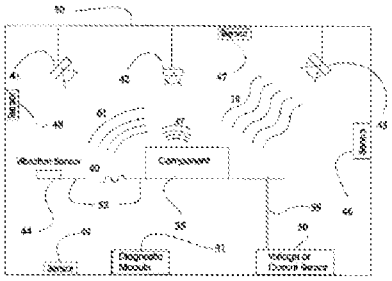
US7089099 | **Publication Date: 2006-08-08** | **Priority Date: 2004-07-30**

Sensor assemblies

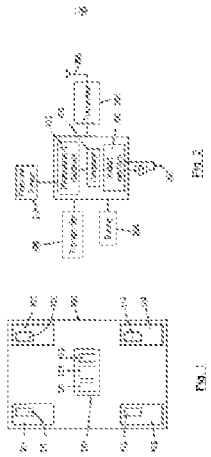


Abstract:
Sensor assembly capable of obtaining and providing a measurement of a physical quantity, e.g., measurement of temperature and/or pressure of a vehicular tire, includes an antenna capable of receiving a radio frequency signal, a radio frequency identification (RFID) device coupled to the antenna, a sensor coupled to the RFID device arranged to generate a measurement of the physical quantity or quantities, and a switch coupled to the RFID device and arranged to connect or disconnect the sensor from a circuit with the antenna dependent on whether the antenna receives a particular signal associated with the RFID device. When the antenna receives the particular signal associated with the RFID device, the RFID device causes the switch to close and connect the sensor in the circuit with the antenna to enable the measurement generated by the sensor to be directed to and transmitted by the antenna.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

GB2545968A | **Publication Date: 2017-07-05** | **Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device. Further features may include detecting fluid increase/decrease, a transponder coil, memory/data storage, power induction, and the monitor is enclosed having a base and lid fixed together by laser welds.

Current Assignees: SCHRADER ELTNC LTD

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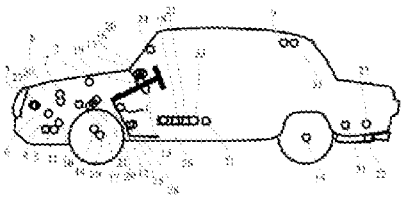
US7379800 | **Publication Date: 2008-05-27** | **Priority Date: 2000-09-08**

Tire pressure monitoring using hall effect sensors

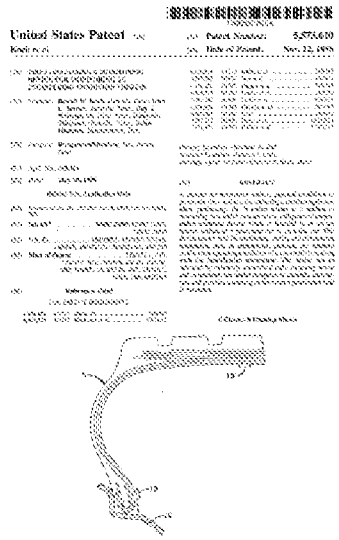


Abstract:
Wheel assembly with a tire pressure monitoring system includes a wheel rim, a tire mounted thereon, a housing having an interior in flow communication with the tire interior such that the same pressure prevails in the tire and in the housing interior, a magnet arranged in the housing and movable in an axial direction of the tire, a Hall effect sensor arranged on a non-rotating part of the vehicle in a position in which it is in a magnetic field generated by the magnet during rotation of the tire relative to the non-rotating part, and a spring arranged to move the magnet in dependence on pressure in the housing interior. The spring is arranged outside of the magnet. The Hall effect sensor senses magnetic field density of the magnet as the magnet rotates which is convertible into an indication of the pressure in the housing and thus the tire pressure.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US5573610 | **Publication Date: 1996-11-12** | **Priority Date: 1994-06-03**

Tires containing a monitoring device for monitoring an engineering condition therein



Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

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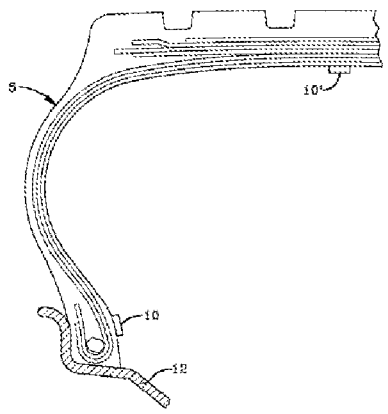
EP0689950A2 | **Publication Date: 1996-01-03** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein



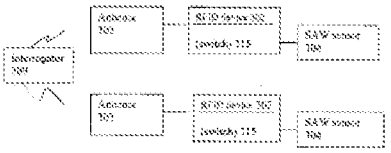
FIG−1

Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded. -

Current Assignees: BRIDGESTONE AMERICAS INC

US20060025897 | **Publication Date: 2006-02-02** | **Priority Date: 2004-07-30**

Sensor assemblies



Abstract:
Sensor assembly capable of obtaining and providing a measurement of a physical quantity, e.g., measurement of temperature and/or pressure of a vehicular tire, includes an antenna capable of receiving a radio frequency signal, a radio frequency identification (RFID) device coupled to the antenna, a sensor coupled to the RFID device arranged to generate a measurement of the physical quantity or quantities, and a switch coupled to the RFID device and arranged to connect or disconnect the sensor from a circuit with the antenna dependent on whether the antenna receives a particular signal associated with the RFID device. When the antenna receives the particular signal associated with the RFID device, the RFID device causes the switch to close and connect the sensor in the circuit with the antenna to enable the measurement generated by the sensor to be directed to and transmitted by the antenna.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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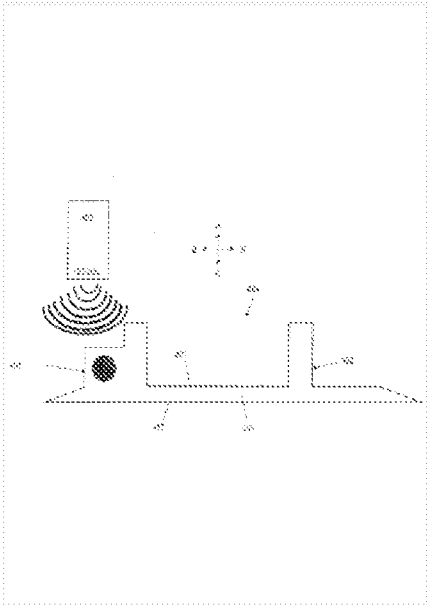
DE102016225640A1 | **Publication Date: 2017-06-22** | **Priority Date: 2015-12-22**

Improved tire monitoring system

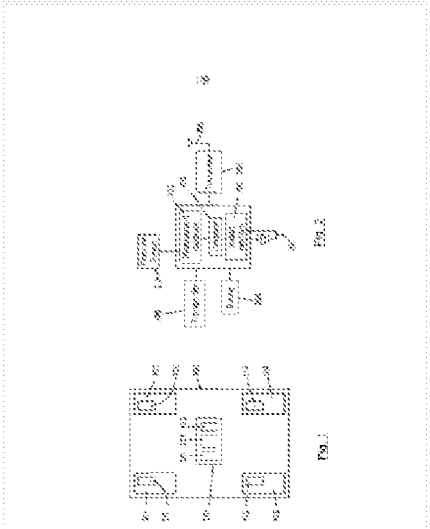


Abstract:
A tire pressure monitoring system includes a tire pressure monitoring device for mounting on an inner surface of a tire, and a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag disposed on the tire separate from the tire monitor. In response to the detection of a tire pressure event from the monitoring of the fluid pressure, the tire pressure monitoring device causes the RFID to send data received from the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

GB2545693A | **Publication Date: 2017-06-28** | **Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system (111, Fig.1) comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor 208 for monitoring the fluid pressure in the tire(101-104). The system has a data storage device, RFID tag 401, located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device. This permits the communication of data such as manufacturer, recommended tyre pressure, date of manufacture, mileage covered, etc. between the pressure sensor and the RFID tag. Pressure change detection may be event of new tyre being fitted to rim, i.e. from atmospheric to in use pressure, or the opposite for removal of old tyre. Also claimed is a tyre monitoring device for the inside of a tire comprising spaced...

Current Assignees: SCHRADER ELTNC LTD

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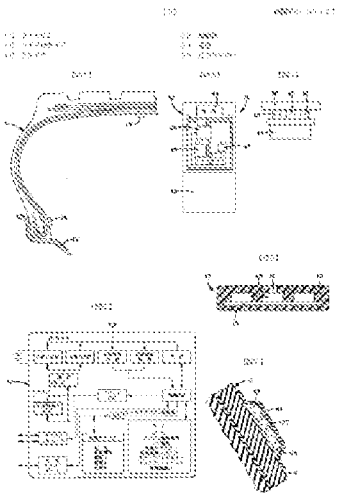
JPH0867117A | **Publication Date: 1996-03-12** | **Priority Date: 1994-06-03**

Method for monitoring state of tire for vehicle and monitor device built-in tire

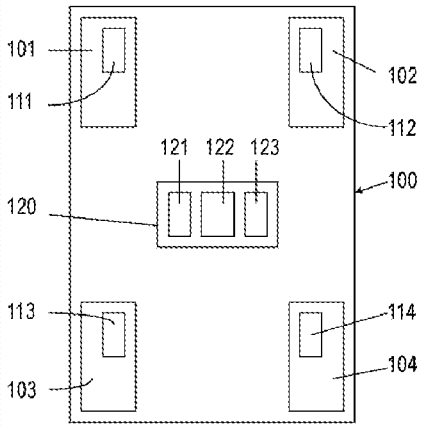


Abstract:
(57) [Summary] [Purpose] To monitor various physical conditions of tires. The configuration uses an active, self-driving programmable electronic device mounted inside the tire or on the tire rim. This device is designed for the temperature of pneumatic tires, Information such as pressure, mileage, and / or other driving conditions is monitored, stored, and used to telemeter along with tire identification information. The device can be activated by an externally transmitted radio frequency, in response the device compares or transmits information and gives a warning if a preselected limit is exceeded. -

Current Assignees: BRIDGESTONE CORP

KR20170074804A | **Publication Date: 2017-06-30** | **Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system comprising a pressure sensor for monitoring fluid pressure in a tire and a tire pressure monitoring device for mounting on an inner surface of the tire. The system has an RFID tag located on a tire separate from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of the fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

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GB2405931A | **Publication Date: 2005-03-16** | **Priority Date: 2000-09-08**

Tyre pressure and/or temperature sensor

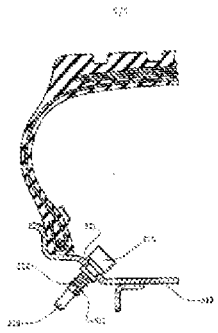


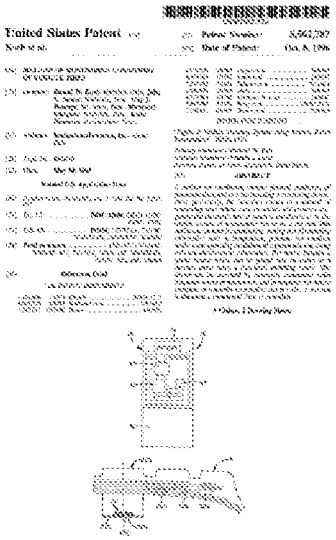
Fig 1

Abstract:
A tyre pressure and/or temperature monitor 510 is arranged inside the tyre at one end of an elongate body which extends through a wheel rim 513. An antenna 515 is arranged outside the tyre at the other end of the elongate body. The antenna 515 is coupled to the monitor 510 by an inductive wire 512 which matches the output of the monitor to the antenna. Insulating material 511 surrounds the elongate body to prevent electrical contact with the wheel rim. The sensor may be a SAW (surface acoustic wave) sensor.

Current Assignees: AUTOMOTIVE TECH INTL INC

US5562787 | **Publication Date: 1996-10-08** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires



Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device includes a power source which can be placed into an active or a dormant mode using a data band switching circuit. The device can be activated by externally transmitted radio frequency waves or microwaves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

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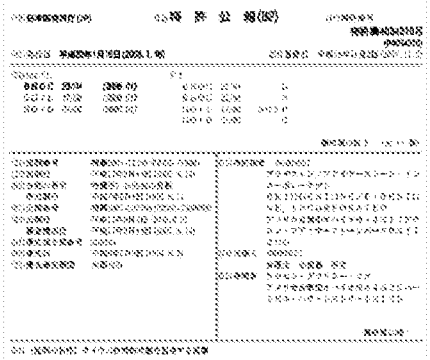
JP4034316B2 | **Publication Date: 2008-01-16 | Priority Date: 1994-06-03**

Equipment for monitoring the technical state of tires

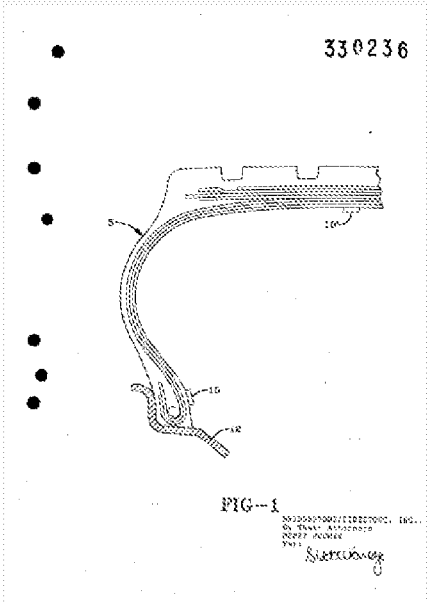


Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

NZ330236A | **Publication Date: 1998-06-26 | Priority Date: 1994-06-03**

Tire includes monitoring transducer transmitting tire data by data band switching



Abstract:

Current Assignees: BRIDGESTONE AMERICAS INC

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Method and apparatus for identifying wheel module positions of a vehicle, system and vehicle including said apparatus, and method of operating the system

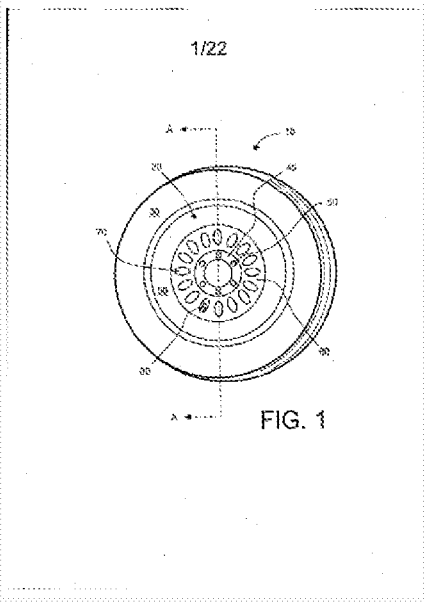
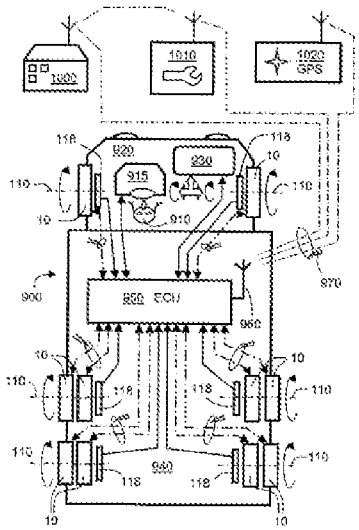


FIG. 1

Abstract:
METHOD AND APPARATUS FOR IDENTIFYING THE POSITIONS OF WHEEL MODULES OF A VEHICLE, SYSTEM AND VEHICLE INCLUDING THIS APPLIANCE, AND METHOD OF OPERATING THE SYSTEM The present invention relates to a method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring the operation of at least one wheel (10) of the vehicle (900), the apparatus (600, 680, 690, 2200) including a or more sensor modules (400) operatively mounted to revolutionize with at least one wheel (10), the one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of the vehicle (900). The method includes the steps of: (a) communicating with one or more modules (400) of the device (600, 680, 690, 2200) to receive their identification codes (ID) in a processing arrangement (950) of the device (600, 680, 690, 2200); (b) direct the vehicle (900) around a curved trajectory as sensed by a...

Current Assignees: VOLVO LASTVAGNAR AB

Method of identifying positions of wheel modules



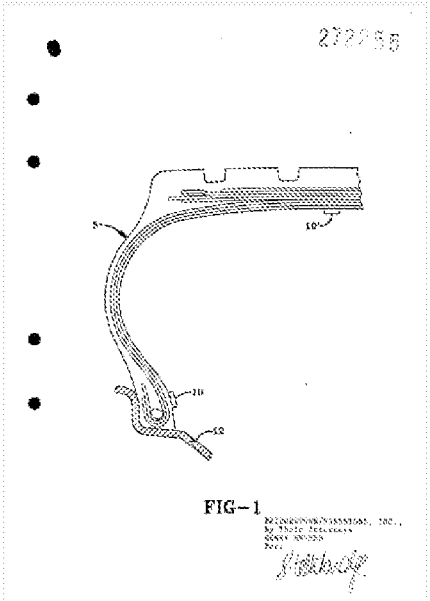
Abstract:
There is provided a method of identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle, the one or more modules operatively mounted to revolve with the at least one wheel, the one or more modules being operatively coupled in communication with a processing arrangement of the vehicle, the one or more modules being operable to sense at least one physical parameter of the wheel and to generate at least one corresponding sensor signal for the processing arrangement, the processing arrangement being operable to process the at least one sensor signal to compute information indicative of operation of the at least one wheel. The method includes steps of: (a) driving the vehicle for a period of time whilst recording a number of rotations executed for each of at least one wheel of the vehicle by employing a rotation sensing arrangement associated with the at least one wheel; (b) during the period of time,...

Current Assignees: VOLVO TRUCKS CORP

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 131

NZ272255A | **Publication Date: 1998-06-26 | Priority Date: 1994-06-03**

Signalling device, embedded in tyre to monitor engineering condition of tire



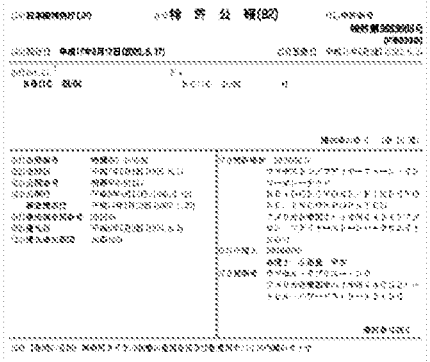
FIG–1

Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

JP3683008B2 | **Publication Date: 2005-08-17 | Priority Date: 1994-06-03**

Vehicle tire condition monitoring method and tire with built-in monitoring device



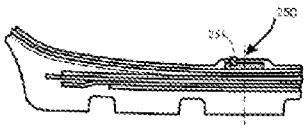
Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 132

US7549327 | **Publication Date: 2009-06-23** | **Priority Date: 2001-02-16**

Tire-mounted energy generator and monitor



Abstract:
Tire monitoring arrangement including at least one tire condition sensor arranged on the tire to measure a condition of the tire and an energy generating mechanism or device arranged on the tread of the tire for generating electricity upon rotation of the tire. The energy generating mechanism is connected in a circuit with each tire condition sensor and powers the circuit and thus provides energy for the tire condition sensor(s). The tire condition sensor(s) and energy generating mechanism may be part of a tire monitor assembly which is affixed to an interior surface of the tire opposite the tread or inserted into the tire opposite the tread. Various tire condition sensors may be used including accelerometers, tire pressure sensors and tire temperature sensors. Various energy generating mechanisms may be used including a piezoelectric device, a polyvinylidene fluoride (PVDF) piezoelectric polymer, and a flexible material whose flexure causes energy generation.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

EP3505336B1 | **Publication Date: 2021-09-01** | **Priority Date: 2018-12-18**

Article with electronic component inclusion and method of manufacturing

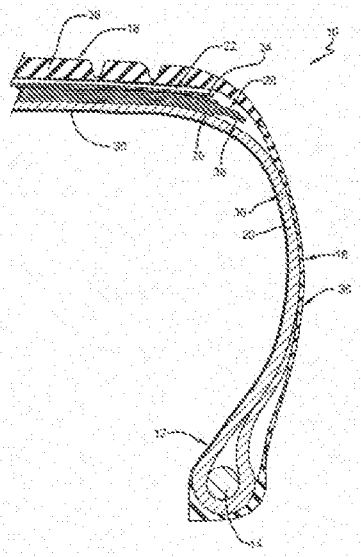


FIG. 1

Abstract:
An article that experiences repeated deformation includes an electronic component as an inclusion. The article includes at least one structural element, in which the structural element includes a material. At least one electronic component is incorporated into the material as an inclusion. The electronic component includes an integrated circuit and may also include at least one sensor and an antenna. The size of the electronic inclusion is no greater than the largest inclusion typically occurring within the material. The article may be an article formed of rubber, such as a tire.

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 133

BRPI0722238A2 | **Publication Date: 2014-06-03 | Priority Date: 2007-11-30**

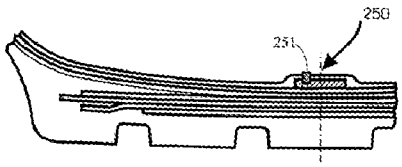
Wheel modules position identification method

Abstract:
A method for identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle includes steps of (a) communicating with one or more modules of the apparatus for receiving their identification codes at a processing arrangement of the apparatus, the one or more modules being mounted on at least one wheel of the vehicle; (b) driving the vehicle around a curved trajectory as sensed by the steering sensing arrangement and recording a direction of steering of the vehicle together with a temporal record of the physical parameter measured by the one or more modules together with their corresponding identification codes, the physical parameter pertaining to one or more tires of the at least one wheel; and (c) applying an analysis to the steering direction and the temporal record in respect of time to identify where the one or more modules are located on the at least one wheel of the vehicle, the analysis utilizing...

Current Assignees: VOLVO LASTVAGNAR AB

US20060243043 | **Publication Date: 2006-11-02 | Priority Date: 2001-02-16**

Tire-Mounted Energy Generator and Monitor



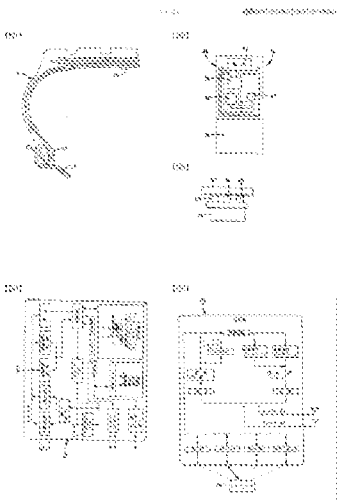
Abstract:
Information management and monitoring system and method for monitoring components on an apparatus during its operation includes a monitoring system including sensors for monitoring the components operation thereof, and a processing module arranged on the apparatus and to receive and process data about the monitored components from the sensors. The module derives information from the data about the monitored components to determine whether any component is operating in a non-optimal manner and/or to forecast failure of any component prior to such failure. The system also includes at least one remote entity interested in the operation or failure of any component. A wireless communication system is arranged on the apparatus and coupled to the module for enabling wireless communications of derived information from the module to each entity during operation of the apparatus, including information about the presence and identity of any non-optimally operating component or component forecast...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 134

JP2005233968A | **Publication Date: 2005-09-02** | **Priority Date: 1994-06-03**

System for monitoring technical conditions of tire

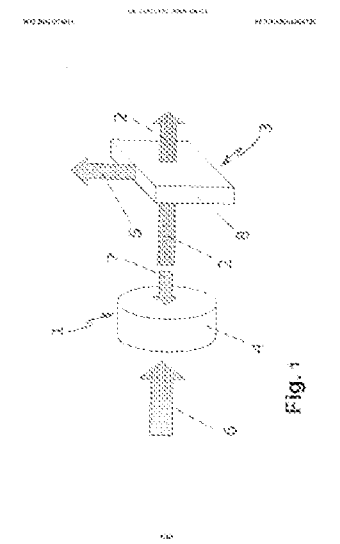


Abstract:
PROBLEM TO BE SOLVED: To monitor various physical states of a tire. An active, self-driven programmable electronic device is used that is mounted inside a tire or on a tire rim. This device is used to monitor, store and further telemetry information such as pneumatic tire temperature, pressure, mileage and / or other driving conditions along with tire identification information. This device can be activated by externally transmitted high frequencies, and in response, the device compares or transmits information and gives a warning if a preselected limit is exceeded. [Selection] Figure 1

Current Assignees: BRIDGESTONE AMERICAS INC

CA2515769A1 | **Publication Date: 2004-09-02** | **Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same



Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Article with electronic component inclusion and method of manufacturing

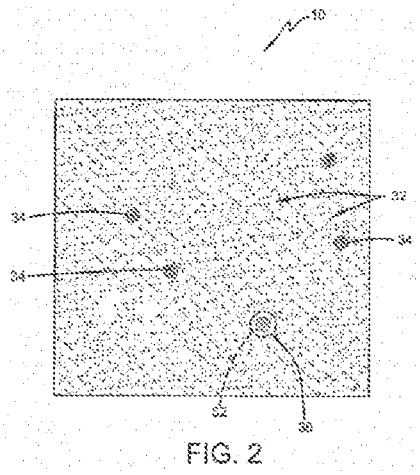
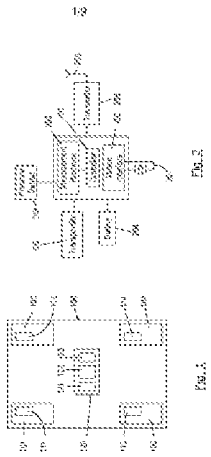


FIG. 2

Abstract:
An article such as a tire (10) with an electronic component inclusion is disclosed. The article (10) comprises at least one structural element, the structural element including a material (32) and at least one electronic component (36) being incorporated into the material (32) as an inclusion, the electronic component (36) including an integrated circuit (38). -

Current Assignees: GOODYEAR TIRE & RUBBER CO

Advanced tire monitoring system



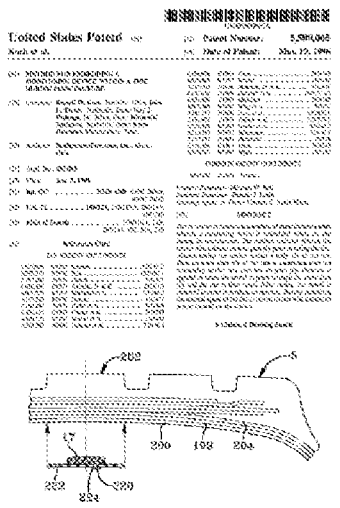
Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 136

US5500065 | **Publication Date: 1996-03-19** | **Priority Date: 1994-06-03**

Method for embedding a monitoring device within a tire during manufacture

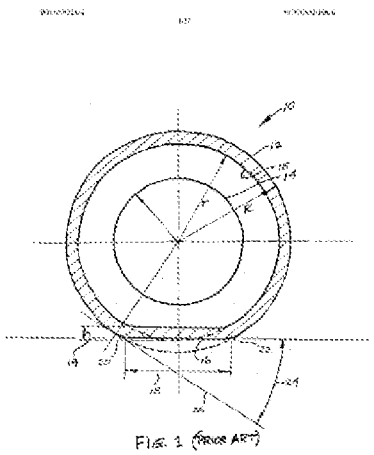


Abstract:
The invention is directed to a method of manufacturing a tire wherein a monitoring device is embedded within the tire during its manufacture. The method includes placing the device with a dowel on a tie gum ply prior to curing the tire, without having the device contact a body ply of the tire. Then an inner liner ply of the tire is assembled over the monitoring device and over the tie gum ply. Pressure is applied to cause the dowel to press through the inner liner ply and the tire is then cured. After curing, the dowel is removed in order to produce an aperture, thereby permitting the internal space of the tire to communicate with a pressure sensor located on the device.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

WO2002092364A2 | **Publication Date: 2002-11-21** | **Priority Date: 2001-05-15**

Vehicle and vehicle tire monitoring system, apparatus and method



Abstract:
Vehicle and vehicle tire monitoring system, apparatus and method determine the load-induced deflection or deformation of a vehicle tire and based thereon, deflection-related information, such as tire load, molar air content, total vehicle mass and distribution of vehicle mass, may be provided. The fire deflection region or contact region (40) of the loaded tire is detected by sensing the acceleration of the rotating tire by means od an accelerometer (50) mounted on the tire, preferably on an inner surface such as the tread lining (15) thereof. As the tire rotates and the accelerometer is off of the contact region, a high centrifugal acceleration is sensed. Conversely, when the accelerometer is on the contact region and not rotating, a low acceleration is sensed. The deflection points delimiting the contact region are determined at the points where the sensed acceleration transitions between the high and low values.

Current Assignees: WILSON KITCHENER C

Revvo's Exhibit 1002
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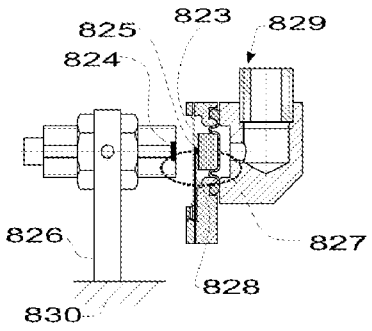
US20060212193 | **Publication Date: 2006-09-21** | **Priority Date: 2000-09-08**

Tire Pressure Monitoring Using Hall Effect Sensors



Abstract:
Wheel assembly with a tire pressure monitoring system includes a wheel rim, a tire mounted thereon, a housing having an interior in flow communication with the tire interior such that the same pressure prevails in the tire and in the housing interior, a magnet arranged in the housing and movable in an axial direction of the tire, a Hall effect sensor arranged on a non-rotating part of the vehicle in a position in which it is in a magnetic field generated by the magnet during rotation of the tire relative to the non-rotating part, and a spring arranged to move the magnet in dependence on pressure in the housing interior. The spring is arranged outside of the magnet. The Hall effect sensor senses magnetic field density of the magnet as the magnet rotates which is convertible into an indication of the pressure in the housing and thus the tire pressure.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

EP1390218A2 | **Publication Date: 2004-02-25** | **Priority Date: 2001-05-15**

Vehicle and vehicle tire monitoring system, apparatus and method

Image not currently available

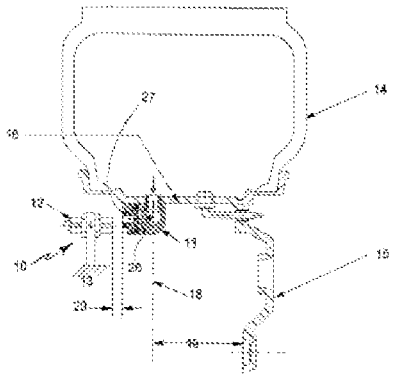
Abstract:
Vehicle and vehicle tire monitoring system, apparatus and method determine the load-induced deflection or deformation of a vehicle tire and based thereon, deflection-related information, such as tire load, molar air content, total vehicle mass and distribution of vehicle mass, may be provided. The fire deflection region or contact region (40) of the loaded tire is detected by sensing the acceleration of the rotating tire by means od an accelerometer (50) mounted on the tire, preferably on an inner surface such as the tread lining (15) thereof. As the tire rotates and the accelerometer is off of the contact region, a high centrifugal acceleration is sensed. Conversely, when the accelerometer is on the contact region and not rotating, a low acceleration is sensed. The deflection points delimiting the contact region are determined at the points where the sensed acceleration transitions between the high and low values.

Current Assignees: WILSON KITCHENER C

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 138

US7032443 | **Publication Date: 2006-04-25** | **Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same

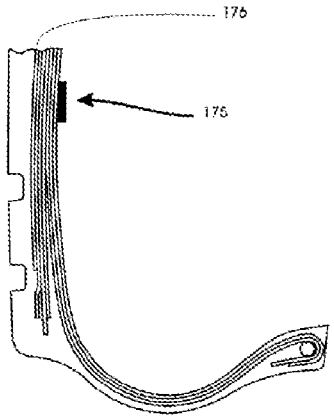


Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

US6988026 | **Publication Date: 2006-01-17** | **Priority Date: 1995-06-07**

Wireless and powerless sensor and interrogator



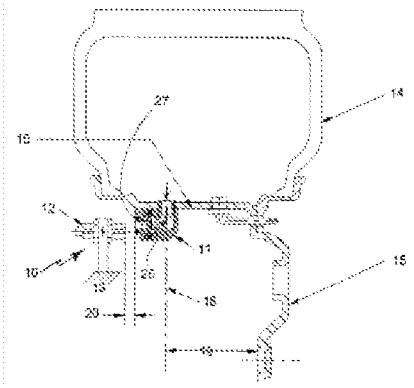
Abstract:
Arrangement and method for monitoring a tire mounted to the vehicle in which a thermal radiation detecting device detects the temperature of the tire at different circumferential locations along the circumference of the tire. The detected temperatures of the tire are analyzed to determine, for example, whether a difference in thermal radiation is present between the circumferential locations of the tire, and if so, an action is effected in response to the analysis. The thermal radiation detecting devices are preferably supplied with power wirelessly, e.g., through an inductive system, a capacitive system or a radio frequency energy transfer system.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 139

US20060006994 | **Publication Date: 2006-01-12** | **Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same

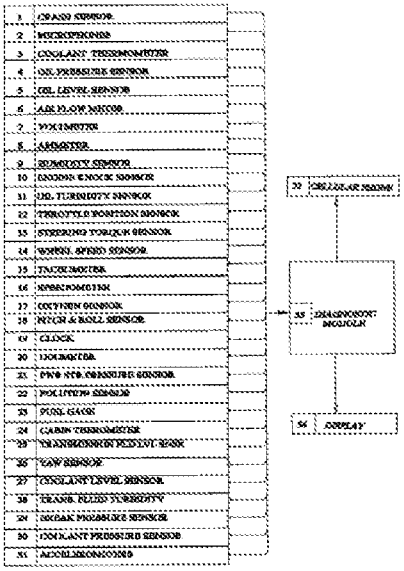


Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: MOSER GEORGE G

US20090043441 | **Publication Date: 2009-02-12** | **Priority Date: 1995-06-07**

Information Management and Monitoring System and Method



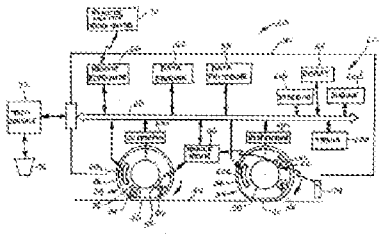
Abstract:
Information management and monitoring system and method for monitoring components on an apparatus during its operation includes a monitoring system including sensors for monitoring the components operation thereof, and a processing module arranged on the apparatus and to receive and process data about the monitored components from the sensors. The module derives information from the data about the monitored components to determine whether any component is operating in a non-optimal manner and/or to forecast failure of any component prior to such failure. The system also includes at least one remote entity interested in the operation or failure of any component. A wireless communication system is arranged on the apparatus and coupled to the module for enabling wireless communications of derived information from the module to each entity during operation of the apparatus, including information about the presence and identity of any non-optimally operating component or component forecast...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 140

US20030058118 | **Publication Date: 2003-03-27** | **Priority Date: 2001-05-15**

Vehicle and vehicle tire monitoring system, apparatus and method



Abstract:
Vehicle and vehicle tire monitoring system, apparatus and method determine the load-induced deflection or deformation of a vehicle tire and based thereon, deflection-related information, such as tire load, molar air content, total vehicle mass and distribution of vehicle mass, may be provided. The tire deflection region or contact region of the loaded tire is detected by sensing the acceleration of the rotating tire by means of an accelerometer mounted on the tire, preferably on an inner surface such as the tread lining thereof. As the tire rotates and the accelerometer is off of the contact region, a high centrifugal acceleration is sensed. Conversely, when the accelerometer is on the contact region and not rotating, a low acceleration is sensed. The deflection points delimiting the contact region are determined at the points where the sensed acceleration transitions between the high and low values.

Current Assignees: WILSON KITCHENER C

WO2004074013A2 | **Publication Date: 2004-09-02** | **Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same

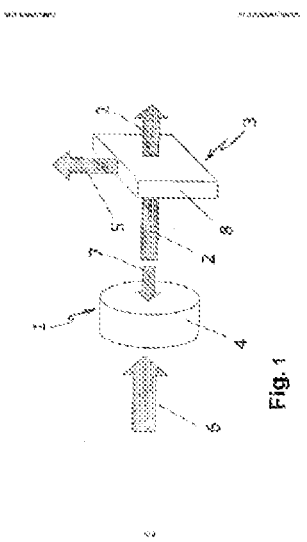


Fig. 1

Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 141

CA2448855A1 | **Publication Date: 2004-06-20** | **Priority Date: 2002-12-20**

Tire monitoring apparatus

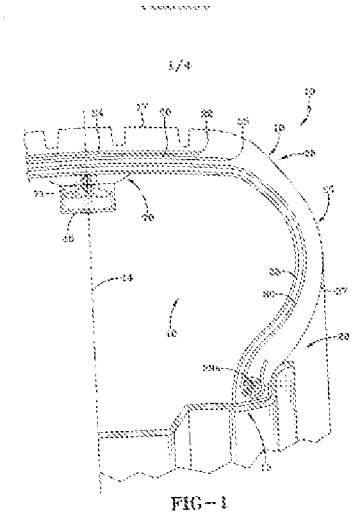


FIG - 1

Abstract:
Apparatus for mounting an electronic tag within a tire includes a patch having a first side for mounted location against an inner liner of the tire, a second opposite side, and a socket member extending into the second side. A housing is provided having an internal tag receiving chamber defined by sidewalls and an elongate assembly bolt extends through the housing passageway and into the patch socket member to attach the housing to the patch. A remote end of the assembly bolt protrudes through the patch and carries a temperature sensor that engages the tire inner liner and transmits temperature data to electronic data transmission means within the housing. A lower portion of the housing sidewall is adapted to angle inward toward the lower housing end and a pressure measuring device is mounted within the angled sidewall portion. The housing comprises a cup and a top member, the top member covering the cap and including a dependent skirt portion engaging the patch second surface along a...

Current Assignees: GOODYEAR TIRE & RUBBER CO

EP1599350A2 | **Publication Date: 2005-11-30** | **Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same

Image not currently available

Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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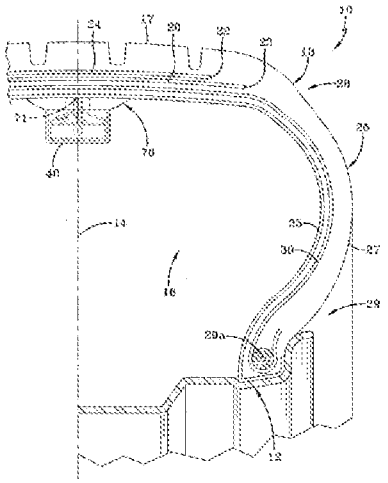
US20040118196 | **Publication Date: 2004-06-24** | **Priority Date: 2002-12-20**

Tire monitoring apparatus

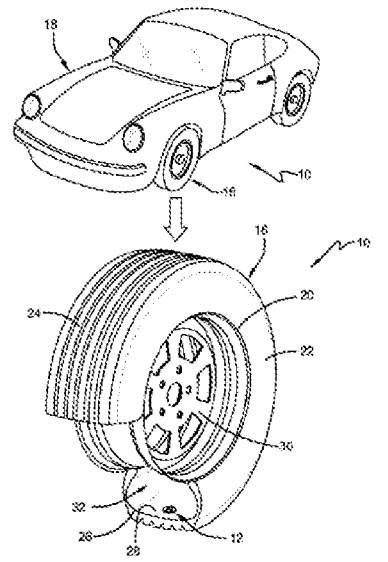


Abstract:
Apparatus for mounting an electronic tag within a tire includes a patch having a first side for mounted location against an inner liner of the tire, a second opposite side, and a socket member extending into the second side. A housing is provided having an internal tag receiving chamber defined by sidewalls and an elongate assembly bolt extends through the housing passageway and into the patch socket member to attach the housing to the patch. A remote end of the assembly bolt protrudes through the patch and carries a temperature sensor that engages the tire inner liner and transmits temperature data to electronic data transmission means within the housing. A lower portion of the housing sidewall is adapted to angle inward toward the lower housing end and a pressure measuring device is mounted within the angled sidewall portion. The housing comprises a cup and a top member, the top member covering the cap and including a dependent skirt portion engaging the patch second surface along a...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US20190187027 | **Publication Date: 2019-06-20** | **Priority Date: 2017-12-20**

Integrated tire sensor and reader system



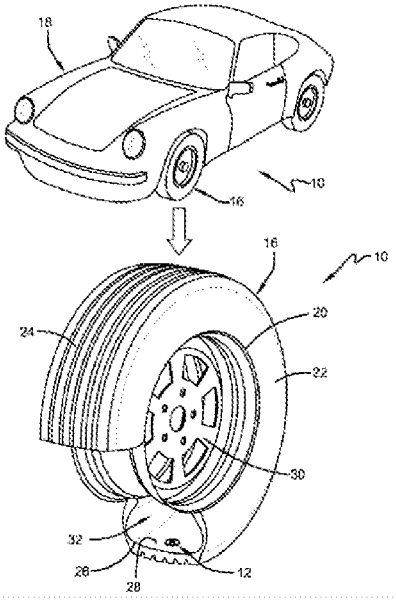
Abstract:
An integrated tire sensor and reader system includes at least one sensor unit mounted a tire or a wheel. A reader is disposed remotely from the sensor unit. The sensor unit includes at least one sensor for measuring a parameter of the tire or wheel and an antenna for communicating with the reader. The sensor unit is configured to receive a radio frequency power signal from the reader and to transmit data to the receiver. The reader includes an antenna for transmitting the radio frequency power signal to the sensor unit to actuate the one sensor unit. Upon actuation of the sensor unit, the sensor measures the parameter of the tire or wheel, and data from the sensor is transmitted from the sensor unit to the reader.

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 143

US10935466 | **Publication Date: 2021-03-02** | **Priority Date: 2017-12-20**

Integrated tire sensor and reader system

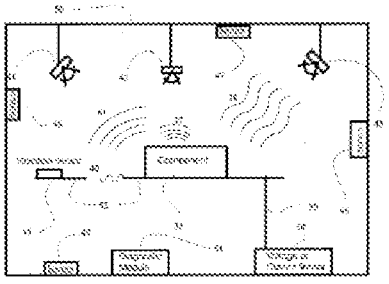


Abstract:
An integrated tire sensor and reader system includes at least one sensor unit mounted a tire or a wheel. A reader is disposed remotely from the sensor unit. The sensor unit includes at least one sensor for measuring a parameter of the tire or wheel and an antenna for communicating with the reader. The sensor unit is configured to receive a radio frequency power signal from the reader and to transmit data to the reader. The reader includes an antenna for transmitting the radio frequency power signal to the sensor unit to actuate the one sensor unit. Upon actuation of the sensor unit, the sensor measures the parameter of the tire or wheel, and data from the sensor is transmitted from the sensor unit to the reader.

Current Assignees: GOODYEAR TIRE & RUBBER CO

US20040130442 | **Publication Date: 2004-07-08** | **Priority Date: 1995-06-07**

Wireless and powerless sensor and interrogator



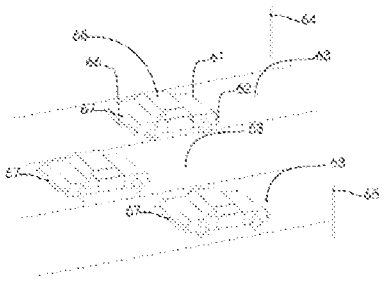
Abstract:
Arrangement and method for monitoring a tire mounted to the vehicle in which a thermal radiation detecting device detects the temperature of the tire at different circumferential locations along the circumference of the tire. The detected temperatures of the tire are analyzed to determine, for example, whether a difference in thermal radiation is present between the circumferential locations of the tire, and if so, an action is effected in response to the analysis. The thermal radiation detecting devices are preferably supplied with power wirelessly, e.g., through an inductive system, a capacitive system or a radio frequency energy transfer system.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 144

US9014953 | **Publication Date: 2015-04-21** | **Priority Date: 2000-09-08**

Wireless sensing and communication system for traffic lanes

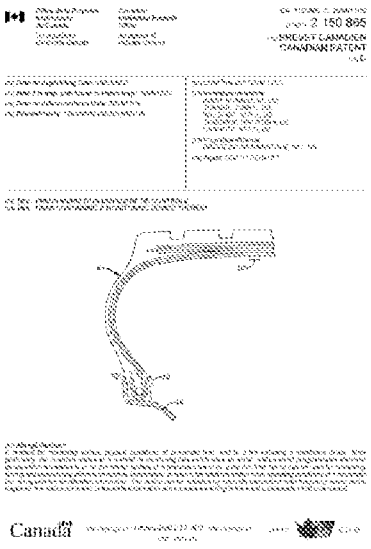


Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

CA2150865C | **Publication Date: 2004-11-16** | **Priority Date: 1994-06-03**

Tires containing a monitoring device therein



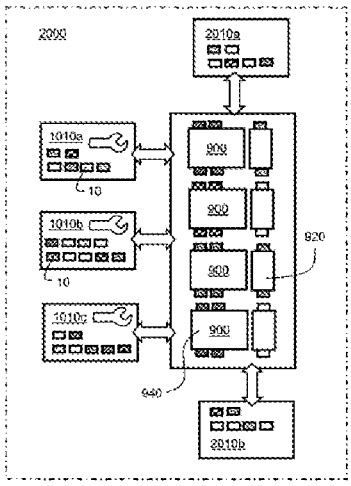
Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 145

US20100256874 | **Publication Date: 2010-10-07** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

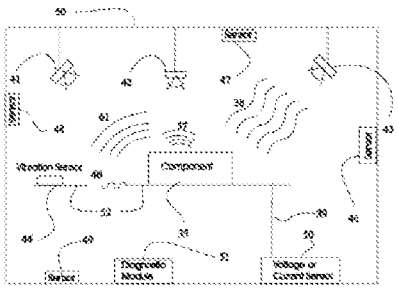


Abstract:
A method for identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle includes steps of (a) communicating with one or more modules of the apparatus for receiving their identification codes at a processing arrangement of the apparatus, the one or more modules being mounted on at least one wheel of the vehicle; (b) driving the vehicle around a curved trajectory as sensed by the steering sensing arrangement and recording a direction of steering of the vehicle together with a temporal record of the physical parameter measured by the one or more modules together with their corresponding identification codes, the physical parameter pertaining to one or more tires of the at least one wheel; and (c) applying an analysis to the steering direction and the temporal record in respect of time to identify where the one or more modules are located on the at least one wheel of the vehicle, the analysis utilizing...

Current Assignees: VOLVO TRUCKS CORP

US7630802 | **Publication Date: 2009-12-08** | **Priority Date: 1995-06-07**

Information management and monitoring system and method



Abstract:
Information management and monitoring system and method for monitoring components on a vehicle during its operation includes a monitoring system including sensors for monitoring the components operation thereof, and a processing module arranged on the vehicle and to receive and process data about the monitored components from the sensors. The module derives information from the data about the monitored components to determine whether any component is operating in a non-optimal manner and/or to forecast failure of any component. A wireless communication system is arranged on the vehicle and coupled to the module for enabling wireless communications of derived information from the module to a remote entity interested in the operation or failure of any component during operation of the vehicle. The communication includes information about the presence and identity of any non-optimally operating component or component forecast to fail.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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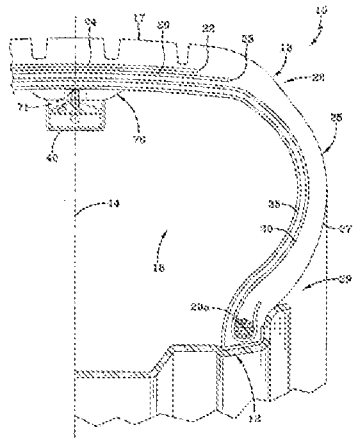
US6854324 | **Publication Date: 2005-02-15** | **Priority Date: 2002-12-20**

Tire monitoring apparatus

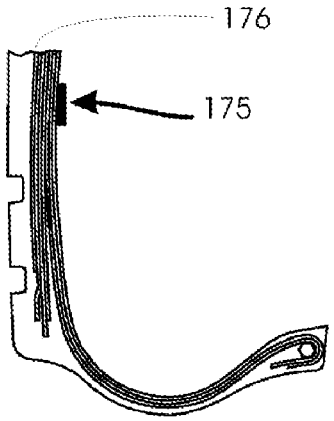


Abstract:
Apparatus for mounting an electronic tag within a tire includes a patch having a first side for mounted location against an inner liner of the tire, a second opposite side, and a socket member extending into the second side. A housing is provided having an internal tag receiving chamber defined by sidewalls and an elongate assembly bolt extends through the housing passageway and into the patch socket member to attach the housing to the patch. A remote end of the assembly bolt protrudes through the patch and carries a temperature sensor that engages the tire inner liner and transmits temperature data to electronic data transmission means within the housing. A lower portion of the housing sidewall is adapted to angle inward toward the lower housing end and a pressure measuring device is mounted within the angled sidewall portion. The housing comprises a cup and a top member, the top member covering the cap and including a dependent skirt portion engaging the patch second surface along a...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US20070156320 | **Publication Date: 2007-07-05** | **Priority Date: 2000-09-08**

Vehicular Tire Monitoring Based on Sensed Acceleration



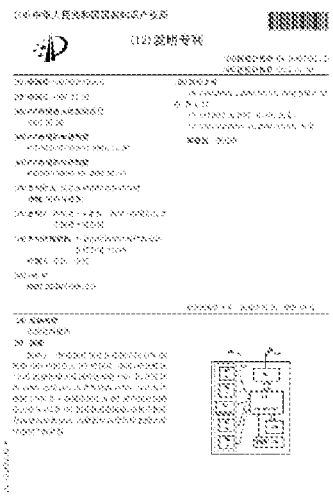
Abstract:
Vehicle with tire monitoring capabilities includes at least one wheel, each including a rim, a tire mounted on the rim, a sensor system for sensing angular, radial, tangential and/or lateral acceleration of the tire and providing acceleration signals based thereon, and an antenna arranged on the rim or tire and coupled to the sensor system for communicating data about the sensed acceleration. A processor receives acceleration signals provided by the sensor system and determines the existence of an anomaly in the tire based thereon. When arranged on the wheel, the processor provides a signal indicative or representative of the determination of the existence of the anomaly via the antenna to a receiving antenna which conveys it to a reactive system. The reactive system may provide a visual and/or audible warning to the driver of the vehicle or to personnel at a vehicle or tire monitoring facility.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 147

CN101873943B | **Publication Date: 2013-01-09** | **Priority Date: 2007-11-30**

Wheel-monitoring module

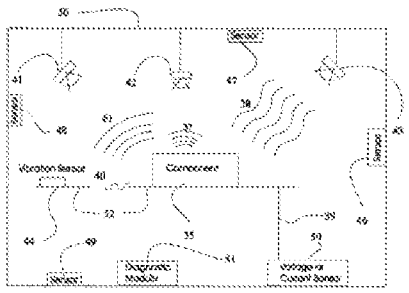


Abstract:
There is provided a module (400) operable to monitor at least a pressure (P) within a tyre (30) of a wheel (10), said module (400) being operatively mounted to said wheel (10), said module (400) includes: (a) a pressure sensor (760) for measuring said pressure (P) and generating a corresponding pressure signal; and (b) an associated data memory including a data field containing data relevant to the functional status of the tyre. -

Current Assignees: VOLVO TRUCKS CORP

US7408453 | **Publication Date: 2008-08-05** | **Priority Date: 2001-02-16**

Wheel-mounted tire pumping and energy generating system and method



Abstract:
Wheel for a vehicle includes a wheel rim, a tire mounted on the wheel rim to define an inflatable interior compartment, a pump for pumping air into the compartment, and an energy generating system for generating energy upon rotation of the wheel to power the pump and cause the pump to pump air into the compartment. The energy generating system may include a first coil, a magnetized mass movable upon rotation of the wheel relative to and partly in a chamber surrounded by the first coil, and an energy storage or load device coupled to the first coil. Upon rotation of the wheel, the mass moves relative to the first coil imparting a charge to the first coil which is stored in the energy storage or load device and used to power the pump when needed.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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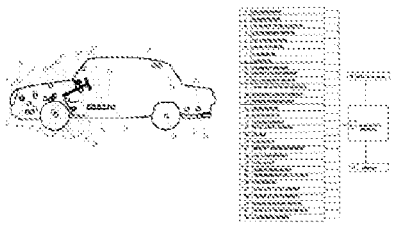
US7693626 | **Publication Date: 2010-04-06** | **Priority Date: 2000-09-08**

Vehicular tire monitoring based on sensed acceleration

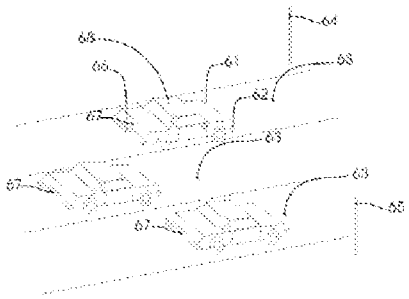


Abstract:
Vehicle with tire monitoring capabilities includes at least one wheel, each including a rim, a tire mounted on the rim, a sensor system for sensing angular, radial, tangential and/or lateral acceleration of the tire and providing acceleration signals based thereon, and an antenna arranged on the rim or tire and coupled to the sensor system for communicating data about the sensed acceleration. A processor receives acceleration signals provided by the sensor system and determines the existence of an anomaly in the tire based thereon. When arranged on the wheel, the processor provides a signal indicative or representative of the determination of the existence of the anomaly via the antenna to a receiving antenna which conveys it to a reactive system. The reactive system may provide a visual and/or audible warning to the driver of the vehicle or to personnel at a vehicle or tire monitoring facility.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20080119966 | **Publication Date: 2008-05-22** | **Priority Date: 2000-09-08**

Wireless Sensing and Communication System for Traffic Lanes



Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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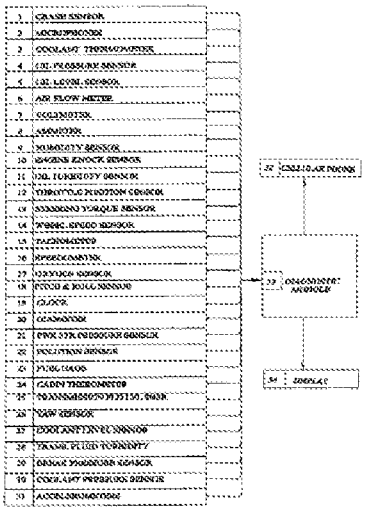
US20050192727 | **Publication Date: 2005-09-01** | **Priority Date: 1994-05-09**

Sensor Assemblies

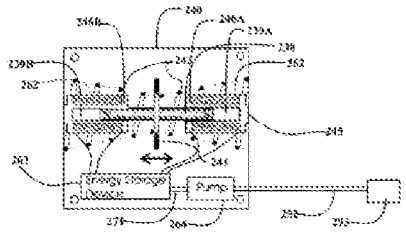


Abstract:
Sensor assembly capable of obtaining and providing a measurement of a physical quantity, e.g., measurement of temperature and/or pressure of a vehicular tire, includes an antenna capable of receiving a radio frequency signal, a radio frequency identification (RFID) device coupled to the antenna, a sensor coupled to the RFID device arranged to generate a measurement of the physical quantity or quantities, and a switch coupled to the RFID device and arranged to connect or disconnect the sensor from a circuit with the antenna dependent on whether the antenna receives a particular signal associated with the RFID device. When the antenna receives the particular signal associated with the RFID device, the RFID device causes the switch to close and connect the sensor in the circuit with the antenna to enable the measurement generated by the sensor to be directed to and transmitted by the antenna.

Current Assignees: AUTOMOTIVE TECH INTL INC

US20080156406 | **Publication Date: 2008-07-03** | **Priority Date: 2001-02-16**

Wheel-mounted tire pumping and energy generating system and method



Abstract:
Wheel for a vehicle includes a wheel rim, a tire mounted on the wheel rim to define an inflatable interior compartment, a pump for pumping air into the compartment, and an energy generating system for generating energy upon rotation of the wheel to power the pump and cause the pump to pump air into the compartment. The energy generating system may include a first coil, a magnetized mass movable upon rotation of the wheel relative to and partly in a chamber surrounded by the first coil, and an energy storage or load device coupled to the first coil. Upon rotation of the wheel, the mass moves relative to the first coil imparting a charge to the first coil which is stored in the energy storage or load device and used to power the pump when needed.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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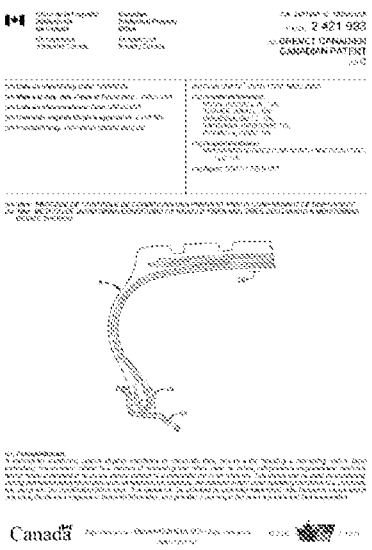
CA2421993C | Publication Date: 2005-01-25 | Priority Date: 1994-06-03

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein



Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitor- ing tires which uses an active, self-powered programmable elec- tronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as tempera- ture, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio fre- quency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

EP2219888A1 | Publication Date: 2010-08-25 | Priority Date: 2007-11-30

Method of identifying positions of wheel modules

Image not currently available

Abstract:
A method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), said apparatus (600, 680, 690, 2200) including one or more sensor modules (400) operatively mounted to revolve with said at least one wheel (10), said one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of said vehicle (900), said one or more modules (400) being operable to sense at least one physical parameter of said wheel (10) and to generate at least one corresponding sensor signal for said processing arrangement (950), said processing arrangement (710, ECU 950) being operable to process said at least one sensor signal to compute information indicative of operation of said at least one wheel (10),, characterized in that said method includes steps of (a) communicating with one or more modules (400) of said apparatus...

Current Assignees: VOLVO TRUCKS CORP

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 151

BRPI0722236A2 | **Publication Date: 2014-06-03** | **Priority Date: 2007-11-30**

Wheel modules position identification method

Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (0) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO LASTVAGNAR AB

EP2217457B1 | **Publication Date: 2018-10-24** | **Priority Date: 2007-11-30**

Wheel-monitoring module

Abstract:
A module is operable to monitor at least a pressure within a tire of a wheel, the module being operatively mounted to said wheel, the module including: (a) a pressure sensor for measuring the pressure (P) and generating a corresponding pressure signal; and b1) an associated data memory including a data field containing data relevant to the functional status of the tyre.

Current Assignees: VOLVO TRUCKS CORP

Revvo's Exhibit 1002
Revvo v. Cerebrum
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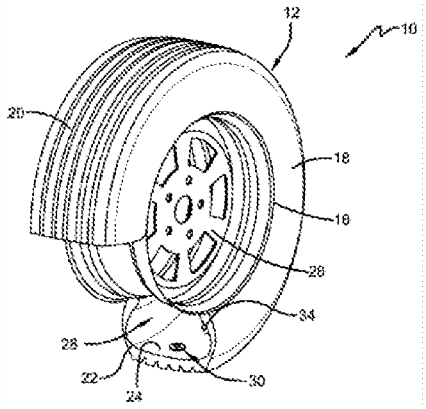
US20220055425 | **Publication Date: 2022-02-24** | **Priority Date: 2020-08-19**

Tire sensor attachment structure

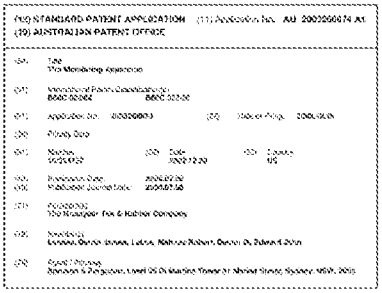


Abstract:
A tire sensor attachment structure is provided. The tire includes a pair of bead areas, a sidewall extending from each respective bead area to a tread, a carcass extending toroidally between each of the bead areas, and an innerliner that is disposed radially inwardly of the carcass. A sensor housing is attached to the innerliner, and defines an interior chamber. A sensor is disposed in the chamber. The tire sensor attachment structure includes a compressible body that is disposed in the chamber between the sensor and the innerliner.

Current Assignees: GOODYEAR TIRE & RUBBER CO

AU2003268874A1 | **Publication Date: 2004-07-08** | **Priority Date: 2002-12-20**

Tire Monitoring Apparatus



Abstract:
Apparatus for mounting an electronic tag within a tire includes a patch having a first side for mounted location against an inner liner of the tire, a second opposite side, and a socket member extending into the second side. A housing is provided having an internal tag receiving chamber defined by sidewalls and an elongate assembly bolt extends through the housing passageway and into the patch socket member to attach the housing to the patch. A remote end of the assembly bolt protrudes through the patch and carries a temperature sensor that engages the tire inner liner and transmits temperature data to electronic data transmission means within the housing. A lower portion of the housing sidewall is adapted to angle inward toward the lower housing end and a pressure measuring device is mounted within the angled sidewall portion. The housing comprises a cup and a top member, the top member covering the cap and including a dependent skirt portion engaging the patch second surface along a...

Current Assignees: GOODYEAR TIRE & RUBBER CO

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Tire with a sensor attachment structure

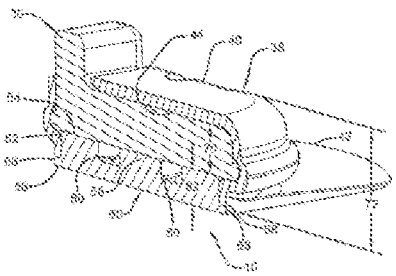

Fig. 7

Abstract:
A tire comprising a tire sensor attachment structure (10) is disclosed. The tire (12) includes a pair of bead areas (16), a sidewall (18) extending from each respective bead area to a tread (20), a carcass (22) extending toroidally between each of the bead areas (16), and an innerliner (24) being disposed radially inwardly of the carcass (22). A housing (38) is attached to the innerliner (24). The housing (38) defines an interior chamber (44). A sensor (30) is disposed in the interior chamber (44). The tire sensor attachment structure (10) comprises a discrete body (50) being formed of a compressible material and being disposed in the interior chamber (44) between the sensor (30) and the innerliner (24). -

Current Assignees: GOODYEAR TIRE & RUBBER CO

Method of identifying positions of wheel modules

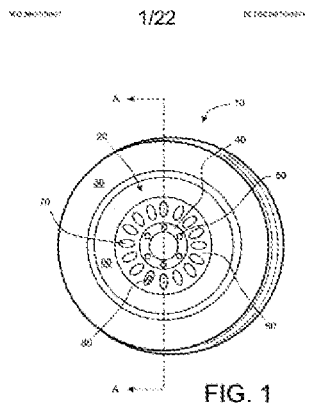

FIG. 1

Abstract:
A method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), said apparatus (600, 680, 690, 2200) including one or more sensor modules (400) operatively mounted to revolve with said at least one wheel (10), said one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of said vehicle (900), said one or more modules (400) being operable to sense at least one physical parameter of said wheel (10) and to generate at least one corresponding sensor signal for said processing arrangement (950), said processing arrangement (710, ECU 950) being operable to process said at least one sensor signal to compute information indicative of operation of said at least one wheel (10),, characterized in that said method includes steps of (a) communicating with one or more modules (400) of said apparatus...

Current Assignees: VOLVO LASTVAGNAR AB

Revvo's Exhibit 1002
Revvo v. Cerebrum
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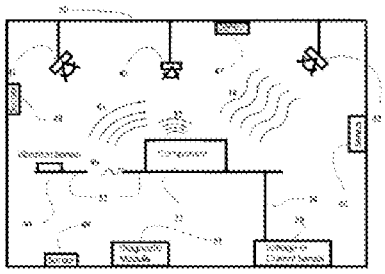
US7421321 | **Publication Date: 2008-09-02** | **Priority Date: 1995-06-07**

System for obtaining vehicular information

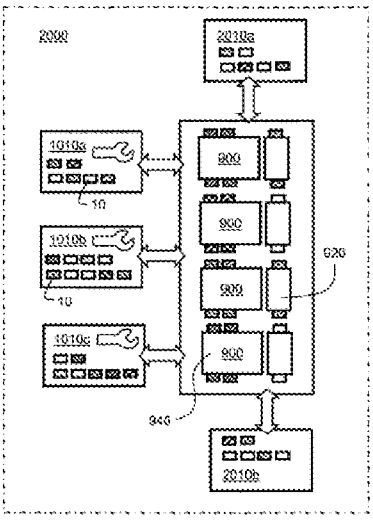


Abstract:
System for obtaining information about a vehicle or a component therein includes sensors arranged to generate and transmit a signal upon receipt and detection of a radio frequency (RF) signal and a multi-element, switchable directional antenna array. Each antenna element is directed toward a respective sensor and transmitter RF signals toward that sensor and receive return signals therefrom. A control mechanism controls transmission of the RF signals from the antenna elements, e.g., causes the antenna elements to be alternately switched on in order to sequentially transmit the RF signals and receive the return signals from the sensors or cause the antenna elements to transmit the RF signals simultaneously and space the return signals from the sensors via a delay line in circuitry from each antenna element such that each return signal is spaced in time in a known manner without requiring switching of the antenna elements.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US8744692 | **Publication Date: 2014-06-03** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules



Abstract:
A method for identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle includes steps of (a) communicating with one or more modules of the apparatus for receiving their identification codes at a processing arrangement of the apparatus, the one or more modules being mounted on at least one wheel of the vehicle; (b) driving the vehicle around a curved trajectory as sensed by the steering sensing arrangement and recording a direction of steering of the vehicle together with a temporal record of the physical parameter measured by the one or more modules together with their corresponding identification codes, the physical parameter pertaining to one or more tires of the at least one wheel; and (c) appiying an analysis to the steering direction and the temporal record in respect of time to identify where the one or more modules are located on the at least one wheel of the vehicle, the analysis utilizing...

Current Assignees: VOLVO TRUCKS CORP

Revvo's Exhibit 1002
Revvo v. Cerebrum
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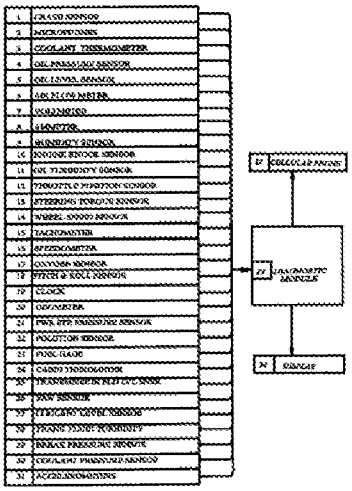
US20050273218 | **Publication Date: 2005-12-08** | **Priority Date: 1995-06-07**

System for obtaining vehicular information



Abstract:
System for obtaining information about a vehicle or a component therein includes sensors arranged to generate and transmit a signal upon receipt and detection of a radio frequency (RF) signal and a multi-element, switchable directional antenna array. Each antenna element is directed toward a respective sensor and transmitter RF signals toward that sensor and receive return signals therefrom. A control mechanism controls transmission of the RF signals from the antenna elements, e.g., causes the antenna elements to be alternately switched on in order to sequentially transmit the RF signals and receive the return signals from the sensors or cause the antenna elements to transmit the RF signals simultaneously and space the return signals from the sensors via a delay line in circuitry from each antenna element such that each return signal is spaced in time in a known manner without requiring switching of the antenna elements.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

WO2009070064A1 | **Publication Date: 2009-06-04** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

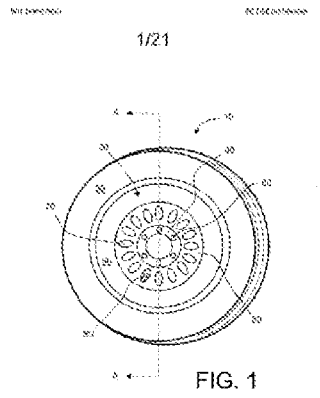


FIG. 1

Abstract:
There is provided a method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), said one or more modules (400) operatively mounted to revolve with said at least one wheel (10), said one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of said vehicle (900), said one or more modules (400) being operable to sense at least one physical parameter of said wheel (10) and to generate at least one corresponding sensor signal for said processing arrangement (950), said processing arrangement (710, ECU 950) being operable to process said at least one sensor signal to compute information indicative of operation of said at least one wheel (10), characterized in that said method includes steps of: (a) driving said vehicle (900) for a period of time whilst recording a number of rotations executed...

Current Assignees: VOLVO LASTVAGNAR AB

Revvo's Exhibit 1002
Revvo v. Cerebrum
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EP2217458A1 | **Publication Date: 2010-08-18 | Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

Image not currently available

Abstract:
There is provided a method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), said one or more modules (400) operatively mounted to revolve with said at least one wheel (10), said one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of said vehicle (900), said one or more modules (400) being operable to sense at least one physical parameter of said wheel (10) and to generate at least one corresponding sensor signal for said processing arrangement (950), said processing arrangement (710, ECU 950) being operable to process said at least one sensor signal to compute information indicative of operation of said at least one wheel (10), characterized in that said method includes steps of: (a) driving said vehicle (900) for a period of time whilst recording a number of rotations executed...

Current Assignees: VOLVO TRUCKS CORP

EP2219888B1 | **Publication Date: 2019-08-21 | Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

$A_1 = \text{pseudo}(\lambda)$ Eq. 1

Abstract:
A method for identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle includes steps of (a) communicating with one or more modules of the apparatus for receiving their identification codes at a processing arrangement of the apparatus, the one or more modules being mounted on at least one wheel of the vehicle; (b) driving the vehicle around a curved trajectory as sensed by the steering sensing arrangement and recording a direction of steering of the vehicle together with a temporal record of the physical parameter measured by the one or more modules together with their corresponding identification codes, the physical parameter pertaining to one or more tires of the at least one wheel; and (c) applying an analysis to the steering direction and the temporal record in respect of time to identify where the one or more modules are located on the at least one wheel of the vehicle, the analysis utilizing...

Current Assignees: VOLVO TRUCKS CORP

EP2217457A1 | **Publication Date: 2010-08-18** | **Priority Date: 2007-11-30**

Wheel-monitoring module

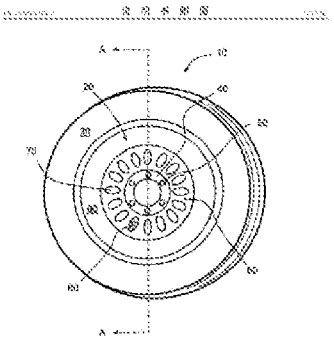
Image not currently available

Abstract:
There is provided a module (400) operable to monitor at least a pressure (P) within a tyre (30) of a wheel (10), said module (400) being operatively mounted to said wheel (10), said module (400) includes: (a) a pressure sensor (760) for measuring said pressure (P) and generating a corresponding pressure signal; and (b) an associated data memory including a data field containing data relevant to the functional status of the tyre

Current Assignees: VOLVO TRUCKS CORP

CN101873943A | **Publication Date: 2010-10-27** | **Priority Date: 2007-11-30**

Wheel-monitoring module



Abstract:
There is provided a module (400) operable to monitor at least a pressure (P) within a tyre (30) of a wheel (10), said module (400) being operatively mounted to said wheel (10), said module (400) includes: (a) a pressure sensor (760) for measuring said pressure (P) and generating a corresponding pressure signal; and (b) an associated data memory including a data field containing data relevant to the functional status of the tyre. -

Current Assignees: VOLVO TRUCKS CORP

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Revvo v. Cerebrum
IPR2025-00632 - Page 158

WO2009070063A1 | **Publication Date: 2009-06-04** | **Priority Date: 2007-11-30**

Wheel-monitoring module

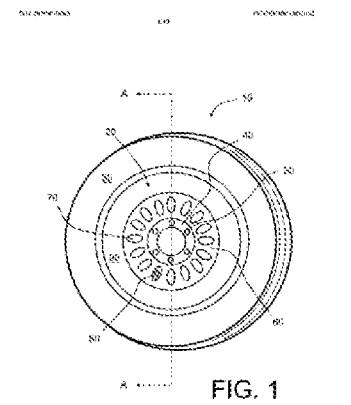


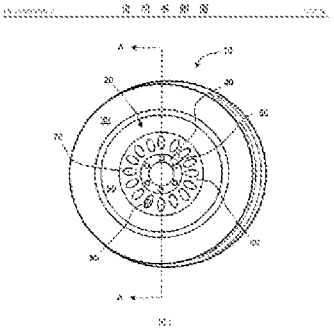
FIG. 1

Abstract:
There is provided a module (400) operable to monitor at least a pressure (P) within a tyre (30) of a wheel (10), said module (400) being operatively mounted to said wheel (10), said module (400) includes: (a) a pressure sensor (760) for measuring said pressure (P) and generating a corresponding pressure signal; and (b) an associated data memory including a data field containing data relevant to the functional status of the tyre

Current Assignees: VOLVO LASTVAGNAR AB

CN101883690A | **Publication Date: 2010-11-10** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules



Abstract:
There is provided a method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), said one or more modules (400) operatively mounted to revolve with said at least one wheel (10), said one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of said vehicle (900), said one or more modules (400) being operable to sense at least one physical parameter of said wheel (10) and to generate at least one corresponding sensor signal for said processing arrangement (950), said processing arrangement (710, ECU 950) being operable to process said at least one sensor signal to compute information indicative of operation of said at least one wheel (10), characterized in that said method includes steps of: (a) driving said vehicle (900) for a period of time whilst recording a number of rotations executed...

Current Assignees: VOLVO TRUCKS CORP

Revvo's Exhibit 1002
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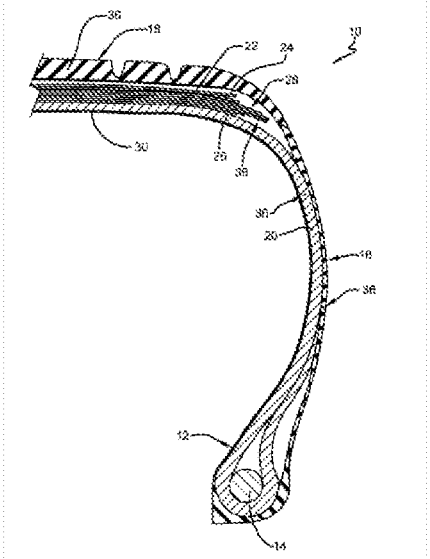
US20190184771 | **Publication Date: 2019-06-20** | **Priority Date: 2017-12-20**

Article with electronic component inclusion

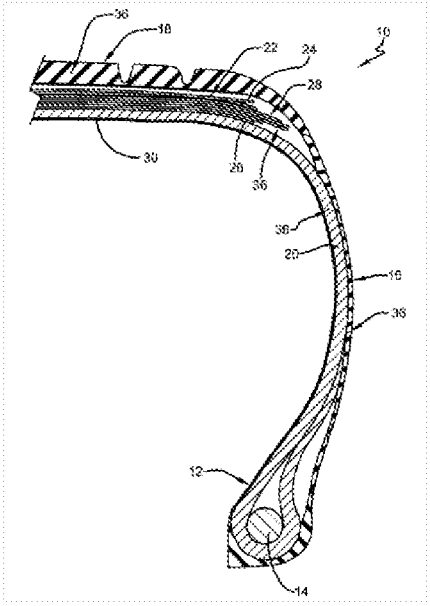


Abstract:
An article that experiences repeated deformation includes an electronic component as an inclusion. The article includes at least one structural element, in which the structural element includes a material. At least one electronic component is incorporated into the material as an inclusion. The electronic component includes an integrated circuit and may also include at least one sensor and an antenna. The size of the electronic inclusion is no greater than the largest inclusion typically occurring within the material. The article may be an article formed of rubber, such as a tire.

Current Assignees: GOODYEAR TIRE & RUBBER CO

US10792960 | **Publication Date: 2020-10-06** | **Priority Date: 2017-12-20**

Article with electronic component inclusion



Abstract:
An article that experiences repeated deformation includes an electronic component as an inclusion. The article includes at least one structural element, in which the structural element includes a material. At least one electronic component is incorporated into the material as an inclusion. The electronic component includes an integrated circuit and may also include at least one sensor and an antenna. The size of the electronic inclusion is no greater than the largest inclusion typically occurring within the material. The article may be an article formed of rubber, such as a tire.

Current Assignees: GOODYEAR TIRE & RUBBER CO

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Method of identifying positions of wheel modules

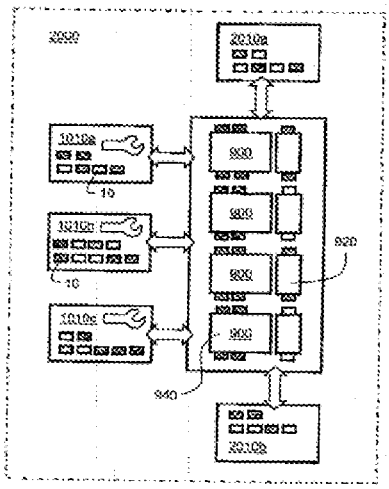
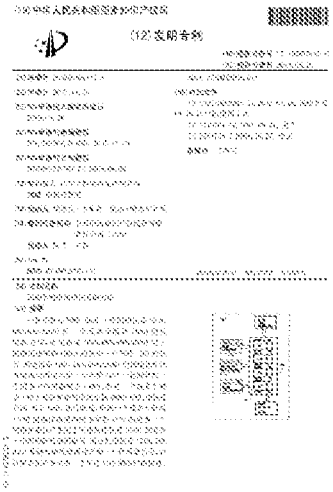


FIG. 18

Abstract:
The present invention relates to a method of identifying locations of one or more modules (400) of an apparatus (1) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900). The apparatus (1) includes one or more sensor modules (400) operatively mounted to revolve with the at least one wheel (10), the one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of the vehicle (900). The one or more modules (400) are operable to determine at least one physical parameter of the wheel (10) and to generate at least one corresponding sensor signal for the processing arrangement (950). The processing arrangement (710, ECU 950) being operable to process the at least one sensor signal to compute information indicative of operation of the at least one wheel (10), wherein the physical parameter is an angular velocity derived from a signal generated by the one or more modules (400). -

Current Assignees: VOLVO TRUCKS CORP

Method of identifying positions of wheel modules



Abstract:
A method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), the apparatus (600, 680, 690, 2200) including one or more sensor modules (400) operatively mounted to revolve with the at least one wheel (10), the one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of the vehicle (900), the one or more modules (400) being operable to sense at least one physical parameter of the wheel (10)and to generate at least one corresponding sensor signal for the processing arrangement (950), the processing arrangement (710, ECU 950) being operable to process the at least one sensor signal to compute information indicative of operation of the at least one wheel (10). -

Current Assignees: VOLVO TRUCKS CORP

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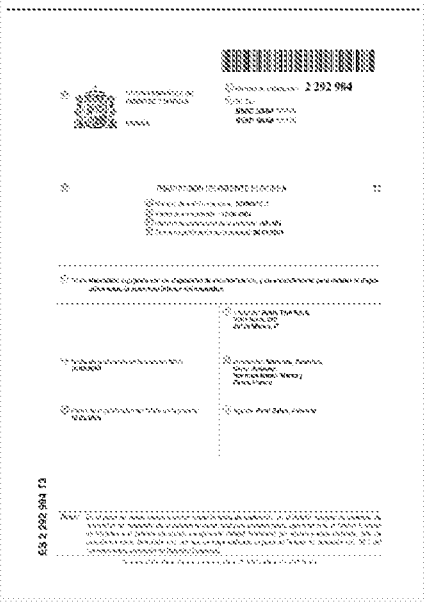
IPR2025-00632 - Page 161

ES2292984T3 | **Publication Date: 2008-03-16** | **Priority Date: 2003-06-12**

Tire equipped with a monitoring device, and procedure to install the device on the interior surface of the tire.

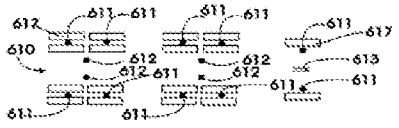


Abstract:
Tire (11) having an internal surface (111) of a substantially toroidal shape and which is provided with at least one monitoring device (3) adhered to the internal surface (111) of the tire (11), wherein an element shock absorber (4) interposes between said at least one monitoring device (3) and the inner surface (111) of the tire (11), characterized in that said damping element (4) comprises at least one layer of elastic material having a Shore A hardness - measured at 23 ° C according to the D2240 ASTM standard - between 1 and 40, and an elastic rebound - measured at 23 ° C according to the D1054 ASTM standard - less than 60.

Current Assignees: PIRELLI & C SPA, PIRELLI TYRE SPA

US20070156312 | **Publication Date: 2007-07-05** | **Priority Date: 2002-11-04**

Tire Monitoring Techniques



Abstract:
Method for obtaining information about tires on a vehicle includes arranging a tire monitor on each tire, arranging an interrogator on the vehicle, arranging antennas on the vehicle, each antenna being spaced apart from one another and associated with some tires and further being spaced different distances from the tire monitors on the associated tires, wirelessly transmitting initiation signals from the interrogator to each tire monitor through the antennas to cause each tire monitor to provide signals containing information about one or more properties of the tire on which the tire monitor is arranged, receiving the signals provided by the tire monitors at the antennas, directing the signals from the antennas to the interrogator, and determining a location of each tire monitor and thus a location of a tire on which the tire monitor is arranged by analyzing the signals provided by each tire monitor.

Current Assignees: AUTOMOTIVE TECH INTL INC, AMERICAN VEHICULAR SCIENCES LLC

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Wheel monitoring module

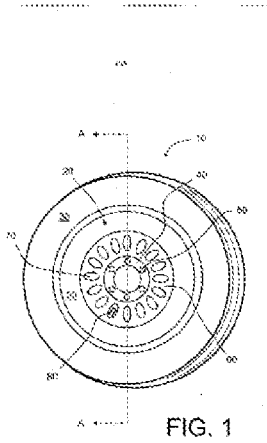
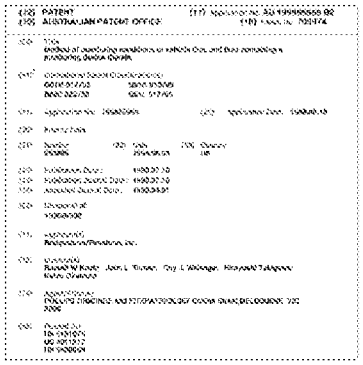


FIG. 1

Abstract:
wheel monitoring module the present invention relates to a module (400) operable for monitoring at least one pressure (p) inside a tire (30) of a wheel (10), said module (400) being operatively mounted for said wheel (10), said module (400) including: a) a pressure sensor (760) for measuring said pressure (p) and generating a corresponding pressure signal; and b) an associated data memory including a data field containing data relevant to the functional status of the tire. in accordance with the present invention, said module includes a flag that can be set by a data processor to represent "valid" or "invalid" to symbolize the validity or invalidity of that data relevant to the functional status of the tire and that flag it is adjusted to be changed from "valid" to "invalid" the sooner that pressure (p) measured by said pressure sensor falls below that predetermined threshold value.

Current Assignees: VOLVO LASTVAGNAR AB

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein



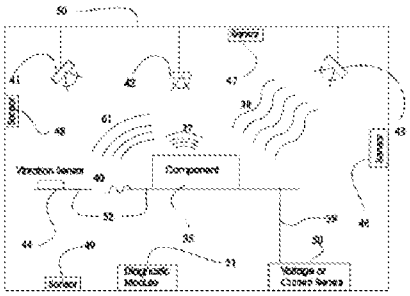
Abstract:

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 163

US7603894 | **Publication Date: 2009-10-20** | **Priority Date: 2000-09-08**

Self-powered tire monitoring system

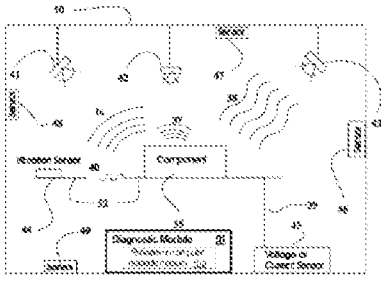


Abstract:
Vehicular tire monitoring system includes an energy providing system arranged on the tire, and a sensor system arranged on the tire and coupled to the energy providing system to be provided with energy by the energy providing system. The sensor system obtains data about at least one property of the tire, such as pressure, and converts the data into signals. An communication system is arranged on a frame of the vehicle and wirelessly communicates with the sensor system to receive the signals from the sensor system and derives, from the signals, the data obtained by the sensor system. A reactive system on the frame of the vehicle may be responsive to the data obtained by the sensor system, e.g., a display to display the data about the tire such as its pressure, or a communications system which transmits data about the tire to a remote site.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US10240935 | **Publication Date: 2019-03-26** | **Priority Date: 1998-10-22**

Vehicle software upgrade techniques



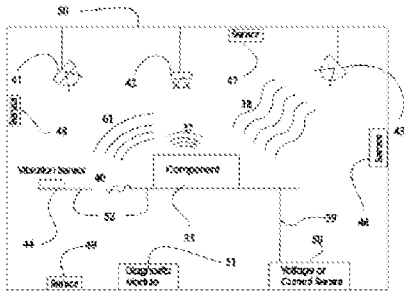
Abstract:
A method for maintaining vehicle-resident map information may include, in a vehicle with at least one communications processor integrated within the vehicle, the at least one communications processor being operable to receive wireless transmissions including map information from a remote location separate and apart from the vehicle, obtaining GPS information relating to the vehicle. The map information received by the at least one communications processor may be downloaded from the remote location. A map corresponding to the map information, and an indication of the current vehicle location may be displayed within the map, based on the GPS information. The map information may correspond to the GPS information. Road information may be wirelessly transmitted to one or more locations based on the GPS information.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 164

US7467034 | **Publication Date: 2008-12-16** | **Priority Date: 2002-11-04**

Tire monitoring techniques

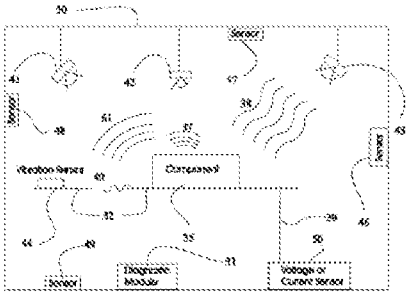


Abstract:
Method for obtaining information about tires on a vehicle includes arranging a tire monitor on each tire, arranging an interrogator on the vehicle, arranging antennas on the vehicle, each antenna being spaced apart from one another and associated with some tires and further being spaced different distances from the tire monitors on the associated tires, wirelessly transmitting initiation signals from the interrogator to each tire monitor through the antennas to cause each tire monitor to provide signals containing information about one or more properties of the tire on which the tire monitor is arranged, receiving the signals provided by the tire monitors at the antennas, directing the signals from the antennas to the interrogator, and determining a location of each tire monitor and thus a location of a tire on which the tire monitor is arranged by analyzing the signals provided by each tire monitor.

Current Assignees: AUTOMOTIVE TECH INTL INC, AMERICAN VEHICULAR SCIENCES LLC

US20080216567 | **Publication Date: 2008-09-11** | **Priority Date: 2000-09-08**

Tire Monitoring System



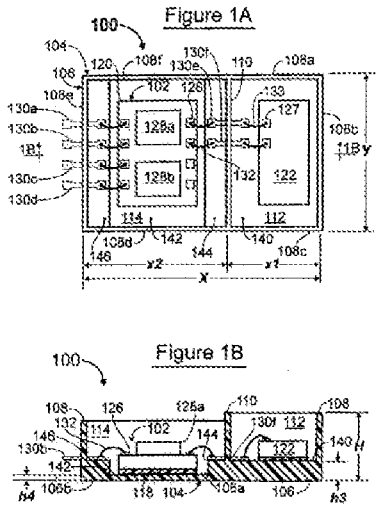
Abstract:
Vehicular tire monitoring system includes an energy providing system arranged on the tire, and a sensor system arranged on the tire and coupled to the energy providing system to be provided with energy by the energy providing system. The sensor system obtains data about at least one property of the tire, such as pressure, and converts the data into signals. An communication system is arranged on a frame of the vehicle and wirelessly communicates with the sensor system to receive the signals from the sensor system and derives, from the signals, the data obtained by the sensor system. A reactive system on the frame of the vehicle may be responsive to the data obtained by the sensor system, e.g., a display to display the data about the tire such as its pressure, or a communications system which transmits data about the tire to a remote site.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 165

EP1144208B1 | **Publication Date: 2004-03-31** | **Priority Date: 1998-08-03**

Mounting transponders in pneumatic tires

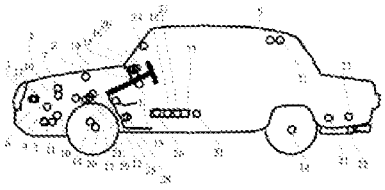


Abstract:
Method and apparatus for mounting a transponder module (602, 602a, 702, 951, 1000, 1020, 1102, 1102', 1402) and an antenna (740, 740', 862, 940, 1140, 1140', 1200, 1300, 1320, 1360, 1360', 1440, 1460) in a pneumatic tire (312, 630, 1204, 1350, 1350'), and for coupling or connecting the antenna to the transponder module. A patch (600, 700, 700', 850, 950, 980, 1100, 1100', 1210, 1356, 1356', 1400) has an opening (620, 720, 720', 856, 956, 986, 1120, 1120', 1420) extending to a cavity (622, 722, 860, 960, 990, 1122, 1122', 1422) within the body of the patch. The transponder module is removably retained in the cavity by a resilient annular lip (624, 724, 724', 858, 958, 988, 1124, 1124', 1424) extending around the opening. End portions (742/744, 742'/744', 864/868, 942/944, 972/974, 1142/1144, 1142'/1144', 1322e/1324e, 1362/1364, 1362'/1364') of the antenna extend into the patch, and may be connected to a coupling coil (750, 750', 866, 938, 968) disposed within the patch for coupling RF...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US7313467 | **Publication Date: 2007-12-25** | **Priority Date: 2000-09-08**

System and method for in-vehicle communications



Abstract:
Method for in-vehicle communications during use of the vehicle, in which a first, data-processing component is arranged on the vehicle, at least one second component is arranged on a non-rotating part of the vehicle, each second component being a sensor arranged to measure a property of the vehicle or a component thereof or an actuator arranged to control a system, subsystem or other component of the vehicle, and the first and second components wirelessly communicate with one another. When the second component is a sensor, it wirelessly transmits data about the measured property and the first component receives the data wirelessly from the second component and processes the received data. When the first component is an actuator, it processes data relating to control of the second component and generates and wirelessly transmits signals to the second component to control the system, subsystem or other component of the vehicle.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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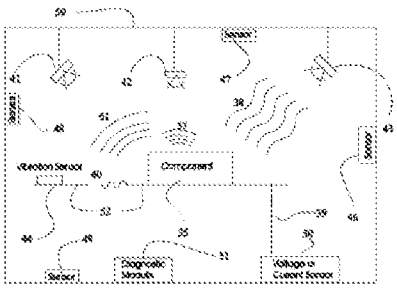
US20080065290 | **Publication Date: 2008-03-13** | **Priority Date: 2000-09-08**

Component Monitoring System

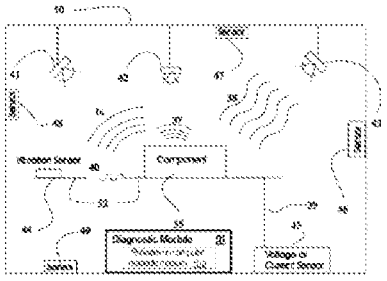


Abstract:
Vehicular tire monitoring system includes an energy providing system arranged on the tire, and a sensor system arranged on the tire and coupled to the energy providing system to be provided with energy by the energy providing system. The sensor system obtains data about at least one property of the tire, such as pressure, and converts the data into signals. An interrogator system is arranged on a frame of the vehicle and wirelessly communicates with the sensor system to receive the signals from the sensor system and derives, from the signals, the data obtained by the sensor system. A reactive system on the frame of the vehicle may be responsive to the data obtained by the sensor system, e.g., a display to display the data about the tire such as its pressure, or a communications system which transmits data about the tire to a remote site.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US10094673 | **Publication Date: 2018-10-09** | **Priority Date: 2013-08-12**

Vehicle software upgrade techniques



Abstract:
A method for maintaining vehicle-resident map information may include, in a vehicle with at least one communications processor integrated within the vehicle, the at least one communications processor being operable to receive wireless transmissions including map information from a remote location separate and apart from the vehicle, obtaining GPS information relating to the vehicle. The map information received by the at least one communications processor may be downloaded from the remote location. A map corresponding to the map information, and an indication of the current vehicle location may be displayed within the map, based on the GPS information. The map information may correspond to the GPS information. Road information may be wirelessly transmitted to one or more locations based on the GPS information.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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Revvo v. Cerebrum
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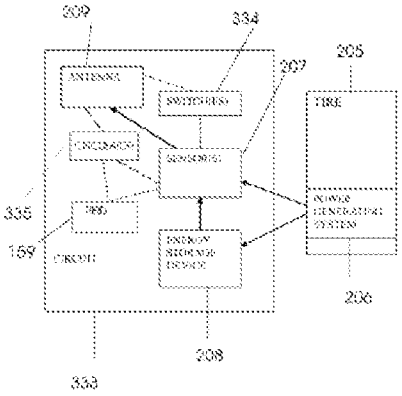
US7760080 | **Publication Date: 2010-07-20** | **Priority Date: 2000-09-08**

Tire monitoring with passive and active modes

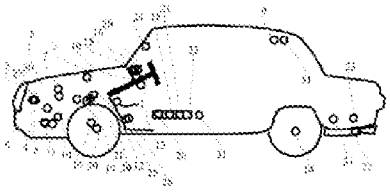


Abstract:
Movable vehicular assembly including an electricity generating system includes a movable substrate such as a tire, a power generating system arranged on, in connection with or within the substrate and to generate energy from movement of the substrate, and a circuit coupled to the power generating system and including an energy storage device. The circuit is operable in an active mode when the substrate moves and the power generating system generates energy or the energy storage device contains energy for powering the circuit and in a passive mode when the substrate is not moving and the energy storage device does not contain sufficient energy to power the circuit. The circuit receives power to operate in the passive mode from a signal received by the circuit. Components which may be part of the circuit include a surface-acoustic-wave device and a radio-frequency identification device.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20070126561 | **Publication Date: 2007-06-07** | **Priority Date: 2000-09-08**

Integrated Keyless Entry System and Vehicle Component Monitoring



Abstract:
Vehicle with integrated keyless entry system and component monitoring capabilities includes at least one door assembly each having a door, an interrogator arranged to transmit waves, a processor coupled to the interrogator and each door assembly, a portable identification device for keyless entry into the vehicle which responds to waves transmitted by the interrogator to generate waves or modify the transmitted waves which contain an identification signal, and at least one sensor system arranged to sense a property of the vehicle or of a component of the vehicle. Each sensor system responds to waves transmitted by the interrogator to generate waves or modify the transmitted waves which contain data about the sensed property. The processor unlocks or locks the door and monitors the sensed property of the vehicle or component based on waves generated or modified by the portable identification device and each sensor system and received by the interrogator.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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WO2020036859A1 | **Publication Date: 2020-02-20** | **Priority Date: 2018-08-12**

Tire sensor device

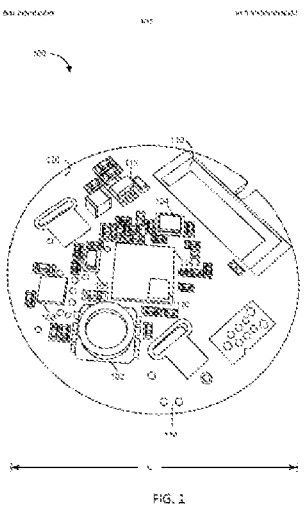


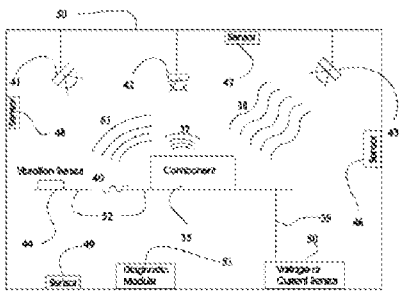
FIG. 1

Abstract:
A tire sensor device for monitoring a condition of a tire includes a plurality of sensors including a temperature sensor and an accelerometer. The tire sensing device further includes memory configured to store data received by the plurality of sensors and one or more processors coupled with the memory. The one or more processors are configured to perform one or more initial processing operations on the data received by the plurality of sensors. The tire sensor device further includes an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices.

Current Assignees: REVVO TECH INC

US20060180371 | **Publication Date: 2006-08-17** | **Priority Date: 2000-09-08**

System and Method for In-Vehicle Communications



Abstract:
Method for in-vehicle communications during use of the vehicle, in which a first, data-processing component is arranged on the vehicle, at least one second component is arranged on a non-rotating part of the vehicle, each second component being a sensor arranged to measure a property of the vehicle or a component thereof or an actuator arranged to control a system, subsystem or other component of the vehicle, and the first and second components wirelessly communicate with one another. When the second component is a sensor, it wirelessly transmits data about the measured property and the first component receives the data wirelessly from the second component and processes the received data. When the first component is an actuator, it processes data relating to control of the second component and generates and wirelessly transmits signals to the second component to control the system, subsystem or other component of the vehicle.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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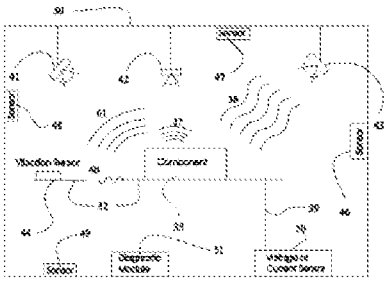
US8169311 | **Publication Date: 2012-05-01** | **Priority Date: 1999-12-15**

Wireless transmission system for vehicular component control and monitoring



Abstract:
Vehicle with wireless sensors includes a frame, at least one sensor assembly fixed to the frame and each including a sensor arranged to obtain data about a condition or property of the vehicle or part thereof or an environment in or around the vehicle, and a wireless transmission component coupled to the sensor for wirelessly transmitting a signal derived from the data obtained by the sensor, a receiver fixed to the frame arranged to receive signals from the wireless transmission component, and a reactive component for performing an action based on the data obtained by the sensor and transmitted from the wireless transmission component to the receiver. The data can be displayed as an indication to the driver or other occupant of the vehicle, relayed the data to a remote location for analysis or response and/or used to determine adjustment or control a component in the vehicle.

Current Assignees: AUTOMOTIVE TECH INTL INC

EP3663110B1 | **Publication Date: 2022-07-20** | **Priority Date: 2018-12-05**

Integrated tire sensor and reader system

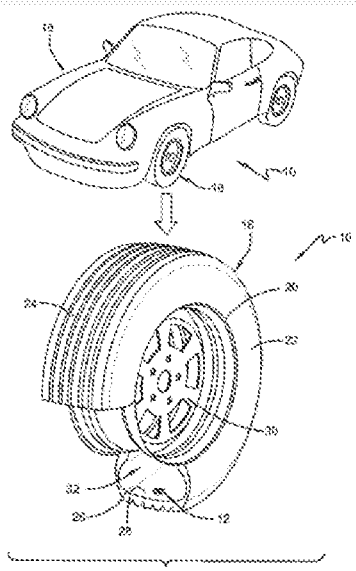


FIG. 1

Abstract:

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Plug-in wear or abrasion sensor and tire comprising such a sensor

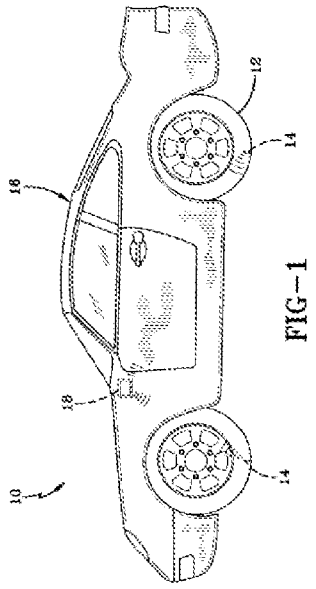
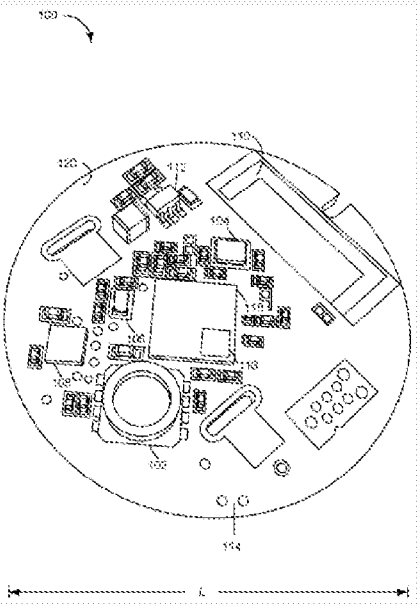


FIG – 1

Abstract:
An autonomous, plug-in and sacrificial wear sensing system including at least one wearable sensor, autonomous energy supply and means for remote radio-frequency communication. The system includes a tubular tread wear indicator body embedded within a tire tread element. The indicator body is centered within the tread element and is shaped in the form of a tube. The sensor element operably changes in at least one electromagnetically measurable physical parameter as the tread element wears radially inward. The system provides a full tread wear system including the algorithm for signal and data processing, buffering and decision making routines to remotely provide vehicle driver or owner with current tire wear status, tire type—vehicle—season match and with real-time estimation of remaining tire life.

Current Assignees: GOODYEAR TIRE & RUBBER CO

Tire sensor device



Abstract:
A tire sensor device for monitoring a condition of a tire includes a plurality of sensors including a temperature sensor and an accelerometer. The tire sensing device further includes memory configured to store data received by the plurality of sensors and one or more processors coupled with the memory. The one or more processors are configured to perform one or more initial processing operations on the data received by the plurality of sensors. The tire sensor device further includes an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices.

Current Assignees: REVVO TECH INC

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Revvo v. Cerebrum
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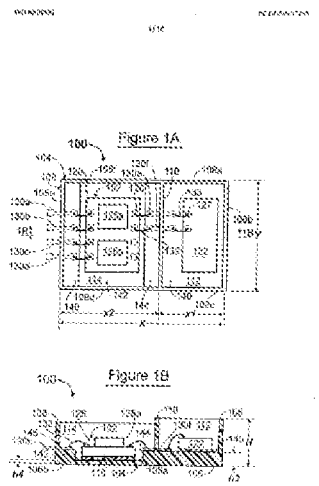
WO2000008598A1 | **Publication Date: 2000-02-17 | Priority Date: 1998-08-03**

Antennas for transponders in pneumatic tires

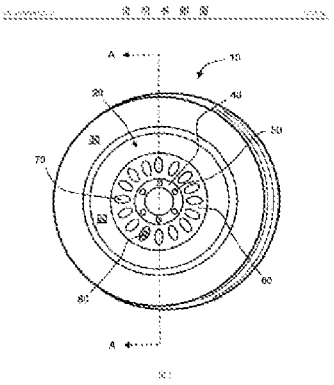


Abstract:
Method and apparatus for mounting a transponder module (602, 602a, 702, 951, 1000, 1020, 1102, 1102', 1402) and an antenna (740, 740', 862, 940, 1140, 1140', 1200, 1300, 1320, 1360, 1360', 1440, 1460) in a pneumatic tire (312, 630, 1204, 1350, 1350'), and for coupling or connecting the antenna to the transponder module. A patch (600, 700, 700', 850, 950, 980, 1100, 1100', 1210, 1356, 1356', 1400) has an opening (620, 720, 720', 856, 956, 986, 1120, 1120', 1420) extending to a cavity (622, 722, 860, 960, 990, 1122, 1122', 1422) within the body of the patch. The transponder module is removably retained in the cavity by a resilient annular lip (624, 724, 724', 858, 958, 988, 1124, 1124', 1424) extending around the opening. End portions (742/744, 742'/744', 864/868, 942/944, 972/974, 1142/1144, 1142'/1144', 1322e/1324e, 1362/1364, 1362'/1364') of the antenna extend into the patch, and may be connected to a coupling coil (750, 750', 866, 938, 968) disposed within the patch for coupling RF...

Current Assignees: GOODYEAR TIRE & RUBBER CO

CN101878122A | **Publication Date: 2010-11-03 | Priority Date: 2007-11-30**

Method of identifying positions of wheel modules



Abstract:
A method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), said apparatus (600, 680, 690, 2200) including one or more sensor modules (400) operatively mounted to revolve with said at least one wheel (10), said one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of said vehicle (900), said one or more modules (400) being operable to sense at least one physical parameter of said wheel (10) and to generate at least one corresponding sensor signal for said processing arrangement (950), said processing arrangement (710, ECU 950) being operable to process said at least one sensor signal to compute information indicative of operation of said at least one wheel (10), characterized in that said method includes steps of (a) communicating with one or more modules (400) of said apparatus...

Current Assignees: VOLVO TRUCKS CORP

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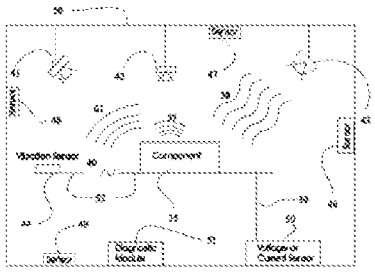
US20080129475 | **Publication Date: 2008-06-05** | **Priority Date: 2000-09-08**

System and Method for In-Vehicle Communications

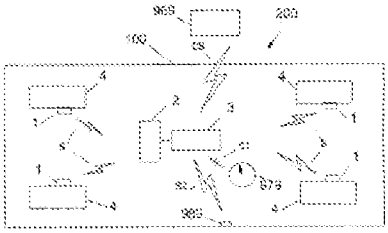


Abstract:
Method for in-vehicle communications during use of the vehicle, in which a first, data-processing component is arranged on the vehicle, at least one second component is arranged on a non-rotating part of the vehicle, each second component being a sensor arranged to measure a property of the vehicle or a component thereof or an actuator arranged to control a system, subsystem or other component of the vehicle, and the first and second components wirelessly communicate with one another. When the second component is a sensor, it wirelessly transmits data about the measured property and the first component receives the data wirelessly from the second component and processes the received data. When the first component is an actuator, it processes data relating to control of the second component and generates and wirelessly transmits signals to the second component to control the system, subsystem or other component of the vehicle.

Current Assignees: AUTOMOTIVE TECH INTL INC

US7075421 | **Publication Date: 2006-07-11** | **Priority Date: 2002-07-19**

Tire temperature and pressure monitoring sensors and systems



Abstract:
A tire monitoring system providing tire status and notifying or warning the vehicle operator of early detection of imminent tire failure and performance degradation; thus improving safety by preventing blowouts from occurring, lengthening tire life by encouraging preventive maintenance, and improving fuel mileage by encouraging the operator to fill the tire to its proper pressure or repair it. The system monitors temperature of the rim of the wheel to which the tire is attached, such temperature being transmitted to the vehicle operator or other interested parties via means such as radio frequency.

Current Assignees: TUTTLE JOHN R

Revvo's Exhibit 1002
Revvo v. Cerebrum
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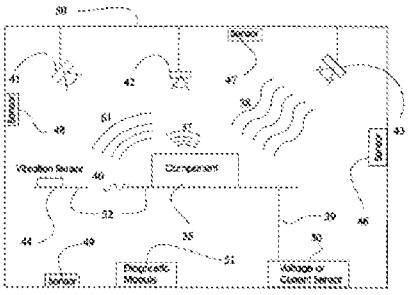
US7103460 | **Publication Date: 2006-09-05** | **Priority Date: 1994-05-09**

System and method for vehicle diagnostics

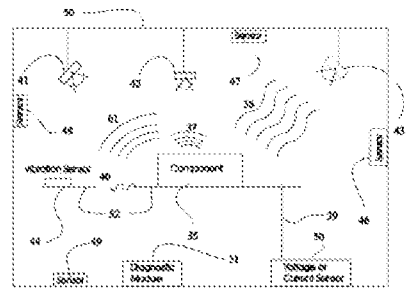


Abstract:
Method and system for diagnosing whether vehicular components are operating abnormally based on data obtained from sensors arranged on a vehicle. In a training stage, output from the sensors during normal operation of the components is obtained, each component is adjusted to induce abnormal operation thereof and output from the sensors is obtained during the induced abnormal operation. A determination is made as to which sensors provide data about abnormal operation of each component based on analysis of the output from the sensors during normal operation and during induced abnormal operation of the components. During operation of the vehicle, the output from the sensors is obtained and analyzed, e.g., by inputting it into a pattern recognition algorithm or neural network generated during the training stage, in order to output an indication of abnormal operation of any components being diagnosed.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US7444210 | **Publication Date: 2008-10-28** | **Priority Date: 2000-09-08**

System and method for in-vehicle communications



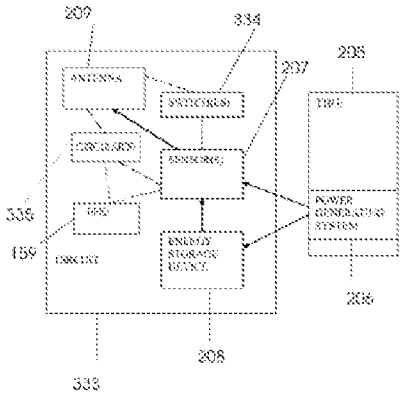
Abstract:
Method for in-vehicle communications during use of the vehicle, in which a first, data-processing component is arranged on the vehicle, at least one second component is arranged on a non-rotating part of the vehicle, each second component being a sensor arranged to measure a property of the vehicle or a component thereof or an actuator arranged to control a system, subsystem or other component of the vehicle, and the first and second components wirelessly communicate with one another. When the second component is a sensor, it wirelessly transmits data about the measured property and the first component receives the data wirelessly from the second component and processes the received data. When the first component is an actuator, it processes data relating to control of the second component and generates and wirelessly transmits signals to the second component to control the system, subsystem or other component of the vehicle.

Current Assignees: AUTOMOTIVE TECH INTL INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 174

US20060244581 | **Publication Date: 2006-11-02** | **Priority Date: 2000-09-08**

Tire Monitoring with Passive and Active Modes



Abstract:
Movable vehicular assembly including an electricity generating system includes a movable substrate such as a tire, a power generating system arranged on, in connection with or within the substrate and to generate energy from movement of the substrate, and a circuit coupled to the power generating system and including an energy storage device. The circuit is operable in an active mode when the substrate moves and the power generating system generates energy or the energy storage device contains energy for powering the circuit and in a passive mode when the substrate is not moving and the energy storage device does not contain sufficient energy to power the circuit. The circuit receives power to operate in the passive mode from a signal received by the circuit. Components which may be part of the circuit include a surface-acoustic-wave device and a radio-frequency identification device.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

EP3663110A1 | **Publication Date: 2020-06-10** | **Priority Date: 2018-12-05**

Integrated tire sensor and reader system

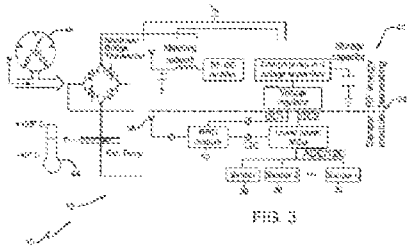


FIG. 3

Abstract:
An integrated tire sensor and reader system (10) is disclosed. The system (10) comprises at least one sensor unit (12) mounted on at least one of a tire (16) and a wheel (30) and a reader or receiver (14) disposed remotely from the at least one sensor unit (12). The at least one sensor unit (12) includes at least one sensor (36) for measuring a parameter of the tire (16) or wheel (30), and an antenna (38) for communicating with the reader or receiver (14). The at least one sensor unit (12) is configured to receive a radio frequency power signal from the reader or receiver (14) and to transmit data to the reader or receiver (14). The reader or receiver (14) includes an antenna (56) for transmitting the radio frequency power signal to the at least one sensor unit (12) to actuate the at least one sensor unit (12). Upon actuation of the at least one sensor unit (12), the at least one sensor (36) measures the parameter of the tire (16) or wheel (30), and data from the at least one sensor...

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
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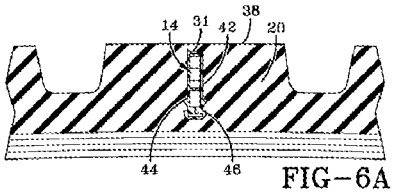
EP2743101A1 | **Publication Date: 2014-06-18** | **Priority Date: 2012-12-13**

Plug-in wear or abrasion sensor and tire comprising such a sensor



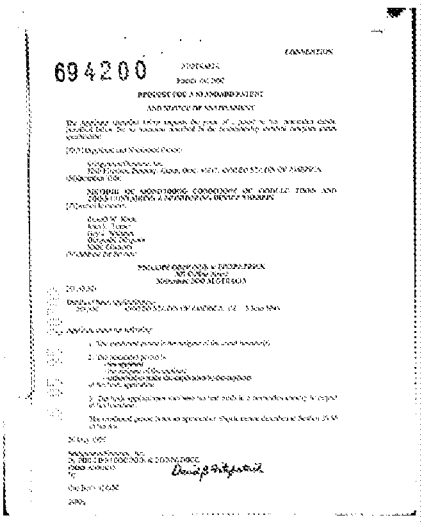
FIG−6A

Abstract:
A plug-in wear sensor device for embedding into a mechanical element (12) is disclosed. The sensor device comprises at least one sensor sacrificial and wearable sensing element (32, 34, 36); power supply means (24) for supplying operational electrical power to the at least one sensing element (32, 34, 36); and communication means (22) for transmitting a data signal from the at least one sensing element (32, 34, 36) indicative of a state of the wear of the mechanical element (12) in which the sensor device (14) is operationally embedded. Also, a vehicle tire comprising at least one tread element (20) projecting radially outward from a base of the tread and having a defined tread depth is disclosed comprising such a sensor device embedded or plugged in into the at least one tread element (20). Finally, vehicle tire tread wear sensing system comprising such a vehicle tire (12) and a controller is disclosed. -

Current Assignees: GOODYEAR TIRE & RUBBER CO

AU6942008B2 | **Publication Date: 1998-07-16** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein


694200

Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

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GB2406646A | **Publication Date: 2005-04-06** | **Priority Date: 2000-09-08**

Wireless SAW device used as pressure switch

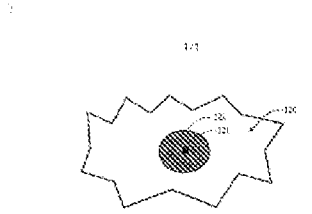


Fig 1A

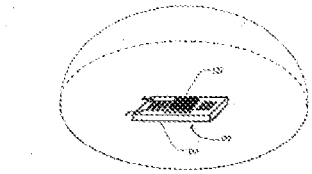


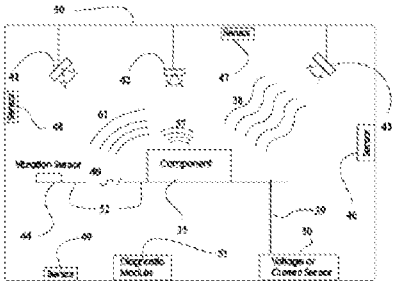
Fig 1B

Abstract:
A pressure switch for a vehicle includes a SAW sensor 121,124 having an interdigital transducer and a reflector formed on a substrate. A surface 120 within the passenger compartment of the vehicle (eg armrest, steering wheel airbag cover) contains a projection 122 which permits force exerted on the surface 120 to be transmitted to the SAW device 121,124, thus changing the time delay or natural frequency of the surface acoustic wave. A projection 123 may also be formed on the substrate of the SAW device.

Current Assignees: AUTOMOTIVE TECH INTL INC

US7920102 | **Publication Date: 2011-04-05** | **Priority Date: 1999-12-15**

Vehicular heads-up display system



Abstract:
Vehicular heads-up display control techniques wherein content of a virtual display generated by the heads-up display system is controlled by actions of an occupant of the vehicle. The control device can be a voice-reception system which receives vocal commands from the occupant and/or a gesture-detection system which detects gestures by the occupant. One such gesture-detection system includes a camera having a field of view of hands or an upper body region of an occupant expected to exercise control of the heads-up display and a processor arranged to receive images from the camera, detect movement of a head, hand or arm of the occupant in one of predetermined number of areas and perform a function based on the detection of movement in the predetermined area. The function may be to alter the content of the heads-up display or adjustment of a vehicle component.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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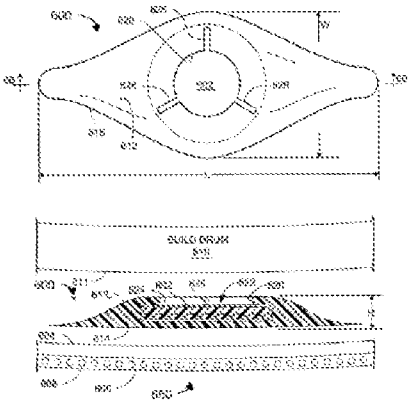
IPR2025-00632 - Page 177

US6546982 | **Publication Date: 2003-04-15** | **Priority Date: 1998-08-03**

Mounting transponders in pneumatic tires

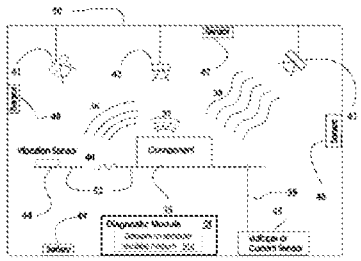


Abstract:
Method and apparatus for mounting a transponder module (602, 602a, 702, 951, 1000, 1020, 1102, 1102', 1402) and an antenna (740, 740', 862, 940, 1140, 1140', 1200, 1300, 1320, 1360, 1360', 1440, 1460) in a pneumatic tire (312, 630, 1204, 1350, 1350'), and for coupling or connecting the antenna to the transponder module. A patch (600, 700, 700', 850, 950, 980, 1100, 1100', 1210, 1356, 1356', 1400) has an opening (620, 720, 720', 856, 956, 986, 1120, 1120', 1420) extending to a cavity (622, 722, 860, 960, 990, 1122, 1122', 1422) within the body of the patch. The transponder module is removably retained in the cavity by a resilient annular lip (624, 724, 724', 858, 958, 988, 1124, 1124', 1424) extending around the opening. End portions (742/744,742'/744', 864/868, 942/944, 972/974, 1142/1144, 1142'/1144', 1322e/1324e, 1362/1364, 1362'/1364') of the antenna extend into the patch, and may be connected to a coupling coil (750, 750', 866, 938, 968) disposed within the patch for coupling RF...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US20130325323 | **Publication Date: 2013-12-05** | **Priority Date: 1998-10-22**

Vehicle software upgrade techniques



Abstract:
A method for maintaining vehicle-resident map information may include, in a vehicle with at least one communications processor integrated within the vehicle, the at least one communications processor being operable to receive wireless transmissions including map information from a remote location separate and apart from the vehicle, obtaining GPS information relating to the vehicle. The map information received by the at least one communications processor may be downloaded from the remote location. A map corresponding to the map information, and an indication of the current vehicle location may be displayed within the map, based on the GPS information. The map information may correspond to the GPS information. Road information may be wirelessly transmitted to one or more locations based on the GPS information.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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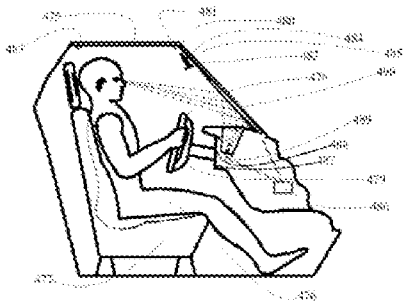
US20070057781 | **Publication Date: 2007-03-15** | **Priority Date: 1999-12-15**

Vehicular Heads-Up Display System

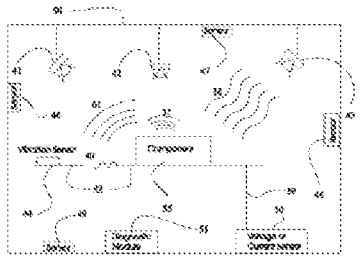


Abstract:
Vehicular heads-up display control techniques wherein content of a virtual display generated by the heads-up display system is controlled by actions of an occupant of the vehicle. The control device can be a voice-reception system which receives vocal commands from the occupant and/or a gesture-detection system which detects gestures by the occupant. One such gesture-detection system includes a camera having a field of view of hands or an upper body region of an occupant expected to exercise control of the heads-up display and a processor arranged to receive images from the camera, detect movement of a head, hand or arm of the occupant in one of predetermined number of areas and perform a function based on the detection of movement in the predetermined area. The function may be to alter the content of the heads-up display or adjustment of a vehicle component.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20120089299 | **Publication Date: 2012-04-12** | **Priority Date: 1999-12-15**

Wireless transmission system for vehicular component control and monitoring



Abstract:
Vehicle with wireless sensors includes a frame, at least one sensor assembly fixed to the frame and each including a sensor arranged to obtain data about a condition or property of the vehicle or part thereof or an environment in or around the vehicle, and a wireless transmission component coupled to the sensor for wirelessly transmitting a signal derived from the data obtained by the sensor, a receiver fixed to the frame arranged to receive signals from the wireless transmission component, and a reactive component for performing an action based on the data obtained by the sensor and transmitted from the wireless transmission component to the receiver. The data can be displayed as an indication to the driver or other occupant of the vehicle, relayed the data to a remote location for analysis or response and/or used to determine adjustment or control a component in the vehicle.

Current Assignees: AUTOMOTIVE TECH INTL INC

Revvo's Exhibit 1002
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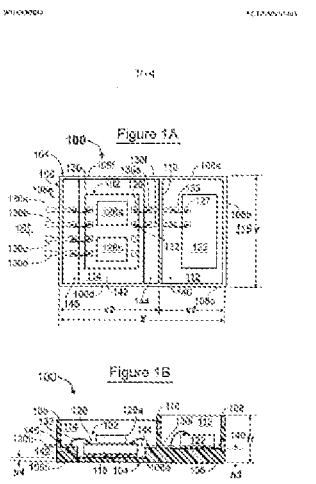
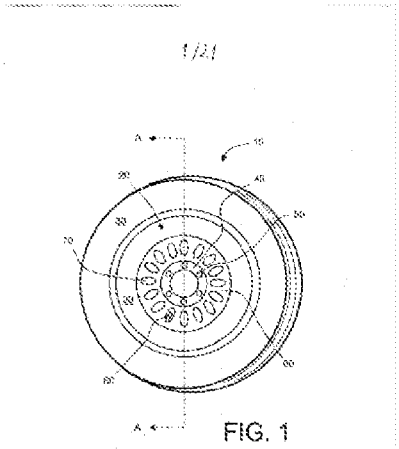
Mounting transponders in pneumatic tires



Abstract:
Method and apparatus for mounting a transponder module (602, 602a, 702, 951, 1000, 1020, 1102, 1102', 1402) and an antenna (740, 740', 862, 940, 1140, 1140', 1200, 1300, 1320, 1360, 1360', 1440, 1460) in a pneumatic tire (312, 630, 1204, 1350, 1350'), and for coupling or connecting the antenna to the transponder module. A patch (600, 700, 700', 850, 950, 980, 1100, 1100', 1210, 1356, 1356', 1400) has an opening (620, 720, 720', 856, 956, 986, 1120, 1120', 1420) extending to a cavity (622, 722, 860, 960, 990, 1122, 1122', 1422) within the body of the patch. The transponder module is removably retained in the cavity by a resilient annular lip (624, 724, 724', 858, 958, 988, 1124, 1124', 1424) extending around the opening. End portions (742/744, 742'/744', 864/868, 942/944, 972/974, 1142/1144, 1142'/1144', 1322e/1324e, 1362/1364, 1362'/1364') of the antenna extend into the patch, and may be connected to a coupling coil (750, 750', 866, 938, 968) disposed within the patch for coupling RF...

Current Assignees: GOODYEAR TIRE & RUBBER CO

Method of identifying wheel module positions, wheel monitoring device, vehicle including wheel monitoring device, and system including wheel monitoring device



Abstract:
METHOD OF IDENTIFYING WHEEL MODULE POSITIONS, WHEEL MONITORING DEVICE, VEHICLE INCLUDING WHEEL MONITORING DEVICE, AND, SYSTEM INCLUDING WHEEL MONITORING DEVICE The present invention relates to a method of identifying locations of a or more modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolutionize with the wheels (10), and communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The method includes the steps of: (a) arranging an elongated feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (b) vehicle direction (900) along the elongated feature (1100) to cause the wheels (10), together with their associated modules (400), to come in contact with the elongated feature (1100) and signal communication including signal components stimulated by contact of the wheels (10) on top of the elongated feature (1100) for...

Current Assignees: VOLVO LASTVAGNAR AB

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EP1144208A2 | **Publication Date: 2001-10-17** | **Priority Date: 1998-08-03**

Mounting transponders in pneumatic tires

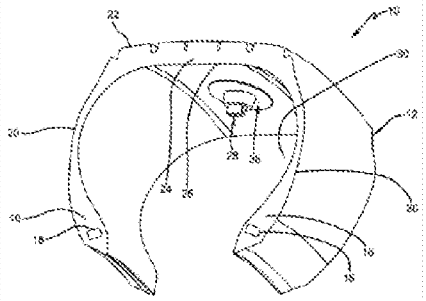
Image not currently available

Abstract:
Method and apparatus for mounting a transponder module (602, 602a, 702, 951, 1000, 1020, 1102, 1102', 1402) and an antenna (740, 740', 862, 940, 1140, 1140', 1200, 1300, 1320, 1360, 1360', 1440, 1460) in a pneumatic tire (312, 630, 1204, 1350, 1350'), and for coupling or connecting the antenna to the transponder module. A patch (600, 700, 700', 850, 950, 980, 1100, 1100', 1210, 1356, 1356', 1400) has an opening (620, 720, 720', 856, 956, 986, 1120, 1120', 1420) extending to a cavity (622, 722, 860, 960, 990, 1122, 1122', 1422) within the body of the patch. The transponder module is removably retained in the cavity by a resilient annular lip (624, 724, 724', 858, 958, 988, 1124, 1124', 1424) extending around the opening. End portions (742/744, 742'/744', 864/868, 942/944, 972/974, 1142/1144, 1142'/1144', 1322e/1324e, 1362/1364, 1362'/1364') of the antenna extend into the patch, and may be connected to a coupling coil (750, 750', 866, 938, 968) disposed within the patch for coupling RF...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US11628695 | **Publication Date: 2023-04-18** | **Priority Date: 2020-12-15**

Tire sensor container system for improved sensor functionality and longevity



Abstract:
A tire sensor container system is provided. A tire includes a carcass toroidally extending from a first bead area to a second bead area, and an innerliner formed on an inner surface of the carcass. The tire sensor container system includes a tire pressure monitoring system sensor, which in turn includes a rigid housing that is formed with an oval shape. A flexible container is mounted to the innerliner. The container includes a base and a wall extending radially outwardly from the base, and the wall terminates in a lip. The container wall is formed with an oval shape that cooperates with the shape of the tire pressure monitoring sensor housing. A cavity is defined by the base, the wall, and the lip, and cavity receives and secures the tire pressure monitoring system sensor. The system reduces sensor rotation and maintains consistent sensor orientation to improve sensor functionality and longevity.

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
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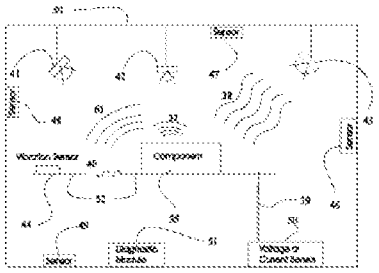
Vehicular component control using wireless switch assemblies



Abstract:
Control system for controlling adjustable components in a vehicle using wireless switch assemblies or other input devices which provide input to the control system to enable the control system to control the components based on the input. The control system includes an interrogator arranged to transmit RF signals having identification data associated with the input devices such that upon transmission of each RF signal, the input devices with matching identification data can provide responsive signals. Various types of input devices are envisioned and one type is a manually activated RFID switch assembly which provides output based on pressure applied by the occupant of the vehicle to an exposed surface and includes an RF transmission component arranged to wirelessly transmit an indication of the application of pressure to the exposed surface.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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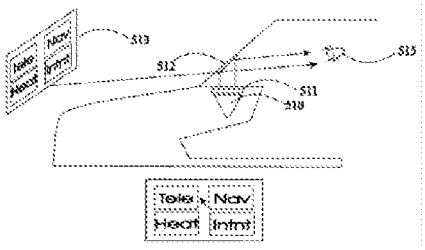
Vehicle computer design and use techniques for receiving navigation software



Abstract:
Vehicle with computer networking capability includes a display visible to an occupant of the vehicle, an on-board computer coupled to the display; and a communications device for enabling the on-board computer to communicate with other computers apart from the vehicle via a communications network. The on-board computer communicates with the other computers via the communications device to receive data and software to enable the on-board computer to perform functions. Further, the on-board computer directs the display to display the data received by the on-board computer from the other computers via the communications device. The on-board computer determines which data and software to receive based on a location of the vehicle.

Current Assignees: LIMESTONE MEMORY SYS LLC, SUPER INTERCONNECT TECH LLC, TELECONFERENCE SYS LLC, AUTOMOTIVE TECH INTL INC, AMERICAN VEHICULAR SCIENCES LLC, ACACIA RSCH GROUP LLC, BONUTTI SKELETAL INNOV LLC, R2 SOLUTIONS INC, CELLULAR COMM EQUIP LLC, LIFEPORT SCIENCES LLC, PARTHENON UNIFIED MEMORY ARCHITECTURE LLC, INNOVATIVE DISPLAY TECH LLC, MOBILE ENHANCEMENT SOLUTIONS LLC, NEXUS DISPLAY TECH LLC, SAINT LAWRENCE COMM LLC, UNIFICATION TECH LLC, MONARCH NETWORKING SOLUTIONS LLC, STINGRAY IP SOLUTIONS LLC

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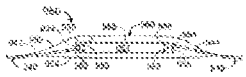
US6885291 | **Publication Date: 2005-04-26** | **Priority Date: 1999-11-15**

Mouting transponders and antennas in pneumatic tires

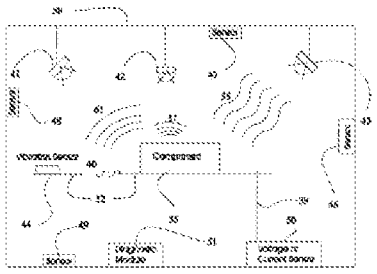


Abstract:
Method and apparatus for mounting a transponder module (400, 702, 951, 1000, 1020, 1751, 1752, 1852, 1852', 1951, 1951a) and a separate antenna (1520, 1520', 1520", 1620, 1720, 1820, 1920) to an inner surface (1504, 1504', 1504", 1704, 1804) of a pneumatic tire (312, 650, 1204, 1350, 1350', 1550, 1550', 1550"), and for coupling the transponder module to the antenna by coupling coils which are included with the transponder module (450, 760, 953, 1004, 1024) and the antenna (750, 750', 866, 938, 968, 1538, 1538', 1538", 1638, 1638', 1738, 1738', 1838, 1838', 1938). The transponder module mounting methods generally allow it to be inserted, removed, or accessed for maintenance at any time during the tire's life cycle, and allow sensing access to the tire's inner atmosphere.

Current Assignees: GOODYEAR TIRE & RUBBER CO

US20070139216 | **Publication Date: 2007-06-21** | **Priority Date: 2000-09-08**

Vehicular Component Control Using Wireless Switch Assemblies



Abstract:
Control system for controlling adjustable components in a vehicle using wireless switch assemblies or other input devices which provide input to the control system to enable the control system to control the components based on the input. The control system includes an interrogator arranged to transmit RF signals having identification data associated with the input devices such that upon transmission of each RF signal, the input devices with matching identification data can provide responsive signals. Various types of input devices are envisioned and one type is a manually activated RFID switch assembly which provides output based on pressure applied by the occupant of the vehicle to an exposed surface and includes an RF transmission component arranged to wirelessly transmit an indication of the application of pressure to the exposed surface.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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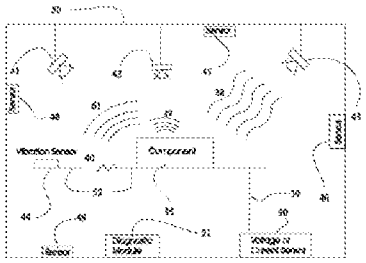
US20100207754 | **Publication Date: 2010-08-19** | **Priority Date: 2000-09-08**

Vehicular rfid and sensor assemblies

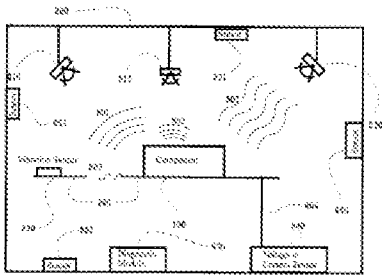


Abstract:
RFID and sensor assemblies for vehicles in which an interrogator transmits RF signals and receives responsive RF signals from the RFID assemblies. Each RFID assembly includes a sensor and an RFID switch which receives an RF signal from the interrogator and upon receipt of a signal containing its identification, enables transmission of a signal from the sensor from which a property being monitored by the sensor is determinable. The sensor may be a SAW sensor which modifies a received wave as a function of the property being monitored by the sensor and thus transmits a modified wave. Each RFID assembly may include an antenna arranged to receive signals from and provide signals to the interrogator. The RFID switch is arranged to connect or disconnect the sensor from a circuit dependent on whether the antenna receives a particular signal associated with the RFID assembly.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20030009270 | **Publication Date: 2003-01-09** | **Priority Date: 1995-06-07**

Telematics system for vehicle diagnostics



Abstract:
Vehicle diagnostic system which diagnoses the state of the vehicle or the state of a component of the vehicle and generates an output indicative or representative thereof. A communications device transmits the output of the diagnostic system to a remote location, possibly via a satellite or the Internet. The diagnostic system can include sensors mounted on the vehicle, each providing a measurement related to a state of the sensor or a measurement related to a state of the mounting location, and a processor coupled to the sensors and arranged to receive data from the sensors and process the data to generate the output indicative or representative of the state of the vehicle or its component. The processor may embody a pattern recognition algorithm trained to generate the output from the data received from the sensors and be arranged to control parts of the vehicle based on the output.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 185

EP1401667A2 | **Publication Date: 2004-03-31** | **Priority Date: 2001-06-25**

Tire sensor

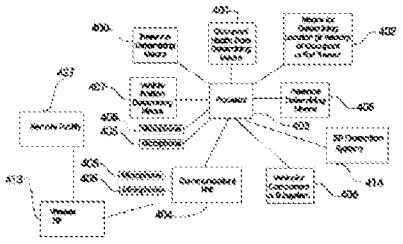
Image not currently available

Abstract:
A tire monitoring device (10) for monitoring various tire conditions of a tubeless tire mounted on a vehicle wheel having a recessed portion of the wheel and a wheel rim (12) defining the recessed portion, including a composite wheel having at least one wire free transmitter and a receiver incorporated into and embedded into the surface of the composite wheel in the recessed portions of the wheel. The transmitter and the receiver will monitor, transmit and receive signals about the tire condition, including tire pressure and temperature. Also included is an embedded antenna (20) permanently incorporated into the recessed portion of the composite wheel, such that the antenna (20) becomes part of the wheel, with an antenna winding length of from about 0.5 to about 5.0 meters long. Other embodiments include the use of a toroidal antenna in the recessed portion of the wheel.

Current Assignees: 3DM TECH INC

US20060212194 | **Publication Date: 2006-09-21** | **Priority Date: 1995-06-07**

Vehicle Communications Using the Internet



Abstract:
Vehicle including a data generating system which obtains or generates information about the vehicle and a communications system coupled to the data generating system for communicating directly with a wireless Internet service provider (ISP) to enable the information obtained or generated by the data generating system to be transmitted via the Internet. The data generating system may be a diagnostic system which diagnoses the state of the vehicle or the state of a component of the vehicle and generates an output indicative or representative thereof. The data generating system may be arranged to obtain or generate information about the operation of the vehicle. Additionally or alternatively, the data generating system may be arranged to obtain or generate information about the presence of contents in the compartment and/or when contents are present, information about contents in the compartment.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
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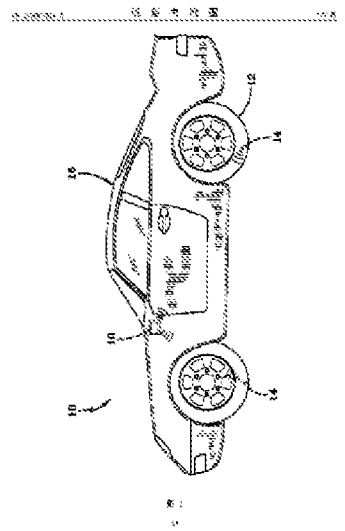
CN103863019A | **Publication Date: 2014-06-18** | **Priority Date: 2012-12-13**

Autonomous, plug-in wear or abrasion sensing system



Abstract:
An autonomous, plug-in and sacrificial wear sensing system including at least one wearable sensor, autonomous energy supply and means for remote radio-frequency communication. The system includes a tubular tread wear indicator body embedded within a tire tread element. The indicator body is centered within the tread element and is shaped in the form of a tube. The sensor element operably changes in at least one electromagnetically measurable physical parameter as the tread element wears radially inward. The system provides a full tread wear system including the algorithm for signal and data processing, buffering and decision making routines to remotely provide vehicle driver or owner with current tire wear status, tire type-vehicle-season match and with real-time estimation of remaining tire life. -

Current Assignees: GOODYEAR TIRE & RUBBER CO

EP2217459B1 | **Publication Date: 2016-12-28** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (θ) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO TRUCKS CORP

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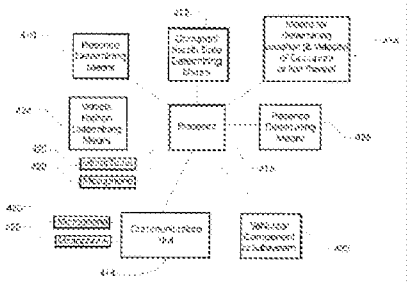
US20040039509 | **Publication Date: 2004-02-26** | **Priority Date: 1995-06-07**

Method and apparatus for controlling a vehicular component

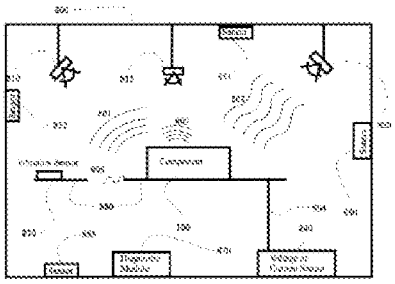


Abstract:
Control system and method for controlling an occupant restraint system in which a plurality of electronic sensors are mounted at different locations on the vehicle, each sensor providing a measurement related to a state thereof or a measurement related to a state of the mounting location. A processor is coupled to the sensors and diagnoses the state of the vehicle based on the measurements of the sensors. The processor controls the occupant restraint system based at least in part on the diagnosed state of the vehicle in an attempt to minimize injury to an occupant.

Current Assignees: BREED DAVID S

US6738697 | **Publication Date: 2004-05-18** | **Priority Date: 1995-06-07**

Telematics system for vehicle diagnostics



Abstract:
Vehicle diagnostic system which diagnoses the state of the vehicle or the state of a component of the vehicle and generates an output indicative or representative thereof. A communications device transmits the output of the diagnostic system to a remote location, possibly via a satellite or the Internet. The diagnostic system can include sensors mounted on the vehicle, each providing a measurement related to a state of the sensor or a measurement related to a state of the mounting location, and a processor coupled to the sensors and arranged to receive data from the sensors and process the data to generate the output indicative or representative of the state of the vehicle or its component. The processor may embody a pattern recognition algorithm trained to generate the output from the data received from the sensors and be arranged to control parts of the vehicle based on the output.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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WO2009070066A1 | **Publication Date: 2009-06-04** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

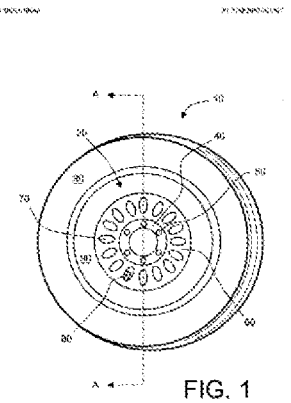


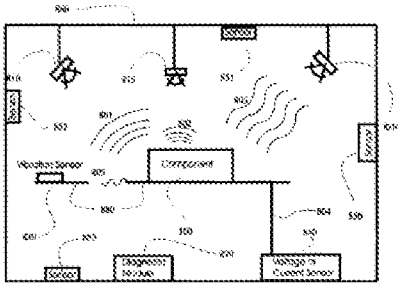
FIG. 1

Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (0) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO LASTVAGNAR AB

US6850824 | **Publication Date: 2005-02-01** | **Priority Date: 1995-06-07**

Method and apparatus for controlling a vehicular component



Abstract:
Control system and method for controlling an occupant restraint system in which a plurality of electronic sensors are mounted at different locations on the vehicle, each sensor providing a measurement related to a state thereof or a measurement related to a state of the mounting location. A processor is coupled to the sensors and diagnoses the state of the vehicle based on the measurements of the sensors. The processor controls the occupant restraint system based at least in part on the diagnosed state of the vehicle in an attempt to minimize injury to an occupant.

Current Assignees: AUTOMOTIVE TECH INTL INC

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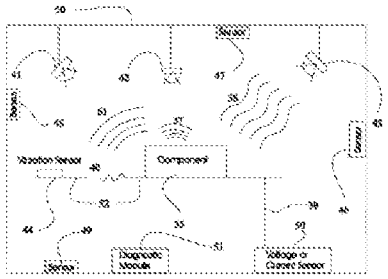
US7672756 | **Publication Date: 2010-03-02** | **Priority Date: 1995-06-07**

Vehicle communications using the internet



Abstract:
Vehicle including a data generating system which obtains or generates information about the vehicle and a communications system coupled to the data generating system for communicating directly with a wireless Internet service provider (ISP) to enable the information obtained or generated by the data generating system to be transmitted via the Internet. The data generating system may be a diagnostic system which diagnoses the state of the vehicle or the state of a component of the vehicle and generates an output indicative or representative thereof. The data generating system may be arranged to obtain or generate information about the operation of the vehicle. Additionally or alternatively, the data generating system may be arranged to obtain or generate information about the presence of contents in the compartment and/or when contents are present, information about contents in the compartment.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

EP2217459A1 | **Publication Date: 2010-08-18** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

Image not currently available

Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (0) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO TRUCKS CORP

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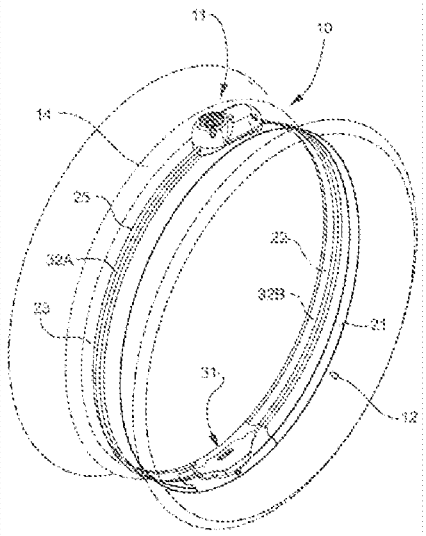
US11420488 | **Publication Date: 2022-08-23** | **Priority Date: 2014-10-17**

Tire sensor mounting assembly, vehicle wheel balancer, combination tire sensor mounting assembly and wheel balancer, method for mounting a tire sensor to a vehicle part, and method for balancing a vehicle wheel



Abstract:
An in-tire vehicle tire sensor assembly is adapted for residing inside a pneumatic tire mounted on a wheel rim of a motor vehicle. A flexible mounting cable is secured to the sensor assembly, and adapted for extending circumferentially within an annular space formed between the tire and wheel rim. A counterweight is secured to the mounting cable a spaced distance from the sensor assembly.

Current Assignees: ITIRE LLC

IN201741032457A | **Publication Date: 2019-03-15** | **Priority Date: 2017-09-13**

An external tire pressure monitoring system for off-highway wheels

Image not currently available

Abstract:
Abstract The present invention provides an external tire pressure monitoring system (TPMS) for monitoring pressure level of an off- highway vehicle wheels. The TPMS comprises of, a tire pressure monitoring system (TPMS) adaptor, a rim 103, a tire 101, an air inflation valve 203 and a tire cavity 102. The TPMS adaptor 106 includes sensor housing 209, at least one valve core housing 203 and so on. A portion of the TPMS is kept external to the rim 103 and away from the tire cavity 102 and in the weather side 104. Further, another portion of the TPMS is mounted on to the rim 103 internally and made to be in contact with air side 102 (tire cavity side) of the rim 103. To describe explicitly, the TPMS is an internally mounted external tire pressure monitoring device. The TPMS is integrated with an air inflation valve 203 through which refilling of air to the tire 101 is performed. (Fig-1)

Current Assignees: WHEELS INDIA LTD

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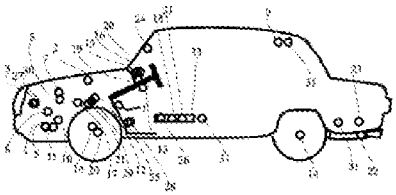
US8024084 | **Publication Date: 2011-09-20** | **Priority Date: 1995-06-07**

Vehicle diagnostic techniques

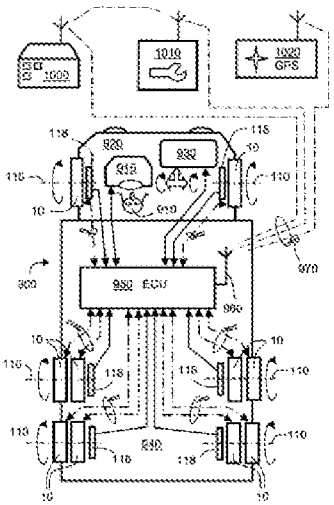


Abstract:
Vehicle with diagnostic capability includes different vehicle-resident sensors, each providing a measurement related to a state of the sensor or a measurement related to a state of the mounting location of the sensor, a vehicle-resident diagnostic processor coupled to the sensors and arranged to receive data from the sensors and process the data to generate an output indicative or representative of a state of the vehicle or a state of a component of the vehicle, and a communications device coupled to the diagnostic system and arranged to automatically establish a communications channel between the vehicle and a remote facility without manual intervention and wirelessly transmit the output of the diagnostic system to the remote facility. The processor may embody a pattern recognition algorithm trained to generate the output from the data received from the sensors.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US8483908 | **Publication Date: 2013-07-09** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules



Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (0) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO TRUCKS CORP

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Revvo v. Cerebrum
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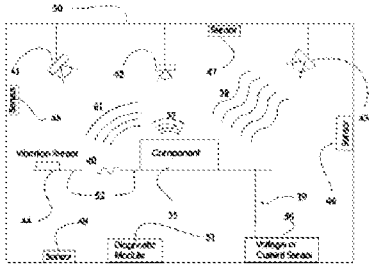
US7786864 | **Publication Date: 2010-08-31** | **Priority Date: 2000-09-08**

Vehicular RFID and sensor assemblies

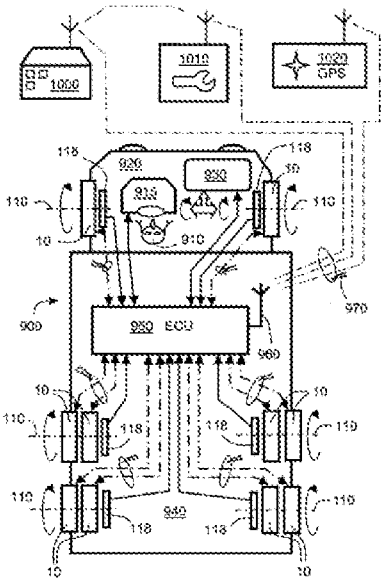


Abstract:
RFID and sensor assemblies for vehicles in which an interrogator transmits RF signals and receives responsive RF signals from the RFID assemblies. Each RFID assembly includes a sensor and an RFID switch which receives an RF signal from the interrogator and upon receipt of a signal containing its identification, enables transmission of a signal from the sensor from which a property being monitored by the sensor is determinable. The sensor may be a SAW sensor which modifies a received wave as a function of the property being monitored by the sensor and thus transmits a modified wave. Each RFID assembly may include an antenna arranged to receive signals from and provide signals to the interrogator. The RFID switch is arranged to connect or disconnect the sensor from a circuit dependent on whether the antenna receives a particular signal associated with the RFID assembly.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20100274607 | **Publication Date: 2010-10-28** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules



Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (0) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO TRUCKS CORP

Revvo's Exhibit 1002
Revvo v. Cerebrum
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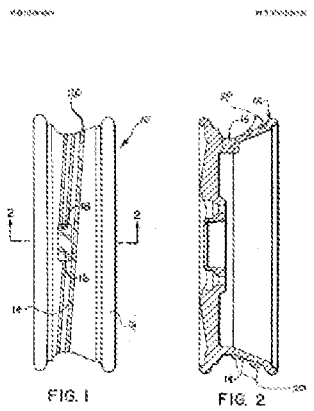
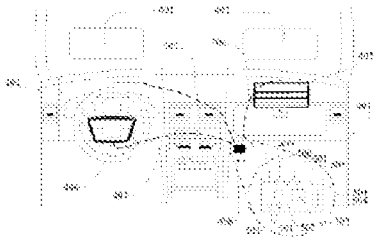
Tire sensor



Abstract:
A tire monitoring device (10) for monitoring various tire conditions of a tubeless tire mounted on a vehicle wheel having a recessed portion of the wheel and a wheel rim (12) defining the recessed portion, including a composite wheel having at least one wire free transmitter and a receiver incorporated into and embedded into the surface of the composite wheel in the recessed portions of the wheel. The transmitter and the receiver will monitor, transmit and receive signals about the tire condition, including tire pressure and temperature. Also included is an embedded antenna (20) permanently incorporated into the recessed portion of the composite wheel, such that the antenna (20) becomes part of the wheel, with an antenna winding length of from about 0.5 to about 5.0 meters long. Other embodiments include the use of a toroidal antenna in the recessed portion of the wheel.

Current Assignees: 3DM TECH INC

Vehicular Steering Wheel with Input Device



Abstract:
Vehicle includes a vehicular frame and a steering wheel connected to the vehicular frame, the steering wheel includes an annular frame and one or more user-manipulatable input devices arranged thereon. Each input device includes electronic components which initiate a change in the operation of a component of the vehicle or a display system based on the user's manipulation thereof. Types of input devices include a joy stick, trackball, directional pad or scroll wheel, as well as a universal stick actuator. A display system includes a display arranged to be visible to the driver, with the input device or devices being arranged to control the display system to alter the display upon being manipulated. The display system can be programmed to display menus on the display. Variation of the menus and selection of items on the menus may be implemented by the input device(s).

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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Revvo v. Cerebrum
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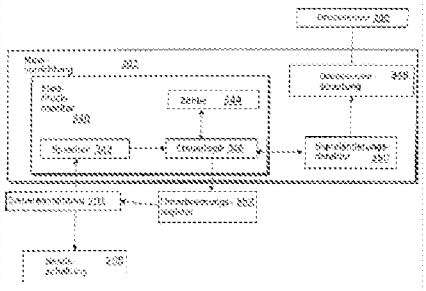
DE102016225664A1 | **Publication Date: 2017-06-22** | **Priority Date: 2015-12-22**

A tire monitoring apparatus and system for use with a vehicle on-board stability control system

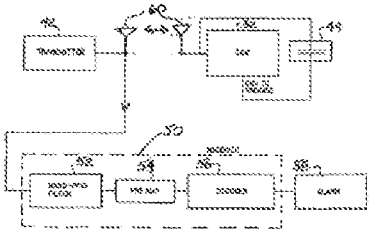


Abstract:
A tire monitoring device comprises a sensor for monitoring a tire parameter and a first control device for controlling the operation of the device. A measuring device is provided to generate parameter measurement data from the sensor output signal. A second control device is provided to control the operation of the measuring device. The second control device communicates parameter data to the first control device based on the measurement data. The device is particularly suitable for monitoring tire pressure and for detecting tire location events.

Current Assignees: SCHRADER ELTNC LTD

US20040212486 | **Publication Date: 2004-10-28** | **Priority Date: 2001-06-25**

Tire sensor



Abstract:
A tire monitoring device for monitoring various tire conditions of a tubeless tire mounted on a vehicle wheel having a recessed portion of the wheel and a wheel rim 5 defining the recessed portion, including a composite wheel having at least one wire free transmitter and a receiver incorporated into and embedded into the surface of the composite wheel in the recessed portions of the wheel. The transmitter and receiver will monitor, transmit and receive signals about the tire condition, including tire pressure and temperature. Also included is an embedded antenna permanently incorporated into the recessed portion of 10 the composite wheel, such that the antenna becomes a part of the wheel, with an antenna winding length of from about 0.5 to about 5.0 meters long. Other embodiments include the use of a toroidal antenna in the recessed portion of the wheel.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

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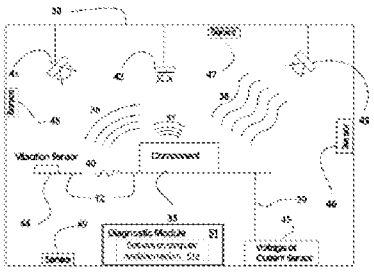
US9443358 | **Publication Date: 2016-09-13** | **Priority Date: 1995-06-07**

Vehicle software upgrade techniques

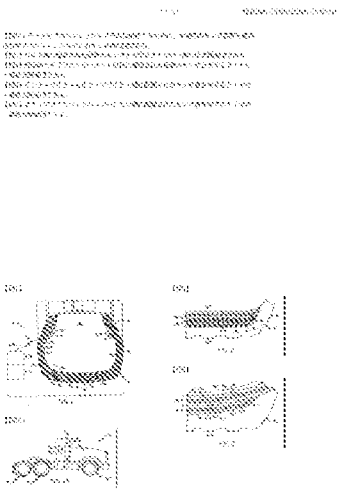


Abstract:
System and method for maintaining functionality of software includes initially providing the vehicle with software resident on computer-readable medium to enable it to operate and interact with components thereof and updating the vehicle software by receiving a wireless transmission from one or more remote locations, e.g., a location maintained by a dealer or manufacturer of the vehicle. The software may be diagnostic software for a diagnostic module which diagnoses operability of components of the vehicle. Different remote locations may be responsible for different portions of the vehicle-resident software and may therefore provide different software upgrades, based on need.

Current Assignees: AUTOMOTIVE VEHICULAR SCIENCES LLC, AMERICAN VEHICULAR SCIENCES LLC

JP2009535699A | **Publication Date: 2009-10-01** | **Priority Date: 2006-04-25**

Elastomer articles with wireless micro / nano sensors



Abstract:
A sensor system for obtaining data from an elastomeric article includes at least one wireless sensor. A sensor is a device with a size in the nanoscale to microscale range that is small enough to avoid blockage of the article. The article can include a sensor embedded in one of the article materials, a sensor layer incorporated into the article, and a sensor array disposed within or embedded within the component of the article. The sensor can be configured to provide data related to one or more of temperature, pressure, sidewall bending, stress, strain, and other parameters. The sensor may be an LCD sensor, and / or a conductive polymer sensor, and / or a biopolymer sensor, and / or a polymer diode, which are suitable for sensing data during tire driving. A power supply circuit using energy generated by the tire can supply electric power to the sensor.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

Revvo's Exhibit 1002
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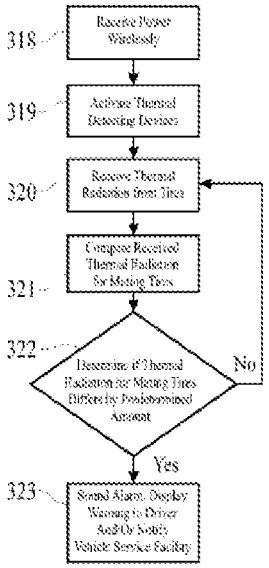
US20080284575 | **Publication Date: 2008-11-20** | **Priority Date: 1995-06-07**

Vehicle Diagnostic Techniques



Abstract:
Vehicle with diagnostic capability includes different vehicle-resident sensors, each providing a measurement related to a state of the sensor or a measurement related to a state of the mounting location of the sensor, a vehicle-resident diagnostic processor coupled to the sensors and arranged to receive data from the sensors and process the data to generate an output indicative or representative of a state of the vehicle or a state of a component of the vehicle, and a communications device coupled to the diagnostic system and arranged to automatically establish a communications channel between the vehicle and a remote facility without manual intervention and wirelessly transmit the output of the diagnostic system to the remote facility. The processor may embody a pattern recognition algorithm trained to generate the output from the data received from the sensors.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

JP2023505511A | **Publication Date: 2023-02-09** | **Priority Date: 2019-12-06**

Systems and methods for monitoring wheel assemblies

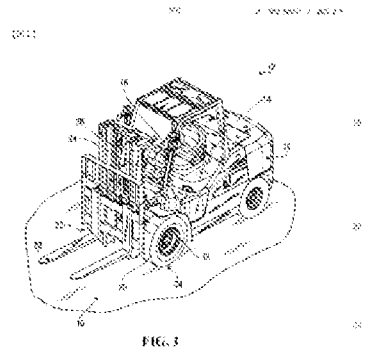


FIG. 3

Abstract:
how the wheel assembly of the vehicle (e.g., forklift, or other material handling vehicle) is used (e.g., the duty cycle of the vehicle and/or wheel assembly); 3D conditions (e.g., degree of wear), loads and impacts on the wheel assembly, and/or environmental conditions (e.g., temperature of the environment, shape of the surface underlying the wheel assembly, compliance, or information about the wheel assembly that may indicate other conditions), for example, may be conveyed to a user (e.g., a vehicle driver), may be transmitted to a remote party (e.g., a provider), and/or it is monitored to obtain information about the vehicle, including information about wheel assemblies that can be used to control the vehicle (eg, speed of the vehicle). This can improve use, maintenance, safety, and/or other aspects of the vehicle, including wheel assemblies.

Current Assignees: CAMSO INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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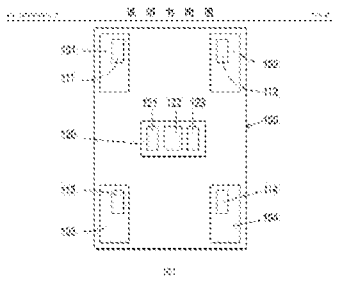
CN106965633A | **Publication Date: 2017-07-21** | **Priority Date: 2015-12-22**

Advanced tire monitor system

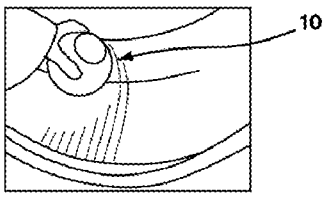


Abstract:
A kind of tire pressure monitoring system, it includes device for monitoring tyre pressure, and the device for monitoring tyre pressure is used to being arranged on tire inner surface and including the pressure sensor for monitoring tire fluid pressure.The system has RFID tag, and the RFID tag is located on tire and is separated with the device for monitoring tyre pressure.In response to detecting tire pressure event by monitoring the Fluid pressure of the fluid, the device for monitoring tyre pressure makes the RFID transmission data, and the data are received by the device for monitoring tyre pressure.

Current Assignees: UNION REED ELTNC LTD, SCHRADER ELTNC LTD

US20130312508 | **Publication Date: 2013-11-28** | **Priority Date: 2012-05-23**

Tire monitoring apparatus, system and method of using the same



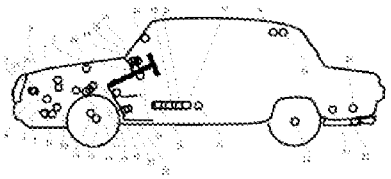
Abstract:
A system and method for measuring, recording and reporting vehicle tire temperatures and/or pressures. In one aspect, a sensing device including a convex protective vessel, with pressure and/or temperature sensors enclosed therein. The sensing device is dropped freely within the interior of a tire prior to rim mounting. A movement sensor can also be included in the sensing device. The protective vessel, including all sensors, is not attached or connected in any way to the vehicle tire, rim, or valve stem such that the sensing device is independent of the vehicle tire, rim, and valve stem, and moves freely within the interior of the tire. A balancing set including a dummy device, substantially equal in weight to a sensing device, and means for connecting the dummy device to the sensing device at 180 degrees separation around the tire may also be employed.

Current Assignees: SOLOMON YUVAL, BOROWITSH ZVI, BEN-SHACH ASI, GIL DAVID

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 198

US20080114502 | **Publication Date: 2008-05-15** | **Priority Date: 1995-06-07**

System for Obtaining Vehicular Information

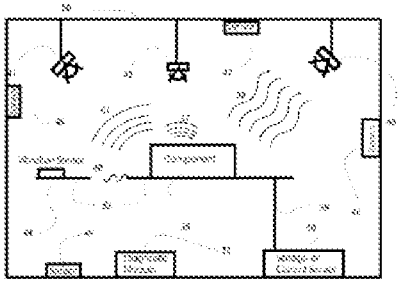


Abstract:
System for obtaining information about a vehicle or a component therein includes sensors fixed to a frame of the vehicle and arranged to generate and transmit a signal upon receipt and detection of a radio frequency (RF) signal and a multi-element, switchable directional antenna array. Each antenna element is directed toward a respective sensor and transmitter RF signals toward that sensor and receive return signals therefrom. A control mechanism controls transmission of the RF signals from the antenna elements, e.g., causes the antenna elements to be alternately switched on in order to sequentially transmit the RF signals and receive the return signals from the sensors.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US7555370 | **Publication Date: 2009-06-30** | **Priority Date: 1995-06-07**

System for obtaining vehicular information



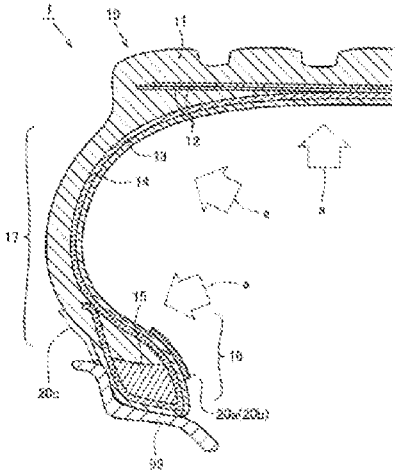
Abstract:
System for obtaining information about a vehicle or a component therein includes sensors fixed to a frame of the vehicle and arranged to generate and transmit a signal upon receipt and detection of a radio frequency (RF) signal and a multi-element, switchable directional antenna array. Each antenna element is directed toward a respective sensor and transmitter RF signals toward that sensor and receive return signals therefrom. A control mechanism controls transmission of the RF signals from the antenna elements, e.g., causes the antenna elements to be alternately switched on in order to sequentially transmit the RF signals and receive the return signals from the sensors.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 199

US20060164250 | **Publication Date: 2006-07-27** | **Priority Date: 2003-08-29**

Wireless ic tag joining method, wireless ic tag-carrying article, and vehicle

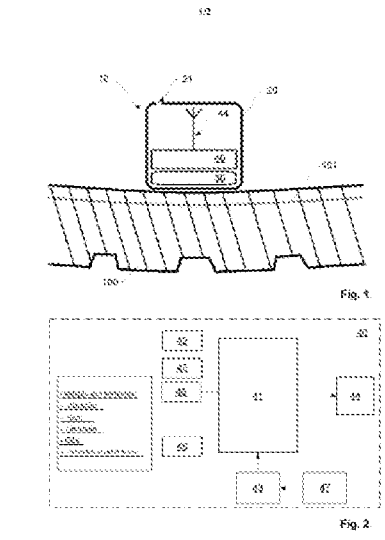


Abstract:
A flat IC tag contains memory means capable of data storage and transmission means capable of data transmission. The IC tag has on a surface thereof an unvulcanized rubber having identical properties to the unvulcanized rubber used for an article to which the IC tag is mounted. The opposite surface of the IC tag is mounted to the article before vulcanization. The article is vulcanized in this state to mount the IC tag to the article. Hence, the IC tag is not damaged if attached to tires and other articles in harsh operating environment.

Current Assignees: OMRON CORP

BR112019027288A2 | **Publication Date: 2020-07-21** | **Priority Date: 2017-06-22**

health sensor set.



Abstract:
Health sensor assembly (10) to be arranged on a vehicle tire (100) formed by a housing (20) arranged to accommodate a magnet assembly (30) formed by at least one magnet, a sensor module (40) including at least one tire pressure sensor (42), energy means (43) in the form of at least one battery or capacitor and / or energy collector (47), and a communication module (44), in which the assembly magnet (30) and the sensor module (40) are arranged at the bottom of the housing (20) providing the housing (20), and, consequently, the tire health sensor assembly (10), with a center of gravity at the bottom of the housing (20) which, together with the magnetic force of the magnet assembly (30), are arranged to self-align / correct the tire health sensor assembly (10) with respect to an internal circumferential surface of the tire (100), and affixing to a metal cord (101) of the tire (100) or metal tire wheel (100).

Current Assignees: EL WATCH AS

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EP1281949B1 | **Publication Date: 2007-06-20** | **Priority Date: 2001-07-06**

Tire tread integrity monitoring system and method

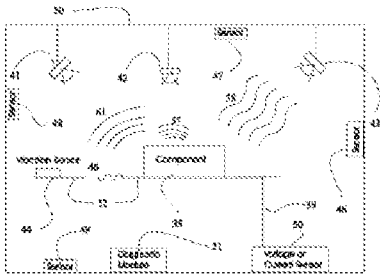
(1) Failure Rate = R=(1/MTBF)=ce $^{-(E_a/KT)}$.

Abstract:
A tire monitoring method and apparatus is provided to predict tire tread separation for a tire on a wheel of a vehicle. This may involve monitoring a parameter of a tire of a vehicle over time and comparing information regarding the monitored parameter (over time) with a reference threshold value of the parameter (over time). The method may also include providing information to a driver based on the comparison. The parameter may be acceleration (axial, radial or longitudinal) along an axis of the tire. The parameter may also be tire imbalance, temperature inside the tire, speed of the tire, load and/or pressure, for example. Information regarding the comparison may be transmitted to a driver if the monitored parameter exceeds the reference threshold value for a predetermined amount of time.

Current Assignees: ZF ACTIVE SAFETY & ELTNC US LLC

US20140358362 | **Publication Date: 2014-12-04** | **Priority Date: 1995-06-07**

Vehicle software upgrade techniques



Abstract:
System and method for maintaining functionality of software includes initially providing the vehicle with software resident on computer-readable medium to enable it to operate and interact with components thereof and updating the vehicle software by receiving a wireless transmission from one or more remote locations, e.g., a location maintained by a dealer or manufacturer of the vehicle. The software may be diagnostic software for a diagnostic module which diagnoses operability of components of the vehicle. Different remote locations may be responsible for different portions of the vehicle-resident software and may therefore provide different software upgrades, based on need.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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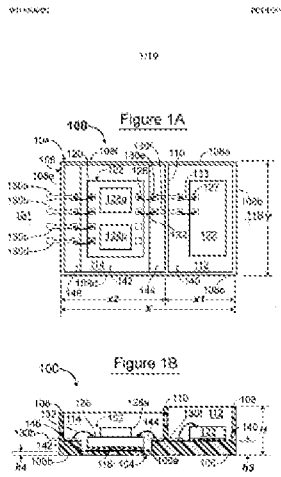
IPR2025-00632 - Page 201

WO2001036221A1 | **Publication Date: 2001-05-25** | **Priority Date: 1999-11-15**

Mounting transponders and antennas in pneumatic tires

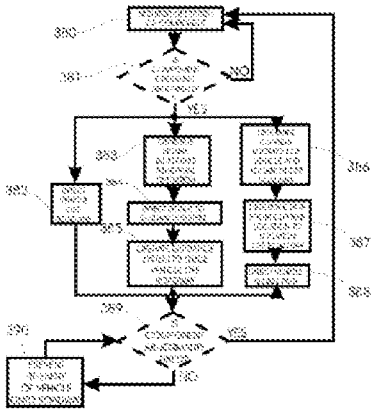


Abstract:
Method and apparatus for mounting a transponder module (400, 702, 951, 1000, 1020, 1751, 1752, 1852, 1852', 1951, 1951a) and a separate antenna (1520, 1520', 1520'', 1620, 1720, 1820, 1920) to an inner surface (1504, 1504', 1504'', 1704, 1804) of a pneumatic tire (312, 650, 1204, 1350, 1350', 1550, 1550', 1550''), and for coupling the transponder module to the antenna by means of coupling coils which are included with the transponder module (450, 760, 953, 1004, 1024) and the antenna (750, 750', 866, 938, 968, 1538, 1538', 1538'', 1638, 1638', 1738, 1738', 1838, 1838', 1938). The transponder module mounting methods generally allow it to be inserted, removed, or accessed for maintenance at any time during the tire's life cycle, and allow sensing access to the tire's inner atmosphere.

Current Assignees: GOODYEAR TIRE & RUBBER CO

US20140336868 | **Publication Date: 2014-11-13** | **Priority Date: 1995-06-07**

Vehicle software upgrade techniques



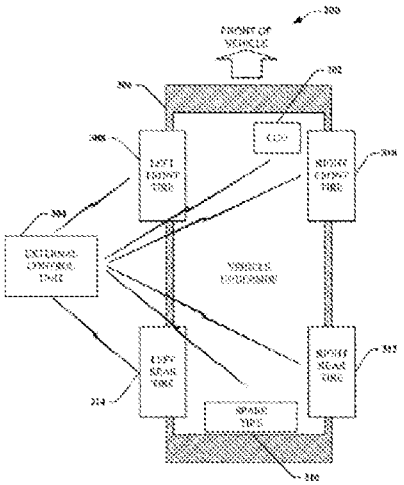
Abstract:
System and method for maintaining functionality of software includes initially providing the vehicle with software resident on computer-readable medium to enable it to operate and interact with components thereof and updating the vehicle software by receiving a wireless transmission from one or more remote locations, e.g., a location maintained by a dealer or manufacturer of the vehicle. The software may be diagnostic software for a diagnostic module which diagnoses operability of components of the vehicle. Different remote locations may be responsible for different portions of the vehicle-resident software and may therefore provide different software upgrades, based on need.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 202

US8009027 | **Publication Date: 2011-08-30** | **Priority Date: 2006-05-31**

Contactless sensor systems and methods

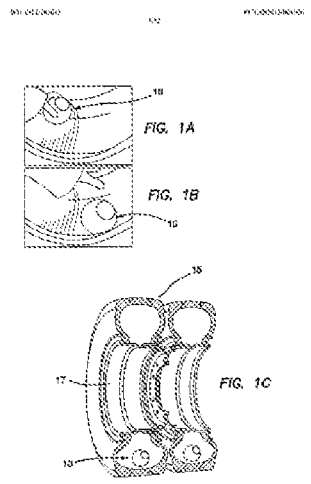


Abstract:
A tire monitoring system and associated method is disciosed. The tire monitoring system includes a plurality of tire sensor modules, employing contactless sensors, configured to transmit tire data at a predetermined time interval. The system also includes a central control unit that is configured to receive the tire data from the tire sensor modules, and is further configured with an external control unit that can communicate with the tire sensor modules, the central control units and outside sources.

Current Assignees: INFINEON TECH AG

WO2013186611A1 | **Publication Date: 2013-12-19** | **Priority Date: 2012-05-23**

Tire monitoring apparatus, system and method of using the same



Abstract:
A system and method for measuring, recording and reporting vehicle tire temperatures and/or pressures. In one aspect, a sensing device including a convex protective vessel, with pressure and/or temperature sensors enclosed therein. The sensing device is dropped freely within the interior of a tire prior to rim mounting. A movement sensor can also be included in the sensing device. The protective vessel, including all sensors, is not attached or connected in any way to the vehicle tire, rim, or valve stem such that the sensing device is independent of the vehicle tire, rim, and valve stem, and moves freely within the interior of the tire. A balancing set including a dummy device, substantially equal in weight to a sensing device, and means for connecting the dummy device to the sensing device at 180 degrees separation around the tire may also be employed.

Current Assignees: SOLOMON YUVAL, BOROWITSH ZVI, BEN-SHACH ASI, GIL DAVID

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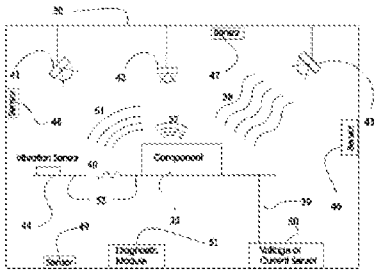
US20140358361 | **Publication Date: 2014-12-04** | **Priority Date: 1995-06-07**

Vehicle software upgrade techniques

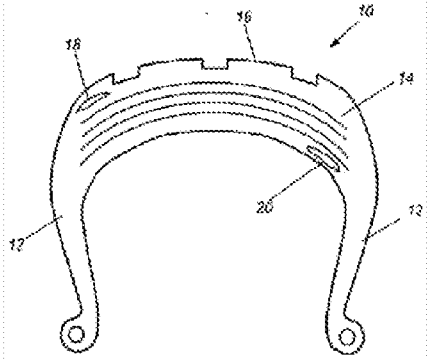


Abstract:
System and method for maintaining functionality of software includes initially providing the vehicle with software resident on computer-readable medium to enable it to operate and interact with components thereof and updating the vehicle software by receiving a wireless transmission from one or more remote locations, e.g., a location maintained by a dealer or manufacturer of the vehicle. The software may be diagnostic software for a diagnostic module which diagnoses operability of components of the vehicle. Different remote locations may be responsible for different portions of the vehicle-resident software and may therefore provide different software upgrades, based on need.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

DE602207487T2 | **Publication Date: 2008-02-21** | **Priority Date: 2001-07-06**

System and method for monitoring the integrity of a tire tread



Abstract:
A tire monitoring method and apparatus is provided to predict tire tread separation for a tire on a wheel of a vehicle. This may involve monitoring a parameter of a tire of a vehicle over time and comparing information regarding the monitored parameter (over time) with a reference threshold value of the parameter (over time). The method may also include providing information to a driver based on the comparison. The parameter may be acceleration (axial, radial or longitudinal) along an axis of the tire. The parameter may also be tire imbalance, temperature inside the tire, speed of the tire, load and/or pressure, for example. Information regarding the comparison may be transmitted to a driver if the monitored parameter exceeds the reference threshold value for a predetermined amount of time.

Current Assignees: ZF ACTIVE SAFETY & ELTNC US LLC

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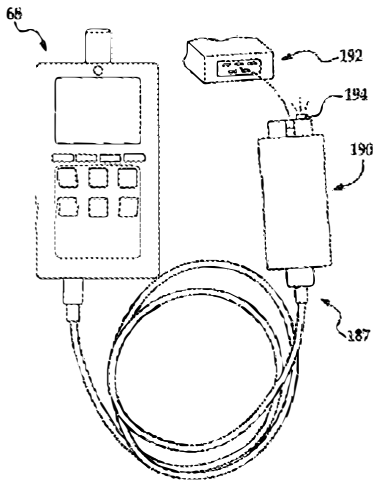
US9050862 | **Publication Date: 2015-06-09** | **Priority Date: 2011-10-26**

Universal tire pressure monitoring system tool and methods

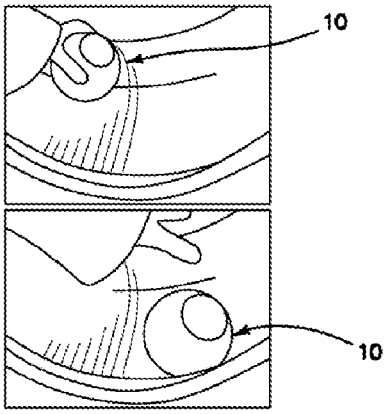


Abstract:
Disclosed herein is an improved universal TPMS tool. According to one aspect of the tool, the tool can include a housing and a processor and a memory storage device positioned within the housing. The tool can optionally include a key pad positioned on the housing in communication with the processor for input of commands from a user, an electronic communication port positioned on the housing in communication with the processor, and an antenna for transmission and receipt of electronic information from the plurality of TPMS tire sensors. The tool can also include an optical scanner for reading indicia connected to the vehicle.

Current Assignees: ATEQ CORP

US9016117 | **Publication Date: 2015-04-28** | **Priority Date: 2012-05-23**

Tire monitoring apparatus, system and method of using the same



Abstract:
A system and method for measuring, recording and reporting vehicle tire temperatures and/or pressures. In one aspect, a sensing device including a convex protective vessel, with pressure and/or temperature sensors enclosed therein. The sensing device is dropped freely within the interior of a tire prior to rim mounting. A movement sensor can also be included in the sensing device. The protective vessel, including all sensors, is not attached or connected in any way to the vehicle tire, rim, or valve stem such that the sensing device is independent of the vehicle tire, rim, and valve stem, and moves freely within the interior of the tire. A balancing set including a dummy device, substantially equal in weight to a sensing device, and means for connecting the dummy device to the sensing device at 180 degrees separation around the tire may also be employed.

Current Assignees: SOLOMON YUVAL, BOROWITSH ZVI, BEN-SHACH ASI, GIL DAVID

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Revvo v. Cerebrum
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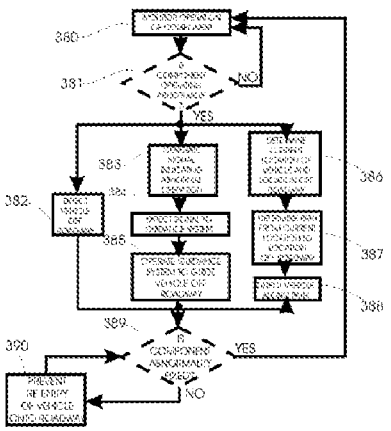
US20080140278 | **Publication Date: 2008-06-12** | **Priority Date: 1995-06-07**

Vehicle Software Upgrade Techniques

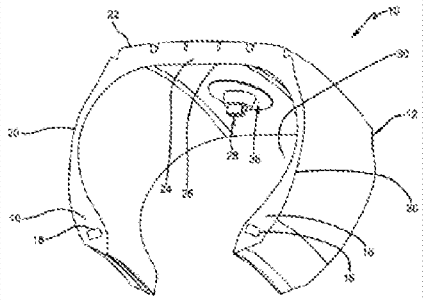


Abstract:
System and method for maintaining functionality of software includes initially providing the vehicle with software resident on computer-readable medium to enable it to operate and interact with components thereof and updating the vehicle software by receiving a wireless transmission from one or more remote locations, e.g., a location maintained by a dealer or manufacturer of the vehicle. The software may be diagnostic software for a diagnostic module which diagnoses operability of components of the vehicle. Different remote locations may be responsible for different portions of the vehicle-resident software and may therefore provide different software upgrades, based on need.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20220185043 | **Publication Date: 2022-06-16** | **Priority Date: 2020-12-15**

Tire sensor container system



Abstract:
A tire sensor container system is provided. A tire includes a carcass toroidally extending from a first bead area to a second bead area, and an innerliner formed on an inner surface of the carcass. The tire sensor container system includes a tire pressure monitoring system sensor, which in turn includes a rigid housing that is formed with an oval shape. A flexible container is mounted to the innerliner. The container includes a base and a wall extending radially outwardly from the base, and the wall terminates in a lip. The container wall is formed with an oval shape that cooperates with the shape of the tire pressure monitoring sensor housing. A cavity is defined by the base, the wall, and the lip, and cavity receives and secures the tire pressure monitoring system sensor.

Current Assignees: GOODYEAR TIRE & RUBBER CO

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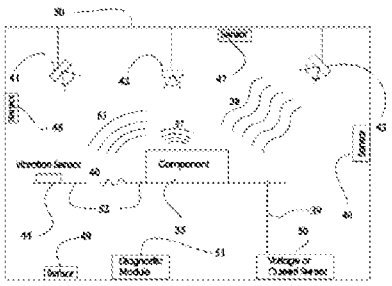
Revvo v. Cerebrum
IPR2025-00632 - Page 206

US7880594 | **Publication Date: 2011-02-01** | **Priority Date: 2000-09-08**

Switch assemblies and method for controlling vehicular components

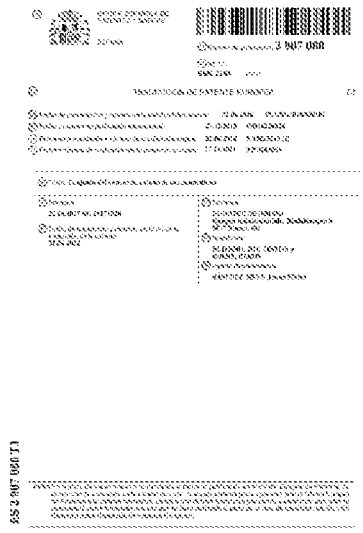


Abstract:
Vehicle including a switch assembly includes a vehicular component subject to control by an occupant in the passenger compartment, and a switch assembly for controlling the component based on pressure applied by the occupant of the vehicle to an exposed surface of the vehicle. The switch assembly includes at least one wireless transmission component arranged to wirelessly transmit an indication of the application of pressure to the exposed surface, and a control mechanism for controlling the wireless transmission by the wireless transmission component(s) based on the application of pressure to the exposed surface. The control mechanism may be a switch or a variable impedance which react to the application of pressure to the exposed surface.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

ES2907088T3 | **Publication Date: 2022-04-21** | **Priority Date: 2017-06-22**

Tire condition sensor assembly



Abstract:
Tire condition sensor assembly (10) for arrangement in a vehicle tire (100) formed by a casing (20) arranged to house a set of magnets (30) formed by at least one magnet, a sensor module (40) including at least one tire pressure sensor (42), power supply means (43) in the form of at least one battery or capacitor and/or energy collector (47), and a communication module (44), characterized in that magnet assembly (30) and sensor module (40) are disposed at the bottom of housing (20) providing housing (20) and consequently tire condition sensor assembly (10)), with a center of gravity at the bottom of the housing (20) which, together with the magnetic force of the magnet assembly (30), are arranged to self-align/correct the tire condition sensor assembly (10) in relationship with an inner circumferential surface of the tire (100), and attachment to a metal cord (101) of the tire (100) or metal wheel of the tire (100).

Current Assignees: EL WATCH AS

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 207

EP1685984A1 | **Publication Date: 2006-08-02** | **Priority Date: 2003-08-29**

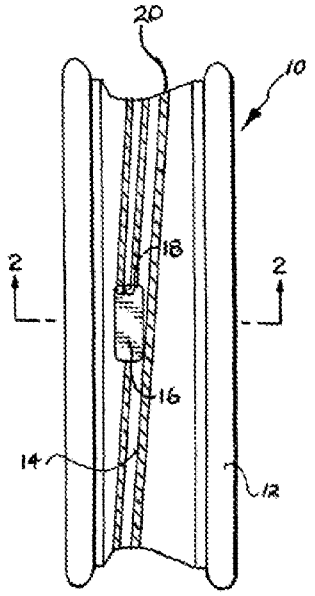
Wireless ic tag joining method, wireless ic tag-carrying article, and vehicle

Abstract:
A flat IC tag contains memory means capable of data storage and transmission means capable of data transmission. The IC tag has on a surface thereof an unvulcanized rubber having identical properties to the unvulcanized rubber used for an article to which the IC tag is mounted. The opposite surface of the IC tag is mounted to the article before vulcanization. The article is vulcanized in this state to mount the IC tag to the article. Hence, the IC tag is not damaged if attached to tires and other articles in harsh operating environment.

Current Assignees: OMRON CORP

US7034672 | **Publication Date: 2006-04-25** | **Priority Date: 2001-06-25**

Tire sensor



Abstract:
A tire monitoring device for monitoring various tire conditions of a tubeless tire mounted on a vehicle wheel having a recessed portion of the wheel and a wheel rim 5 defining the recessed portion, including a composite wheel having at least one wire free transmitter and a receiver incorporated into and embedded into the surface of the composite wheel in the recessed portions of the wheel. The transmitter and receiver will monitor, transmit and receive signals about the tire condition, including tire pressure and temperature. Also included is an embedded antenna permanently incorporated into the recessed portion of 10 the composite wheel, such that the antenna becomes a part of the wheel, with an antenna winding length of from about 0.5 to about 5.0 meters long. Other embodiments include the use of a toroidal antenna in the recessed portion of the wheel.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC, GLOBAL TECH INTL INC

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Revvo v. Cerebrum
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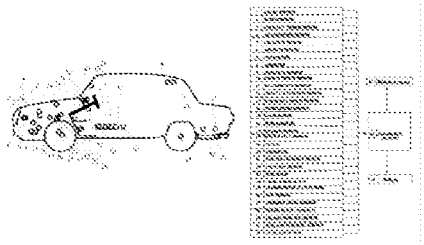
US7650210 | **Publication Date: 2010-01-19** | **Priority Date: 1995-06-07**

Remote vehicle diagnostic management

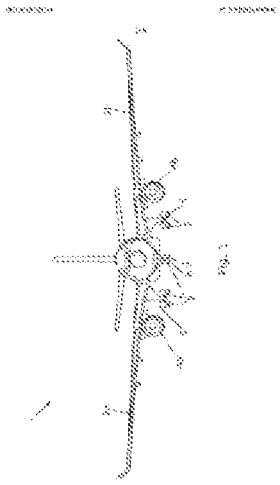


Abstract:
Vehicular diagnostic arrangement includes a diagnostic system arranged on the vehicle to determine whether any vehicular components is operating non-optimally, is expected to fail or has failed and generate an output indicative or representative thereof, and a communications device coupled to the diagnostic system and arranged to direct a transmission of the output of the diagnostic system to a remote location. Remote locations encompasses remote facilities which handle maintenance or monitoring of the vehicle such as a dealer of the vehicle, the manufacturer of the vehicle or the manufacturer of the components for which non-optimal operation has been detected. The communications device may be arranged to direct the transmission of the output of the diagnostic system to the remote location via the Internet, the remote location including or being an Internet-enabled device possessed by the dealer, manufacturer or owner of the vehicle.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

WO2022129141A1 | **Publication Date: 2022-06-23** | **Priority Date: 2020-12-15**

Tyre monitor



Abstract:
A tyre monitor (11) comprises a sensor device (12) arranged to detect an operating parameter of a tyre, such as tyre pressure or temperature. A resiliently flexible housing (14) comprising an elastic material is arranged to substantially surround the sensor device. The tyre monitor (11) is able to move freely when installed in a tyre. The elastic, resiliently flexible housing (14) around the sensor permits the monitor to be easily installed inside a tyre and to bounce, roll and travel inside it as the tyre moves. Thus, the monitor can directly sense the operating parameter within the tyre itself. The monitor may also include a wireless communications device to enable data from the sensor to be shared with crew.

Current Assignees: AIRBUS OPERATIONS LTD

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Revvo v. Cerebrum
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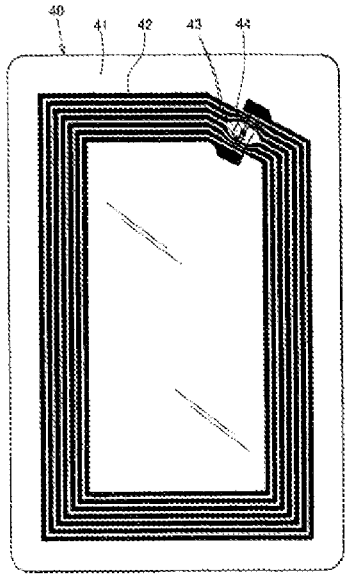
US7690578 | **Publication Date: 2010-04-06** | **Priority Date: 2003-08-29**

Wireless IC tag joining method, wireless IC tag-carrying article, and vehicle

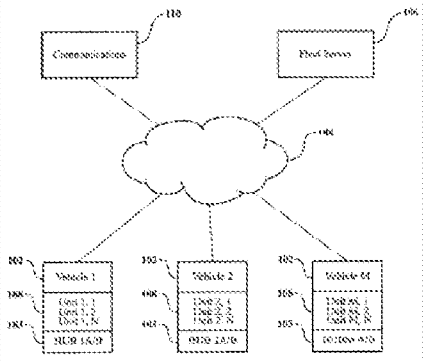


Abstract:
A flat IC tag contains memory means capable of data storage and transmission means capable of data transmission. The IC tag has on a surface thereof an unvulcanized rubber having identical properties to the unvulcanized rubber used for an article to which the IC tag is mounted. The opposite surface of the IC tag is mounted to the article before vulcanization. The article is vulcanized in this state to mount the IC tag to the article. Hence, the IC tag is not damaged if attached to tires and other articles in harsh operating environment.

Current Assignees: OMRON CORP

US20210125428 | **Publication Date: 2021-04-29** | **Priority Date: 2019-10-23**

Apparatus and Method for Tire Separation Monitoring



Abstract:
A vehicle monitoring system monitors a vehicle characteristic and, from the monitoring, determines the state of a vehicle component. The system may set an alert and may communicate that alert to a user or supervisory authority. The state of the vehicle component may relate to a vehicle tire and to the potential delamination of a tire.

Current Assignees: APPLIED MECHATRONIC PROD LLC

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Revvo v. Cerebrum
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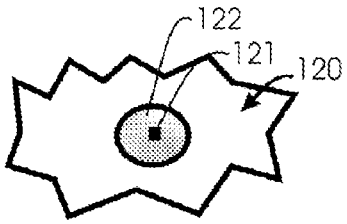
US20070096565 | **Publication Date: 2007-05-03** | **Priority Date: 2000-09-08**

Switch Assemblies and Method for Controlling Vehicular Components



Abstract:
Vehicle including a switch assembly includes a vehicular component subject to control by an occupant in the passenger compartment, and a switch assembly for controlling the component based on pressure applied by the occupant of the vehicle to an exposed surface of the vehicle. The switch assembly includes at least one wireless transmission component arranged to wirelessly transmit an indication of the application of pressure to the exposed surface, and a control mechanism for controlling the wireless transmission by the wireless transmission component(s) based on the application of pressure to the exposed surface. The control mechanism may be a switch or a variable impedance which react to the application of pressure to the exposed surface.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

EP2010401A2 | **Publication Date: 2009-01-07** | **Priority Date: 2006-04-25**

Elastomeric article with wireless micro and nano sensor system

Image not currently available

Abstract:
A sensor system for obtaining data from an elastomeric article includes at least one wireless sensor. The sensor length-scales range from nano- to micro-scale devices that are small enough to avoid becoming occlusions within the article. The article may include sensors embedded within one of the materials of the article, a layer of sensors built into the article, and a string of sensors disposed within a component or embedded within a component of the article. The sensors may be configured to provide data related to one or more of temperature, pressure, sidewall flex, stress, strain and other parameters. The sensors may be LCD sensors, and/or conductive polymer sensors, and/or bio-polymer sensors and/or polymer diodes suitable for sensing data during the operation of the tire. A power circuit using energy generated by the tire may provide power to the sensors.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

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WO1999029524A1 | **Publication Date: 1999-06-17 | Priority Date: 1997-12-09**

Pressure sensor for a tire and method therefor

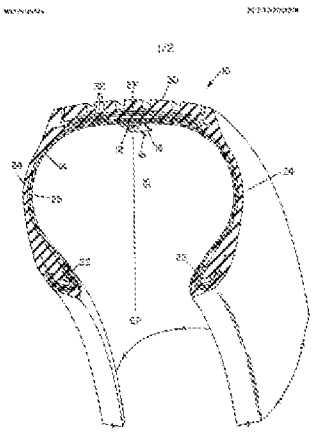


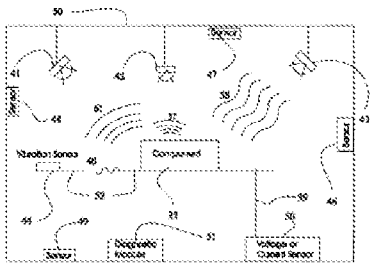
FIG. 1

Abstract:
An apparatus (12) is attached to a tire (10) encapsulated within elastomeric material (16) located within the toroidal region of pneumatic tire (10). The apparatus is preferably embedded in the tire at its equatorial plane (EP). An integrated circuit chip of the transponder has at least the capacity to handle and transmit data relating to tire pressure.

Current Assignees: GOODYEAR TIRE & RUBBER CO

US7527288 | **Publication Date: 2009-05-05 | Priority Date: 1995-06-07**

Vehicle with crash sensor coupled to data bus



Abstract:
Vehicle including sensors one of which is a motion-detecting crash sensor, a processing module for processing data generated by the sensors, the module being separate from most if not all of the sensors, and a data bus coupling the sensors and the module together and enabling transfer of data from the sensors to the module. Each sensor may be mounted at a different location on the vehicle and arranged to provide a measurement related to a time-varying state of the sensor or a measurement related to a time-varying state of the mounting location. A deployable occupant restraint may be arranged to deploy to protect an occupant of the vehicle during a crash involving the vehicle. The module determines deployment of the occupant restraint based on the diagnosed state of the vehicle.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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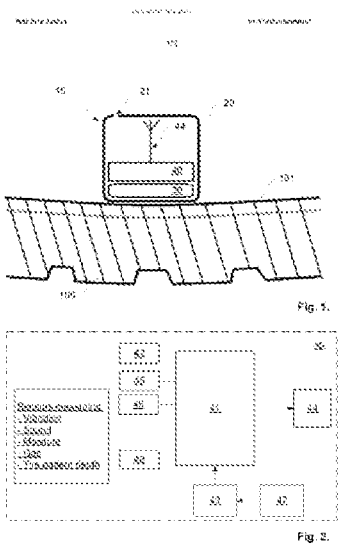
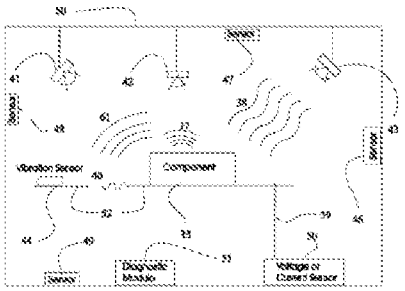
Tire health sensor assembly



Abstract:
Tire health sensor assembly (10) for arrangement in a vehicle tire(100) formed by a housing (20) arranged for accommodating amagnet assembly (30) formed by at least one magnet, a sensor module (40) including at least one tire pressure sensor (42), power means (43) in the form of at least one battery or capacitor and/or energy harvester (47), and a communication module (44) wherein the magnet assembly (30) and sensor module (40) are arranged at lower part of the housing (20) providing the housing (20), and accordingiy the tire health sensor assembly (10), with a centre of gravity at lower part of the housing (20) which together with magnetic force of the magnet assembly (30) are arranged to self-align/correct the tire health sensor assembly (10) in relation to an inner circumferential surface of the tire (100), and attachment to a metal cord (101) of the tire (100) or metal wheel of the tire (100).

Current Assignees: EL WATCH AS

Energy Harvesting Systems and Methods for Vehicles



Abstract:
Vehicular on-board energy generating system includes a coil and a magnet movable in a passage of the coil during movement of the vehicle such that the movement of the magnet relative to the coil causes generation of electricity. The coil may be wrapped around a cylinder, and its passage may include a chamber defined by the cylinder. An energy storage device is coupled to the coil and arranged to receive and store the generated electricity. One or more sensors can additionally or alternatively be coupled to the coil and arranged to receive and use the generated electricity. A control module can also be coupled to the sensor and arranged to control a component in the vehicle based at least in part on data provided by the sensor.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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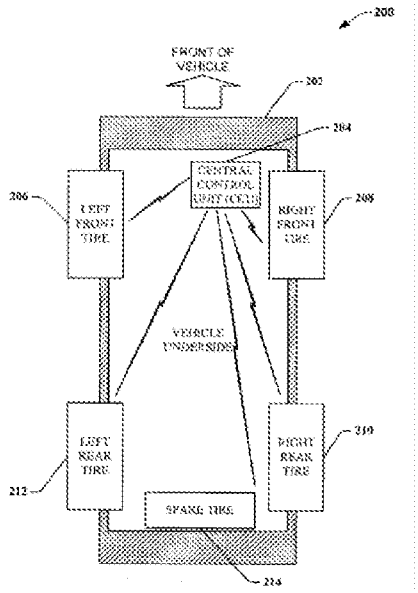
US20070279203 | **Publication Date: 2007-12-06** | **Priority Date: 2006-05-31**

Contactless sensor systems and methods



Abstract:
A tire monitoring system and associated method is disclosed. The tire monitoring system includes a plurality of tire sensor modules, employing contactless sensors, configured to transmit tire data at a predetermined time interval. The system also includes a central control unit that is configured to receive the tire data from the tire sensor modules, and is further configured with an external control unit that can communicate with the tire sensor modules, the central control units and outside sources.

Current Assignees: INFINEON TECH AG

WO2007127220A2 | **Publication Date: 2007-11-08** | **Priority Date: 2006-04-25**

Elastomeric article with wireless micro and nano sensor system

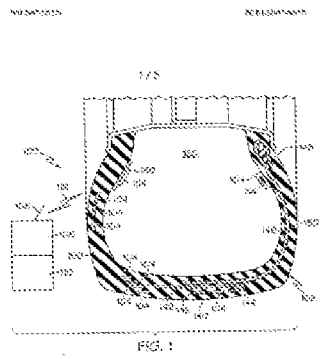


FIG. 1

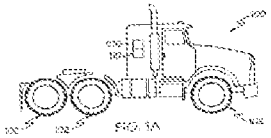


FIG. 1A

Abstract:
A sensor system for obtaining data from an elastomeric article includes at least one wireless sensor. The sensor length-scales range from nano- to micro-scale devices that are small enough to avoid becoming occlusions within the article. The article may include sensors embedded within one of the materials of the article, a layer of sensors built into the article, and a string of sensors disposed within a component or embedded within a component of the article. The sensors may be configured to provide data related to one or more of temperature, pressure, sidewall flex, stress, strain and other parameters. The sensors may be LCD sensors, and/or conductive polymer sensors, and/or bio-polymer sensors and/or polymer diodes suitable for sensing data during the operation of the tire. A power circuit using energy generated by the tire may provide power to the sensors.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

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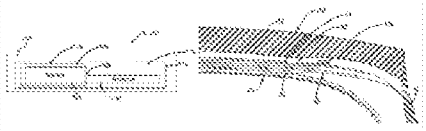
US10836223 | **Publication Date: 2020-11-17** | **Priority Date: 2019-12-17**

Encapsulated embedded tire sensor unit

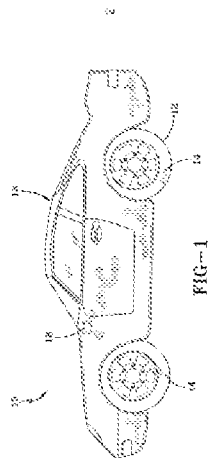


Abstract:
An encapsulated sensor unit is embedded in a tire. The encapsulated sensor unit includes a sensor portion and an antenna portion. A first encapsulating layer is disposed about the sensor portion, and not about the antenna portion. A second encapsulating layer is disposed about the first encapsulating layer and the antenna portion. A third encapsulating layer is disposed about the second encapsulating layer.

Current Assignees: GOODYEAR TIRE & RUBBER CO

BR102013031041A2 | **Publication Date: 2014-09-23** | **Priority Date: 2012-12-13**

Autonomous electrical wear or abrasion wear detection system



Abstract:
SUMMARY "WEAR DETECTION SYSTEM OR ABRASION OF AUTONOMOUS ELECTRICAL CONNECTION" This is an autonomous, electrically and sacri-ficial wear detector system that includes at least one wearable sensor, an autonomous power source and a device for remote radio frequency communication. The system includes a tubular tread wear indicator body embedded within a pneumatic tread element. The indicator body is centered within the tread element and is shaped like a tube. The sensor element changes operationally by at least one electromagnetically measurable physical parameter as the tread element wears out radially inward. The system provides a complete tread wear system that includes the algorithm for signal and data processing, storage routines and decision making to remotely provide the driver or owner with the current tire tread wear condition. , the correspondence between the type of tire - vehicle - station and with real-time estimation of the tire's remaining life.

Current Assignees: GOODYEAR TIRE & RUBBER CO

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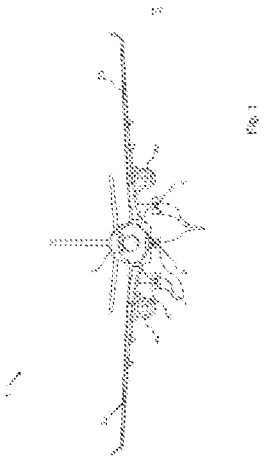
GB2602012A | **Publication Date: 2022-06-22** | **Priority Date: 2020-12-15**

Tyre monitor

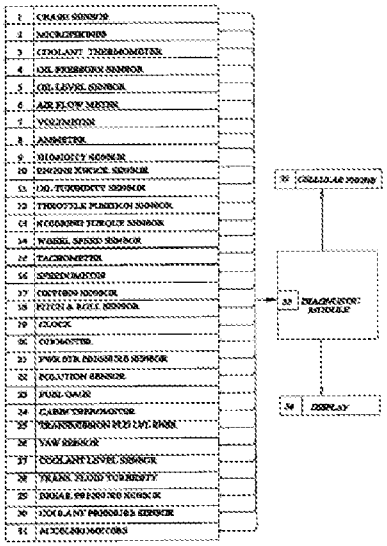


Abstract:
A monitor 11, suitable for detecting a tire operating parameter such as pressure or temperature, comprising a sensor 12, held on a resiliently radially-biased ring 15 with spaced ends 16a, 16b, surrounded by a 14 housing that may be formed of a resiliently flexible material, such as a rubber or thermoplastic elastomer. The monitor 11 may also comprise a wireless communication interface (21, Fig. 6) for transmitting data from the sensor 12 to an external device; and a power supply (18, Fig. 6), such as a battery, for powering the sensor 12. The monitor 11 may further have a processor (19, Fig. 6) for recording data from the sensor 12 in a memory (20, Fig. 6); and a time source (22, Fig. 6) for time-stamping data stored in the memory (20, Fig. 6). Also provided is an aircraft (Fig. 1) with a wheel assembly (7, Fig. 1) and the tyre monitor 11.

Current Assignees: AIRBUS OPERATIONS LTD

US20070005202 | **Publication Date: 2007-01-04** | **Priority Date: 1995-06-07**

Remote Vehicle Diagnostic Management



Abstract:
Vehicular diagnostic arrangement includes a diagnostic system arranged on the vehicle to determine whether any vehicular components is operating non-optimally, is expected to fail or has failed and generate an output indicative or representative thereof, and a communications device coupled to the diagnostic system and arranged to direct a transmission of the output of the diagnostic system to a remote location. Remote locations encompasses remote facilities which handle maintenance or monitoring of the vehicle such as a dealer of the vehicle, the manufacturer of the vehicle or the manufacturer of the components for which non-optimal operation has been detected. The communications device may be arranged to direct the transmission of the output of the diagnostic system to the remote location via the Internet, the remote location including or being an Internet-enabled device possessed by the dealer, manufacturer or owner of the vehicle.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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EP1037754A1 | **Publication Date: 2000-09-27** | **Priority Date: 1997-12-09**

Pressure sensor for a tire and method therefor

Image not currently available

Abstract:
An apparatus (12) is attached to a tire (10) encapsulated within elastomeric material (16) located within the toroidal region of pneumatic tire (10). The apparatus is preferably embedded in the tire at its equatorial plane (EP). An integrated circuit chip of the transponder has at least the capacity to handle and transmit data relating to tire pressure.

Current Assignees: GOODYEAR TIRE & RUBBER CO

JP2003511287A | **Publication Date: 2003-03-25** | **Priority Date: 1999-10-01**

How to monitor tire condition

Image not currently available

Abstract:
According to the present invention, a central tread (16), one or more belts (20) arranged radially inside the tread (16), and side edges (23 A method of monitoring the condition of a pneumatic tire (10) having an inner liner (35) radially disposed inside a belt (20) having a A state sensor associated with the electronic tag (40) is disposed in the tire. In this method, a first temperature that is the temperature of the inner liner of the tire adjacent to the belt edge is detected using an electronic tag (44), and a second temperature that is the air temperature in the tire is detected using the electronic tag. Detecting using (46) and detecting the air pressure in the tire using an electronic tag (48). -

Current Assignees: GOODYEAR TIRE & RUBBER CO

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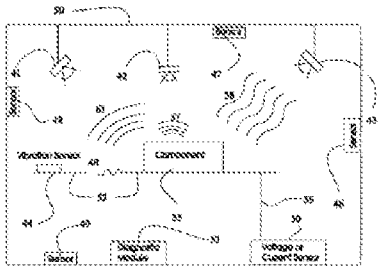
US20070075919 | **Publication Date: 2007-04-05** | **Priority Date: 1995-06-07**

Vehicle with Crash Sensor Coupled to Data Bus



Abstract:
Vehicle including sensors one of which is a motion-detecting crash sensor, a processing module for processing data generated by the sensors, the module being separate from most if not all of the sensors, and a data bus coupling the sensors and the module together and enabling transfer of data from the sensors to the module. Each sensor may be mounted at a different location on the vehicle and arranged to provide a measurement related to a time-varying state of the sensor or a measurement related to a time-varying state of the mounting location. A deployable occupant restraint may be arranged to deploy to protect an occupant of the vehicle during a crash involving the vehicle. The module determines deployment of the occupant restraint based on the diagnosed state of the vehicle.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

CN106965632B | **Publication Date: 2021-05-28** | **Priority Date: 2015-12-22**

Tire monitoring device and system for use with an on-board stability control system

Abstract:
A tire monitoring device includes a sensor for monitoring a tire parameter and a first controller for controlling operation of the device. A measurement device is provided for generating parametric measurement data from the sensor output signals. A second controller is provided for controlling operation of the measuring device. The second controller communicates parameter data to the first controller based on the measurement data. The device is particularly suitable for monitoring tire pressure and detecting a tire burst event. -

Current Assignees: SCHRADER ELTNC LTD

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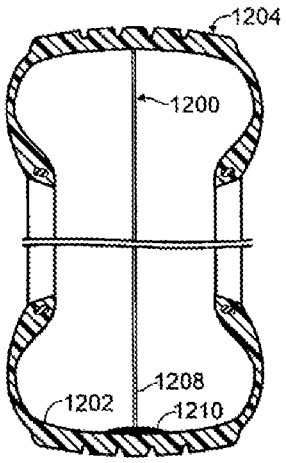
US6899153 | **Publication Date: 2005-05-31** | **Priority Date: 1999-11-15**

Mounting transponders and antennas in pneumatic tires

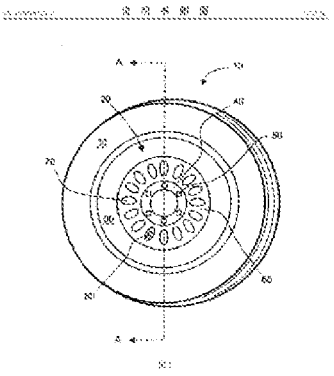


Abstract:
An antenna comprises two elongate antenna segments (740, 740', 862, 940, 970, 1208/1212, 1300, 1320, 1322/1324, 1360, 1360', 1520, 1520', 1520", 1523, 1523', 1620, 1720, 1820, 1920) which extend from first ends (742, 742', 864, 942, 972, 1322e, 1362, 1362', 1522, 1522', 1522", 1622, 1922)/(744, 744', 868, 944, 974, 1324e, 1364, 1364', 1524, 1524', 1524", 1624, 1924) connected to the antenna coupling coil in opposite directions to second ends (744, 744', 868, 944, 974, 1322c, 1366, 1366', 1524, 1524', 1524", 1624, 1924)/(742, 742', 864, 942, 972, 1324c, 1368, 1368', 1522, 1522', 1522", 1622, 1922) at least partially around the inner surface of the tire. The antenna and antenna coupling coil are mounted to the inner surface of the tire, and the transponder module is attached to the antenna coupling coil in a way which positions the transponder coupling coil in close proximity and concentric to the antenna coupling coil, thereby providing effective transformer-type coupling between the...

Current Assignees: GOODYEAR TIRE & RUBBER CO

CN101878123A | **Publication Date: 2010-11-03** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules



Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (0) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO TRUCKS CORP

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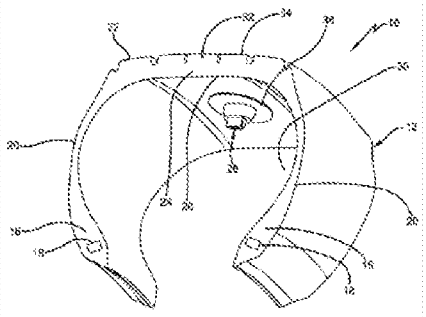
Sensor retaining system for vehicle tire



Abstract:
A sensor retaining system for a vehicle tire is provided. The tire includes a pair of sidewalls extending from a respective bead area to a tread, which is formed with a plurality of tread elements. A sensor unit is mounted to the tire and includes a pair of electrical contacts. A tread wear sensor extends into one of the tread elements and includes a wire. The wire includes proximal ends, each one of which contacts a sensor unit electrical contact to create an electrical circuit. A flexible container is mounted to an innerliner of the tire. A cup includes a base and a sidewall that cooperate to form a cavity, and a bottom of the tread wear sensor and the sensor unit are received in the cavity. The cup maintains a connection between the electrical contacts and the wire proximal ends, and is disposed in the flexible container.

Current Assignees: GOODYEAR TIRE & RUBBER CO

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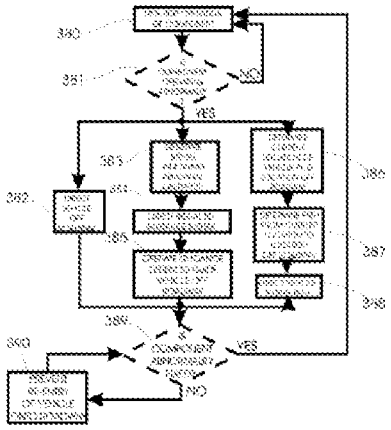
Vehicle Computer Design and Use Techniques



Abstract:
Vehicle including a data generating system which obtains or generates information about the vehicle and a communications system coupled to the data generating system for communicating directly with a wireless Internet service provider (ISP) to enable the information obtained or generated by the data generating system to be transmitted via the Internet. The data generating system may be a diagnostic system which diagnoses the state of the vehicle or the state of a component of the vehicle and generates an output indicative or representative thereof. The data generating system may be arranged to obtain or generate information about the operation of the vehicle. Additionally or alternatively, the data generating system may be arranged to obtain or generate information about the presence of contents in the compartment and/or when contents are present, information about contents in the compartment.

Current Assignees: LIMESTONE MEMORY SYS LLC, SUPER INTERCONNECT TECH LLC, TELECONFERENCE SYS LLC, AUTOMOTIVE TECH INTL INC, AMERICAN VEHICULAR SCIENCES LLC, ACACIA RSCH GROUP LLC, BONUTTI SKELETAL INNOV LLC, R2 SOLUTIONS INC, CELLULAR COMM EQUIP LLC, LIFEPORT SCIENCES LLC, PARTHENON UNIFIED MEMORY ARCHITECTURE LLC, INNOVATIVE DISPLAY TECH LLC, MOBILE ENHANCEMENT SOLUTIONS LLC, NEXUS DISPLAY TECH LLC, SAINT LAWRENCE COMM LLC, UNIFICATION TECH LLC, MONARCH NETWORKING SOLUTIONS LLC, STINGRAY IP SOLUTIONS LLC

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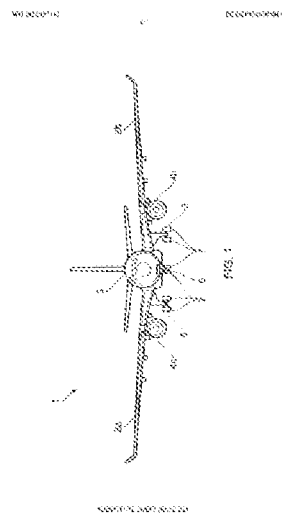
WO2022129143A1 | **Publication Date: 2022-06-23** | **Priority Date: 2020-12-15**

Tyre monitor

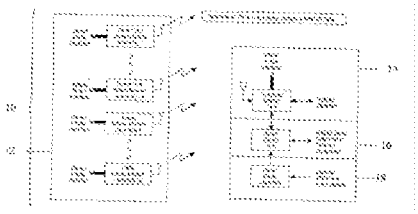


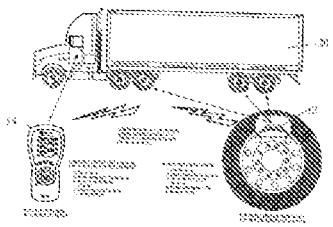
Abstract:
Checking the operating parameters of a tyre, such as tyre pressure, is an important part of tyre maintenance, particularly in aircraft. A tyre monitor (11) comprises a sensor device (12) arranged to detect an operating parameter of a tyre and a protective housing (14) for the device, the device being retained on a ring (15) having spaced end portions (16a, 16b), the ring being resiliently radially biased. The provision of a retaining ring facilitates installation of the tyre monitor within a tyre assembly, so that the sensor device can directly monitor the operating parameter of the tyre. The protective housing protects the sensor device from impact, vibration and temperature extremes.

Current Assignees: AIRBUS OPERATIONS LTD

US20020130771 | **Publication Date: 2002-09-19** | **Priority Date: 2000-08-17**

Vehicle wheel monitoring system





Abstract:
A system for remotely sensing the temperature and pressure in vehicle tires whether moving or stationary. The tire pressure and temperature data along with a unique ID number are transmitted from a sensor in the tire to a computer display in the cab. A portable cab display receives the data and assigns a unique wheel location for each sensor. The cab display compensates the pressure data for local barometric pressure and actual tire temperature and displays the compensated data to the driver. Alarms are included to alert the driver of off specification conditions. The cab display may be removed from the cab for local use.

Current Assignees: TYRE LYNX INC

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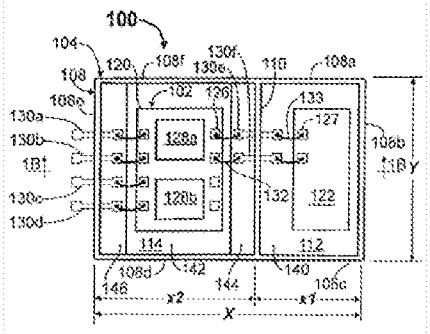
DE69916115T2 | **Publication Date: 2009-10-01** | **Priority Date: 1998-08-03**

Assembly of transponders in air tires

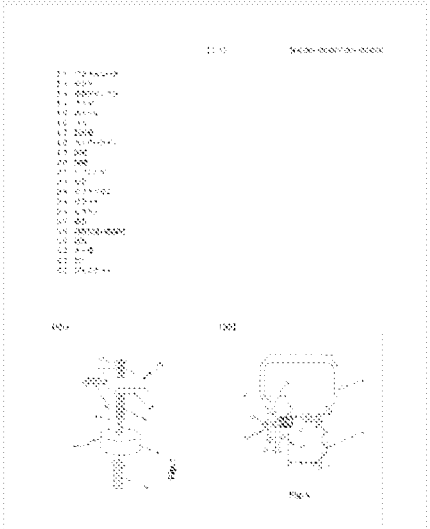


Abstract:
Method and apparatus for mounting a transponder module (602, 602a, 702, 951, 1000, 1020, 1102, 1102', 1402) and an antenna (740, 740', 862, 940, 1140, 1140', 1200, 1300, 1320, 1360, 1360', 1440, 1460) in a pneumatic tire (312, 630, 1204, 1350, 1350'), and for coupling or connecting the antenna to the transponder module. A patch (600, 700, 700', 850, 950, 980, 1100, 1100', 1210, 1356, 1356', 1400) has an opening (620, 720, 720', 856, 956, 986, 1120, 1120', 1420) extending to a cavity (622, 722, 860, 960, 990, 1122, 1122', 1422) within the body of the patch. The transponder module is removably retained in the cavity by a resilient annular lip (624, 724, 724', 858, 958, 988, 1124, 1124', 1424) extending around the opening. End portions (742/744,742'/744', 864/868, 942/944, 972/974, 1142/1144, 1142'/1144', 1322e/1324e, 1362/1364, 1362'/1364') of the antenna extend into the patch, and may be connected to a coupling coil (750, 750', 866, 938, 968) disposed within the patch for coupling RF...

Current Assignees: GOODYEAR TIRE & RUBBER CO

JP2006518307A | **Publication Date: 2006-08-10** | **Priority Date: 2003-02-15**

Tire pressure monitor and its use



Abstract:
The present invention provides an improved tire pressure monitor that communicates information about the tire pressure of a vehicle to a driver accurately and not to be confused with other vehicle information. A tire pressure monitoring system (10) includes a magnetic actuator (11) having an air pressure transducer for generating a signal proportional to tire internal air pressure. Actuator (11) acts parallel to the axle to mitigate speed sensitivity. The magnetic actuator (11) communicates with a static magnetic field sensor (12) permanently attached to the vehicle in the immediate vicinity of the magnetic actuator (11). The magnetic actuator (A (11) rotates near the wheel (15) and approaches the sensor (12) at least once every rotation of the wheel (15) and transmits information about the tire internal pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

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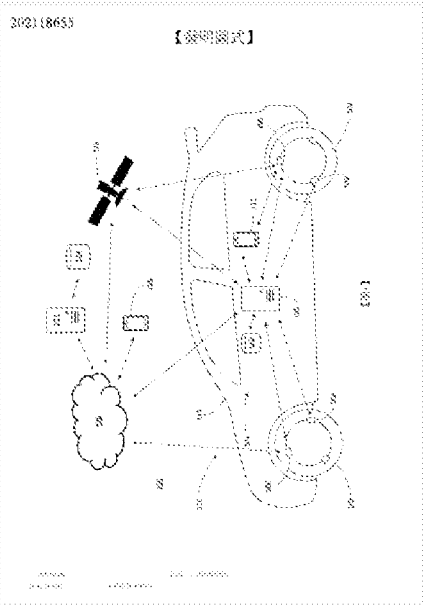
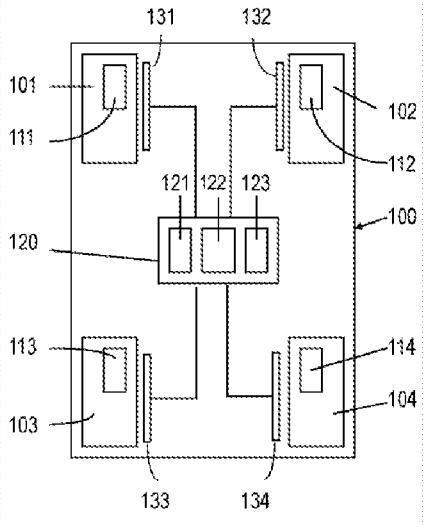
Tire sidewall temperature sensing systems and methods



Abstract:
Systems and methods for sensing a tire parameter from a rotating wheel are disclosed. In some embodiments, a system includes: a rotatable component configured to rotate; a piezoelectric transducer disposed along a circumference of the rotatable component, where the piezoelectric transducer is configured to generate an offload voltage based on a mechanical deformation of the piezoelectric transducer; and at least one processor in communication with the piezoelectric transducer, the at least one processor configured to determine a temperature value based on the offload voltage.

Current Assignees: TDK CORP

Tire monitoring device and system for use with a vehicle on board stability control system



Abstract:
A tire monitoring device comprising a sensor for monitoring a tire parameter and a first controller for controlling the operation of the device. A measurement apparatus is provided for generating parameter measurement data from the sensor output signal. A second controller is provided for controlling the operation of the measurement apparatus. The second controller communicates parameter data to the first controller based on the measurement data. The device is particularly suited to monitoring tire pressure and detecting tire burst events.

Current Assignees: SCHRADER ELTNC LTD

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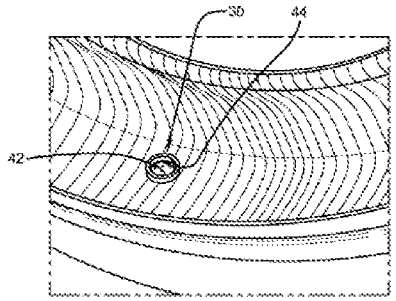
US20190193490 | **Publication Date: 2019-06-27** | **Priority Date: 2017-12-21**

Tire with sensor attachment reservoir and method of attaching sensor



Abstract:
A tire with a sensor attachment reservoir is provided. The tire includes a pair of bead areas, a sidewall extending from each respective bead area to a tread, a carcass extending toroidally between each of the bead areas, and an innerliner disposed inwardly of the carcass. A compound ring is secured to the innerliner, and the compound ring defines a reservoir upon being secured to the innerliner. A sensor adhesive is disposed in the reservoir and a sensor is secured to the tire innerliner by the sensor adhesive. A corresponding method of attaching a sensor to a tire is also provided.

Current Assignees: GOODYEAR TIRE & RUBBER CO

CA2355538A1 | **Publication Date: 2002-04-06** | **Priority Date: 2000-10-06**

Improved apparatus for monitoring a physical condition of a tire

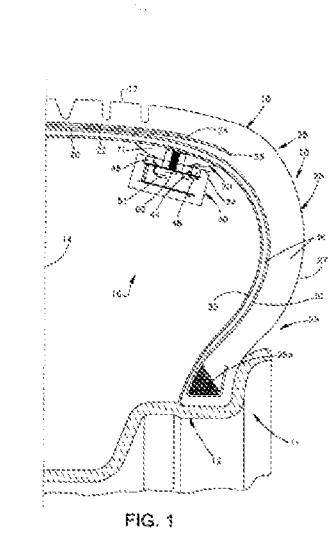


FIG. 1

Abstract:
According to the invention there is in conjunction with a pneumatic tire (10') having an electronic tag (100) mounted therein with a patch (70') having a first side (72') for mounting against the innerliner of the tire, a second arcuately-shaped side (73') and an internally threaded member (71') extending to the arcuately-shaped side (73'). The electronic tag has a pressure sensor (116) located at the bottom of a tubular shaped air inlet structure (118) opening at an upper surface (122a) of the electronic tag, an internally threaded nut (132) having one end (132a) disposed within the electronic tag (100) and an opposite end (132b) extending outward from the upper surface (122a) of the tag, an externally threaded member (134) threaded into the internally threaded nut (132) and extending through the upper surface (122a). The externally threaded member (134) is threaded into the internally threaded member (71') so that the opposite end (132b) of the internally threaded nut (132) is...

Current Assignees: GOODYEAR TIRE & RUBBER CO

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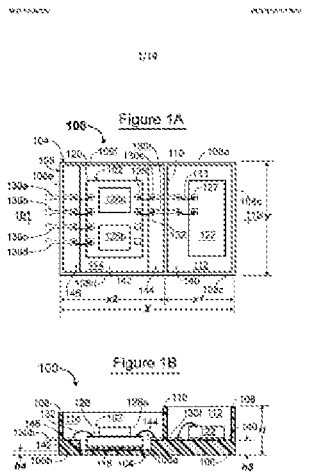
WO2001036220A1 | **Publication Date: 2001-05-25** | **Priority Date: 1999-11-15**

Mounting transponders and antennas in pneumatic tires

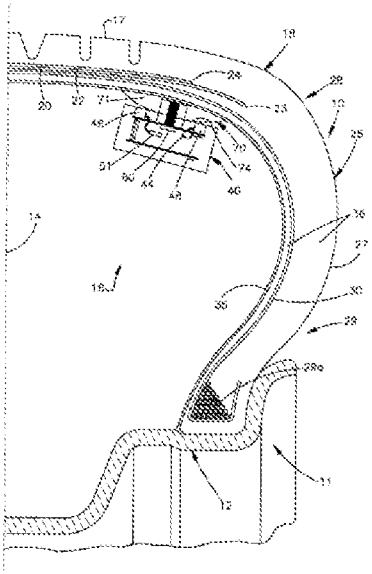


Abstract:
An antenna comprises two elongate antenna segments (740, 740', 862, 940, 970, 1208/1212, 1300, 1320, 1322/1324, 1360, 1360', 1520, 1520', 1520'', 1523, 1523', 1620, 1720, 1820, 1920) which extend from first ends (742, 742', 864, 942, 972, 1322e, 1362, 1362', 1522, 1522', 1522'', 1622, 1922)/(744, 744', 868, 944, 974, 1324e, 1364, 1364', 1524, 1524', 1524'', 1624, 1924) connected to the antenna coupling coil in opposite directions to second ends (744, 744', 868, 944, 974, 1322c, 1366, 1366', 1524, 1524', 1524'', 1624, 1924)/(742, 742', 864, 942, 972, 1324c, 1368, 1368', 1522, 1522', 1522'', 1622, 1922) at least partially around the inner surface of the tire. The antenna and antenna coupling coil are mounted to the inner surface of the tire, and the transponder module is attached to the antenna coupling coil in a way which positions the transponder coupling coil in close proximity and concentric to the antenna coupling coil, thereby providing effective transformer-type coupling between...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US6255940 | **Publication Date: 2001-07-03** | **Priority Date: 1999-10-01**

Apparatus for monitoring a condition of a tire



Abstract:
According to the invention there is in conjunction with a pneumatic tire (10') having an electronic tag (100) mounted therein with a patch (70') having a first side (72') for mounting against the innerliner of the tire, a second arcuately-shaped side (73') and an internally threaded member (71') extending to the arcuately-shaped side (73'). The electronic tag has a pressure sensor (116) located at the bottom of a tubular shaped air inlet structure (118) opening at an upper surface (122a) of the electronic tag, an internally threaded nut (132) having one end (132a) disposed within the electronic tag (100) and an opposite end (132b) extending outward from the upper surface (122a) of the tag, an externally threaded member (134) threaded into the internally threaded nut (132) and extending through the upper surface (122a). The externally threaded member (134) is threaded into the internally threaded member (71') so that the opposite end (132b) of the internally threaded nut (132) is...

Current Assignees: GOODYEAR TIRE & RUBBER CO

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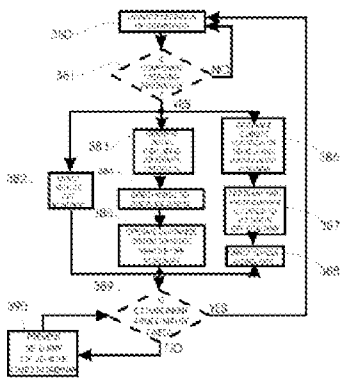
US8019501 | **Publication Date: 2011-09-13** | **Priority Date: 1995-06-07**

Vehicle diagnostic and prognostic methods and systems

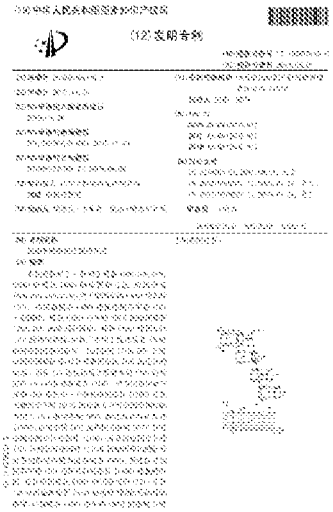


Abstract:
Method for predicting failures in vehicular components includes mounting sensors on the vehicle which provide data affected by the operation of the components, obtaining data from the sensors, detecting patterns in the obtained data on the vehicle, analyzing the detected patterns to predict failure of any component, and informing the user, owner, dealer and/or manufacturer of the vehicle about the predicted failure to enable preventative and corrective action to be taken. A vehicle with remote telematics capability includes sensors arranged to provide data about conditions of the vehicle or components, a processor for receiving data provided by the sensors and converting the data into an output constituting a signal about a diagnostic condition of the vehicle or component(s), and a communications unit arranged to transmit the signal. The communications unit can establish a communications channel with a dealer or manufacturer of the vehicle at a location remote from the vehicle.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

CN101878123B | **Publication Date: 2013-05-01** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules



Abstract:
There is provided a method of identifying locations of modules (400) of an apparatus (600, 680, 690, 2200) for monitoring wheels (10) of a vehicle (900). The sensor modules (400) operatively revolving with the wheels (10). The modules (400) communicate with a processing arrangement (710, ECU 950) of the vehicle (900). The modules (400) sense a physical parameter of the wheels (10) and generate corresponding sensor signals for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signals to compute information indicative of operation of the wheels (10). The apparatus (1) also includes a sensor arrangement (118) for sensing an angular orientation (0) of the wheels (10). The method includes steps of: (b) arranging an elongate feature (1100) in an at least partially transverse direction relative to a direction of travel of the vehicle (900); (c) driving the vehicle (900) over the elongate feature (1100) to cause the wheels (10), together with...

Current Assignees: VOLVO TRUCKS CORP

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

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	1	20210370726	A1	2021-12-02	Dodani et al.	

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Attorney Docket Number	90608.01000

	1	Non-Final Office Action dated August 15, 2022 in corresponding U.S. Application No. 16/671,105 filed October 31, 2019; total 23 pages.
	2	Notice of Allowance dated April 11, 2023 in corresponding U.S. Application No. 16/671,105 filed October 31, 2019; total 9 pages.

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/JERMAINE L JENKINS/	Date Considered	07/12/2023

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-04-25
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Revvo's Exhibit 1002
Revvo v. Cerebrum
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Privacy Act Statement

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

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

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public 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.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/084,483	10/29/2020	Keith George Ferry	90608.01000

CONFIRMATION NO. 7585

125632
Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

POA ACCEPTANCE LETTER

OC000000059277984

Date Mailed: 07/13/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 06/30/2023.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

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

/rnegga/

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Revvo v. Cerebrum
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Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
* 17/084,483 *	17/084,483	Ferry, Keith George	
	Examiner	**Art Unit**	
	JENKINS, JERMAINE L	2855	

Document Code - DISQ	**Internal Document - DO NOT MAIL**

TERMINAL DISCLAIMER	☑ APPROVED	☐ DISAPPROVED
Date Filed: 30 June 2023	**This patent is subject to a Terminal Disclaimer**	

Approved/Disapproved by:

/FELICIA D ROBERTS/

Technology Center: OPLC

Telephone: (571)272-0550

16/671,105

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 233

Electronic Acknowledgement Receipt

EFS ID:	48240784
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	90608.01000
Receipt Date:	30-JUN-2023
Filing Date:	29-OCT-2020
Time Stamp:	18:16:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	063023_POA_as_filed_90608_01000.pdf	481925 0fdec434ca0b72dbd65fb1de4a17009a4fe45aa7	no	2

Warnings:

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IPR2025-00632 - Page 234

Information:					
2	Terminal Disclaimer Filed	063023_TD_16671105_as_filed_90608_01000.pdf	302750 739466974fed16c7ff8b8b3f9b71b5f145f749c7	no	2
Warnings:					
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			Total Files Size (in bytes):	784675	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/25 (04-13)
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TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION

Docket Number (Optional): 90608.01000

In re Application of: Keith George Ferry

Application No.: 17/084,483

Filed: 10-29-2020

For: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

The applicant, Keith George Ferry, owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending **reference** Application Number 16/671,105, filed, 10-31-2019, as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the **reference** application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said **reference** application, "as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application," in the event that: any such patent granted on the pending **reference** application expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 39,739

/Grant T. Langton/	06/30/2023
Signature	Date
Grant T. Langton	
Typed or printed name	
Attorney of Record	(213) 929-2505
Title	Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) is included.

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Routine uses of the information in this record may include disclosure to: 1) law enforcement, in the event that the system of records indicates a violation or potential violation of law; 2) a Federal, state, local, or international agency, in response to its request; 3) a contractor of the USPTO having need for the information in order to perform a contract; 4) the Department of Justice for determination of whether the Freedom of Information Act (FOIA) requires disclosure of the record; 5) a Member of Congress submitting a request involving an individual to whom the record pertains, when the individual has requested the Member's assistance with respect to the subject matter of the record; 6) a court, magistrate, or administrative tribunal, in the course of presenting evidence, including disclosures to opposing counsel in the course of settlement negotiations; 7) the Administrator, General Services Administration (GSA), or their designee, during an inspection of records conducted by GSA under authority of 44 U.S.C. 2904 and 2906, in accordance with the GSA regulations and any other relevant (i.e., GSA or Commerce) directive, where such disclosure shall not be used to make determinations about individuals; 8) another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)); 9) the Office of Personnel Management (OPM) for personnel research purposes; and 9) the Office of Management and Budget (OMB) for legislative coordination and clearance.

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Document Description: Power of Attorney

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NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	17/084,483
Filing Date	10-29-2020
First Named Inventor	Keith George Ferry
Title	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

SIGNATURE of Applicant or Patent Practitioner

Signature	/Grant T. Langton/	Date (Optional)	06/30/2023
Name	Grant T. Langton	Registration Number	39,739
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 125632

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

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OR

☐ The address associated with Customer Number:

OR

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

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

☑ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	6-15-23
Name	Keith George Ferry Keith Ferry		
Title	CEO		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

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Application Number	Application/Control No.	Applicant(s)/Patent under Reexamination	
* 17/084,483 *	17/084,483	Ferry, Keith George	
	Examiner	**Art Unit**	
	JENKINS, JERMAINE L	2855	

Document Code - DISQ	**Internal Document - DO NOT MAIL**

TERMINAL DISCLAIMER	☐ APPROVED	☑ DISAPPROVED
Date Filed: 31 May 2023	**This patent is subject to a Terminal Disclaimer**	

Approved/Disapproved by:

/KIMBERLY R WHITE/

Technology Center: OPLC

Telephone: (571)272-6179

See Continuation Sheet

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IPR2025-00632 - Page 240

Continuation of Approved/Disapproved Comments:

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The person who signed th terminal disclaimer (only for applications filed on or after September 16, 2012
- is not the applicant, patentee or an attorney or agent of record. 37 CFR l.321(a) and (b). (See FP 14.26.08)

- failed to state his/her capacity to sign for the juristic entity, and he/she has not been established as being authorized to act on behalf of the applicant. (See FP 14.26.09).

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TERMINAL DISCLAIMER TO OBVIATE A PROVISIONAL DOUBLE PATENTING REJECTION OVER A PENDING "REFERENCE" APPLICATION	Docket Number (Optional) 90608.01000

In re Application of: Keith George Ferry

Application No.: 17/084,483

Filed: 10-29-2020

For: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

The applicant, Keith George Ferry, owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending **reference** Application Number 16/671,105, filed, 10-31-2019, as the term of any patent granted on said **reference** application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending **reference** application. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the **reference** application are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

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1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 39,739

/Grant T. Langton/	05/31/2023
Signature	Date
Grant T. Langton	
Typed or printed name	
Attorney of Record	(213) 929-2505
Title	Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) is included.

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Electronic Acknowledgement Receipt

EFS ID:	48084140
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	90608.01000
Receipt Date:	31-MAY-2023
Filing Date:	29-OCT-2020
Time Stamp:	21:57:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$170
RAM confirmation Number	E20235UL58008328
Deposit Account	
Authorized User	

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer Filed	053123_TD_16671105_as_filed_90608_01000.pdf	389830 24248013dba2e8124333c333cb282b6a383c88f8	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	37873 a29ec544e8d16871d01919732f300e719d73bcd3	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	427703		

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New International Application Filed with the USPTO as a Receiving Office

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Electronic Patent Application Fee Transmittal

Application Number:	17084483
Filing Date:	29-Oct-2020
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Filer:	Grant T. Langton/Lauren Coyle
Attorney Docket Number:	90608.01000

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
STATUTORY OR TERMINAL DISCLAIMER	2814	1	170	170
		Total in USD ($)		**170**

United States Patent and Trademark Office

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Sale Accounting Date:05/26/2023

Sale Item Reference Number	Effective Date
17084483	05/22/2023

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I20235PD57576256	2201	INDEPENDENT CLAIMS IN EXCESS OF 3	$192.00	Deposit Account

Electronic Patent Application Fee Transmittal

Application Number:	17084483
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First Named Inventor/Applicant Name:	Keith George Ferry
Filer:	Grant T. Langton/Lauren Coyle
Attorney Docket Number:	90608.01000

Filed as Small Entity

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Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	2253	1	592	592
Miscellaneous:				
			Total in USD ($)	**592**

Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of the Claims:

1. (Currently Amended) A sensor assembly configured for attachment with an object that is rotated in use, the sensor assembly comprising:

a housing comprising an outer surface and an internal cavity that is enclosed within the housing;

an electrical sensor device that is disposed within the internal cavity and attached therein to prevent movement of the device within the internal cavity, wherein the internal cavity comprises an unfilled open space above or below the electrical sensor device in the housing, wherein the electrical sensor device is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with the ~~an~~ object and the object is rotated in use; and

a retaining member that is configured to accommodate attachment of the housing therewith, wherein the retaining member has an outside surface configured for attachment to rotate with the object when the object is rotated in use.

2. (Original) The sensor assembly as recited in claim 1, wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member.

3. (Original) The sensor assembly as recited in claim 1, wherein the housing comprises a top cover, a wall structure, and a base section that define the internal cavity, and wherein the top cover, wall structure and base section may be formed from the same or different materials, and wherein one or more of the top cover, wall section, and base section may separate or integral with one another.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 251

4. (Original) The sensor assembly as recited in claim 1, wherein one of the top cover or base section is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity.

5. (Currently Amended) The sensor assembly as recited in claim 1, wherein the electrical sensor device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical sensor device to retain its position therein~~, and wherein there is open space above and below the electrical sensor device within the internal cavity~~.

6. (Original) The sensor assembly as recited in claim 1, wherein the electrical sensor device is encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical sensor device within the housing.

7. (Original) The sensor assembly as recited in claim 1, wherein the housing and retaining member are configured having a complementary shape to facilitate attachment of the housing with the retaining member.

8. (Original) The sensor assembly as recited in claim 7, wherein the housing comprises a wall structure that surrounds the internal cavity, and wherein the retaining member comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith.

9. (Original) The sensor assembly as recited in claim 1, wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces from the object to the housing when the retaining member is attached to the object and the housing is attached to the retaining member.

10. (Original) The sensor assembly as recited in claim 1, wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device.

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11. (Original) A sensing system comprising the sensor assembly as recited in claim 1, wherein the sensing system comprises a receiver that is external from the object and that is configured to receive data from the electrical sensor device by wireless communication.

12. (Original) The sensing system as recited in claim 11, wherein the electrical sensor device comprises an accelerometer sensor connected therewith and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

13. (Currently Amended) The sensing system as recited in claim 12, wherein the object is a vehicle tire, and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire radial load, slip, road or soil conditions, strain, vehicle camber and/or toe alignment is determined from the accelerometer sensor data ~~measuring in a radial direction of the vehicle tire~~.

14. (Original) The sensing system as recited in claim 13, wherein one or more of the tire diameter, tire tread depth, and tire radial load is determined from data including a specific rotational speed of the tire at a given vehicle velocity.

15. (Currently Amended) The sensing system as recited in claim 12, wherein the object is a vehicle tire and a radial load experienced by the tire is determined from data comprising an interval of radial deformation ~~and using a correction coefficient~~.

16. (Previously Presented) The sensing system as recited in claim 11, wherein the electrical sensor device or receiver comprises a global positioning device.

17. (Previously Presented) The sensing system as recited in claim 16, wherein the object is a vehicle tire and a location of the vehicle tire is determined from information provided by one or both of the global positioning device and interaction with the electrical sensor device.

18. (Original) The sensing system as recited in claim 11, wherein the electrical sensor device comprises a gyroscope.

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19. (Original) The sensing system as recited in claim 18, wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth.

20. (Previously Presented) The sensor assembly as recited in claim 1, wherein the electrical sensor device comprises:

a printed circuit board comprising electrical circuitry;

a portable power source for providing power to the electrical sensor device;

at least one sensor element; and

an antenna for receiving and/or transmitting information from the electrical sensor device.

21. (Original) The sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of a storage element and a processor.

22. (Original) The sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of an accelerometer sensor and a global positioning device.

23. (Original) The sensor assembly as recited in claim 20, wherein the sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object.

24. (Original) The sensor assembly as recited in claim 20, wherein the object is a vulcanized rubber vehicle tire, and wherein the retaining member is attached to an inside surface of the vehicle tire or an element attached with the tire that rotates with the tire.

25. (Original) The sensor assembly as recited in claim 24, wherein the retaining member is attached to a wheel that the tire is mounted on.

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26. (Previously Presented) The sensor assembly as recited in claim 24, wherein the retaining member is attached to a valve stem or valve cap of a wheel that the tire is mounted on.

27. (Original) The sensor assembly as recited in claim 24, wherein the retaining member is attached to the inside surface of the vehicle tire by an adhesive layer after the vehicle tire has been vulcanized.

28. (Currently Amended) A sensor assembly and sensing system for use with an object that rotates in use comprising:

a housing comprising an outer structure that defines an open internal cavity therein,

an electrical sensor device disposed within the internal cavity and having a fixed placement therein by ~~through the use of~~ one or more surface features of the housing configured to ~~of the internal cavity in~~ contact ~~with~~ the electrical sensor device, wherein the electrical sensor device is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location, wherein the electrical sensor device comprises:

a portable power source;

a sensor; and

an antenna for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor;

a retaining member having an outside surface configured for attaching with a surface of the object or an element connected with the object to rotate with the object in use, wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the retaining member; and

a receiver external from the object ~~vehicle tire~~ that is configured to receive information from the electrical sensor device wirelessly.

29. (Original) The sensor assembly and sensing system as recited in claim 28, comprising an external transmitter for sending information wirelessly to the electronic sensor device.

30. (Currently Amended) A sensor assembly and sensing system for use with an object that rotates in use comprising:

a housing comprising an outer structure that defines an open internal cavity therein,

an electrical sensor device disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device, wherein the electrical sensor device is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location, wherein the electrical sensor device comprises:

a portable power source;

a sensor; and

an antenna for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor;

a retaining member having an outside surface configured for attaching with a surface of the object or an element connected with the object to rotate with the object in use, wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the retaining member; and

a receiver external from the object that is configured to receive information from the electrical sensor device wirelessly;

~~The sensor assembly and sensing system as recited in claim 28,~~ wherein the housing includes a wall structure having a top cover at a first axial end of the wall structure and a base section at an opposed second axial of the wall structure, wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith.

31. (Original) The sensor assembly and sensing system as recited in claim 28, wherein one of the top cover or the bottom section are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity.

32. (Currently Amended) The sensor assembly and sensing system as recited in claim 28, wherein the internal cavity comprises an open space ~~exists~~ above or ~~and~~ below the electrical sensor device ~~when~~ disposed within the internal cavity.

33. (Original) The sensor assembly and sensing system as recited in claim 28, wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching the housing attached with the retaining member.

34. (Original) The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises an accelerometer sensor and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

35. (Previously Presented) The sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire and the system is configured to determine one or more parameters consisting of a tire diameter, slip, strain, road conditions or soil conditions, a tire tread depth, a tire radial load, and vehicle camber and/or toe alignment from the accelerometer sensor data.

36. (Previously Presented) The sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire and the system is configured to determine one or more of a tire diameter, a tire tread depth, slip, strain, road or soil conditions, and a tire radial load from data including a specific rotational speed of the tire at a given vehicle velocity.

37. (Previously Presented) The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device or receiver comprises a global positioning device.

38. (Original) The sensor assembly and sensing system as recited in claim 37, wherein the object is a vehicle tire and the system is configured to determine a location of the vehicle tire from information provided by the global positioning device.

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39. (Original) The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises a gyroscope.

40. (Original) The sensing system as recited in claim 39, wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

41. (Currently Amended) A method for using a sensor assembly and sensing system with an object that rotates in use comprising the steps of:

installing an electrical sensor device within an internal cavity of a housing, wherein the housing includes an outer structure that defines the internal cavity, and wherein the electrical sensor device comprises a sensor, a portable power source, an antenna, a printed circuit board, and related electrical circuitry, wherein the housing comprises an opening extending from an outer surface of the housing to the internal cavity;

attaching the housing after the step of installing to a retaining member, wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique, wherein the retaining member is connected with the object before or after formation of the object; and

monitoring an operating parameter of the object through the use of the electrical sensing device, wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly.

42. (Original) The method as recited in claim 41, wherein during the step of installing, the housing includes a wall structure having an opening through which the electrical sensor device is installed and, after the step of installing, the opening is closed by attaching a top cover or bottom section to the opening.

43. (Original) The method as recited in claim 41, wherein during the step of installing, the electrical sensor device is attached in place within the internal cavity by contact between the electrical sensor device and one or more surface features in the internal cavity.

44. (Previously Presented) The method as recited in claim 41, wherein the object is a made from vulcanized rubber, and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object before or after the object has been formed.

45. (Previously Presented) The method as recited in claim 44, wherein the retaining member is attached to a surface of the object by use of an adhesive layer or during the formation of the object.

46. (Original) The method as recited in claim 45, wherein the retaining member is attached to the object after the step of attaching the housing to the retaining member.

47. (Original) The method as recited in claim 45, wherein the retaining member is attached to the object by applying hand pressure onto the retaining member once placed into contact with the surface of the object to cause the adhesive layer to form an attachment therebetween.

48. (Original) The method as recited in claim 44, wherein the object is a vehicle tire, and wherein the retaining member is attached to a surface that is inside of the vehicle tire.

49. (Original) The method as recited in claim 44, wherein the retaining member is mechanically attached to an element that is connected to and that rotates with the object.

50. (Original) The method as recited in claim 41, wherein during the step of attaching, the housing is positioned relative to the retaining member according to a display feature that is positioned on the housing.

51. (Original) The method as recited in claim 41, wherein during the step of monitoring, the sensor monitors operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna information related to the monitored

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operating parameter to the receiver, and wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device.

52. (Original) The method as recited in claim 41, wherein the sensor assembly electrical sensor device comprises an accelerometer sensor.

53. (Currently Amended) The method as recited in claim 52, wherein the object is a vehicle tire, and wherein during the step of monitoring, ~~on~~ one or more of a tire outside diameter, a tire tread depth, slip, strain, road or soil conditions, a tire radial load, and a vehicle camber and/or toe alignment parameter is determined from information sent wirelessly from the sensor assembly.

54. (Previously Presented) The method as recited in claim 52, wherein the object is a vehicle tire, and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, slip, strain, road or soil conditions, and a tire radial load is determined from information relating to a specific rotational speed of the tire at a given vehicle velocity.

55. (Previously Presented) The method as recited in claim 41, wherein the object is a vehicle tire and the electrical sensor device or receiver comprises a global positioning device, and wherein the step of monitoring a location of the tire is determined from information provided by the global positioning device.

56. (Original) The method as recited in claim 41, wherein the electrical sensor device comprises a gyroscope.

57. (Original) The sensing system as recited in claim 56 wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

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Electronic Acknowledgement Receipt

EFS ID:	48041354
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
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Attorney Docket Number:	90608.01000
Receipt Date:	22-MAY-2023
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Payment was successfully received in RAM	$592
RAM confirmation Number	E20235LK21416204
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The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		052323_ROA_as_filed_90608_01000.pdf	178243 4aa5f98b214275945d086ffd0ff3fe113c7b7544	yes	18

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Request for Reconsideration-After Non-Final Rejection	1	1
	Claims	2	11
	Applicant Arguments/Remarks Made in an Amendment	12	18

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	38452 96ed38263eebcf381972449c1373a1287bcd1762	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	216695		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	17/084,483	Confirmation No.:	7585
Inventor(s):	Keith George Ferry	Group Art Unit:	2855
Filed:	10/29/2020	Examiner:	Jenkins, Jermaine L.
Title:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	Docket No.	90608.01000

Mail Stop Amendments
Commissioner of Patents
P. O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO NON-FINAL OFFICE ACTION

Dear Commissioner:

In response to the Non-Final Office Action of November 23, 2023, Applicant respectfully requests that the above-identified patent application be amended as set forth below:

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 12 of this paper.

REMARKS

Applicant has amended claims 1, 5, 13, 15, 28, 30, 32, 41, and 53, and has not cancelled any claims. Accordingly, upon entry of this response Applicant submits that claims 1 to 57 are pending in this patent application. Applicant now addresses the issues raised in the above-identified Office action as follows.

I. Claim Rejection Under Section 112

Claim 1 to 40 have been rejected 35 U.S.C. §112, second paragraph, as allegedly being indefinite for reasons noted by the Examiner. Applicant has amended claims 1 and 28 to address the issues pointed out by the Examiner and respectfully requests that the rejection of these claims and the claims depending therefrom under 35 U.S.C. §112 be reconsidered and withdrawn.

II. Provisional Claim Rejection on the Ground of Nonstatutory Double Patenting

Claims 1 to 57 have been provisional rejection on the ground of nonstatutory double patenting over noted claims of copending US Patent Application No. 16/671,105. Applicant encloses herewith a properly executed Terminal Disclaimer and respectfully requests that in view thereof that this basis of rejection be reconsidered and withdrawn.

III. Rejection of Claims Under Section 102

Claims 1, 3, 4, 6 to 8, 11 to 15, 20 to 29, 31, 34 to 36, 41 to 49, and 51 to 54 have been rejected under 35 U.S.C. §102 as being allegedly anticipated by Saito (US Pub 2019/0184733). Applicant has amended independent claims 1, 28, and 41 to better clarify the nature of Applicant's sensor apparatus and system. Specifically, independent claim 1 has been amended to recite, *inter alia*, the feature that the housing internal cavity comprises an unfilled open space above or below the electrical sensor device in the housing internal cavity. Independent claim 28 has been amended to recite, *inter alia*, the feature that the housing comprises one or more surface features configured to contact the electrical sensor device, e.g., to prevent movement of the electrical sensor device within the housing internal cavity. Independent claim 41 has been amended to recite, *inter alia*, the feature that the housing comprises an opening extending from an outer surface of the housing to the internal cavity.

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Saito discloses a tire-mounted sensor comprising an accommodation structure (22f – with reference to FIG. 2) to accommodate the respective components of the sensor so as to be covered with the resin sealing portion (22fb). Paragraph [0046] recites the housing 22fa configures an accommodation chamber that accommodates the different components of the sensor. While Saito discloses the feature of an accommodation structure to accommodate the different components of the sensor, Saito fails to expressly or implicitly disclose the that the housing comprises one or more surface features configured to contact the electrical sensor device to prevent movement of the electrical sensor device within the housing internal cavity as presently recited in Applicant's amended independent claim 28.

Also, Saito discloses that the sensor components disposed in the accommodation structure (22f) are filled with the resin sealing portion (22fb), which is clearly illustrated in FIG. 3, to protect the sensor components, i.e., the sensor components are encapsulated within the accommodation structure by the resin sealing portion. Accordingly, Saito fails to expressly or implicitly disclose the feature that the housing internal cavity includes an unfilled open space above or below the electrical sensor device disposed inside the internal cavity as presently recited in Applicant's amended independent claim 1.

As noted above, Saito discloses a tire-mounted sensor construction comprising sensor components disposed in the accommodation structure that is filled with the resin sealing portion (22fb) for purposes of protecting the sensor components. Accordingly, Saito also necessarily fails to disclose the feature that the housing comprises an opening extending from an outer surface of the housing to the internal cavity as presently recited in Applicant's amended independent claim 41, which is not surprising given the intent and purpose of Saito to have a resin filled accommodation structure (22f), i.e., the feature of an opening in the housing would be inconsistent and incompatible with the resin filled housing of Saito.

For a reference to properly anticipate the subject matter of a claim the reference must disclose each and every feature recited in such claim. For all of the reasons presented above, Applicant submits that Saito fails to disclose each and every one of the features presently recited in amended independent claims 1, 28, and 41, and for this reason Applicant submits that its sensor apparatus and system as recited in such amended independent claims is properly novel and not anticipated by Saito. In view thereof, Applicant respectfully requests that the rejection of amended independent claims 1, 28, and 41 (and any rejected claims depending respectively

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therefrom) under 35 U.S.C. §102 based on Saito be reconsidered and withdrawn.

IV. Rejection of Claims Under Section 103 Based on Saito and Brusarosco

Claims 2, 5, 9, 32, 33, and 50 have been rejected under 35 U.S.C. §103 as being allegedly unpatentable over Saito in view of Brusarosco (US Pub 2018/018620). Applicant has amended independent claims 1, 28, and 41 as described above in Section IV, and submits that Saito fails to disclose or remotely suggest the features of recited in such claims for the same reasons presented in Section III,

Brusarosco discloses a method for installing a monitoring device in a tire and is relied on by the Examiner to allegedly disclose features admittedly not disclosed in Saito such as display features or indicia on the housing outer surface, and the existence of an open space in the housing internal cavity above and/or below the electrical sensor device.

With respect to amended independent claim 1, Applicant submits that Saito (for the reasons presented above in Section III) necessarily fails to disclose the feature of the housing internal cavity including an unfilled open space above or below the electrical sensor device disposed inside the internal cavity as this is contrary to the fundamental structure of Saito comprising a resin-filled housing for the purpose of protecting the sensor components. Applicant submits that any modification of Saito to include any unfilled open space in the housing of Saito based on Brusarosco would frustrate the purpose and intent of Saito and its resin-filled housing to protect the sensor components. Thus, Applicant respectfully submits that the combination of the Saito with Brusarosco for the purpose described above is improper as such combination would result in a bizarre situation where any unfilled open space in the accommodation structure of Saito would be contrary to the purpose and intent of Saito and thus frustrate the purpose of Saito's sensor construction that is intentionally filled with resin to protect the sensor components.

MPEP § 2143.01(V) states "[i]f proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)" (emphasis added). "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)" (emphasis added). Thus, for all the reasons

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presented above, the Examiner's combination of Brusarosco with Saito (to modify Saito to have an unfilled open space) frustrates Saito's principal of operation and is thereby improper.

With respect to amended independent claim 28, Applicant submits that neither Saito (for the reasons presented above in Section IV) nor Brusarosco taken alone or in combination disclose or suggest the feature presently recited in such claim of the housing comprising one or more surface features configured to contact the electrical sensor device to prevent movement of the electrical sensor device within the housing internal cavity.

With respect to amended independent claim 41, Applicant submits that Saito (for the reasons presented above in Section III) necessarily fails to disclose the feature of the housing having an opening extending from an outer surface of the housing to the internal cavity as this is contrary to and inconstant with the fundamental structure of Saito comprising a resin-filled housing for the purpose of protecting the sensor components, i.e., where any such opening would serve no purpose and be inconsistent as used with a resin-filled housing. Applicant submits that any modification of Saito to include any opening in the housing of Saito to inside the housing based on Brusarosco would serve no purpose in Saito. In fact, any such opening extending into the housing would operate to frustrate the purpose and intent of Saito and its resin-filled housing to protect the sensor components. Thus, Applicant respectfully submits that the combination of the Saito with Brusarosco for the purpose described above is improper as such combination would result in a bizarre situation where any opening in the housing to inside the housing would be contrary to the purpose and intent of Saito and thus frustrate the purpose of Saito's sensor construction that is intentionally filled with resin to protect the sensor components. Accordingly, for the same reasons presented above with respect to independent claim 1, Applicant submits that the combination of Saito and Brusarosco frustrates Saito's principal of operation and is thereby improper.

For all of the reasons presented above, Applicant submits that one having ordinary skill in the art taking Saito and Brusarosco in combination (as such combination is improper) would not find motivation or suggestion to make Applicant's sensor assembly and/or system comprising the above-described features recited in amended independent claims 1, 28, and 41. In view thereof, Applicant submits that the subject matter recited in amended independent claims 1, 28, and 41 is properly patentable and nonobvious over the combination of Saito and Brusarosco, and respectfully requests that the rejection of the above-noted claims (depending

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from respective amended independent claims 1, 28, and 41) under 35 U.S.C. §103 based on the combination of Saito and Brusarosco be reconsidered and withdrawn.

V. Rejection of Claims Under Section 103 Based on Saito and Laird

Claim 10 has been rejected under 35 U.S.C. §103 as being allegedly unpatentable over Saito in view of Laird (US Pub 2011/025487). Applicant has amended independent claim 1 in the manner described above in Section III, and submits that Saito fails to disclose or remotely suggest the features of such claim for the same reasons presented in Section II.

Laird discloses a tire pressure sensor and is relied on by the Examiner to allegedly disclose a housing having an opening through an outside surface to a cavity, which feature is admittedly not disclosed by Saito. For the same reasons presented above in Section IV, Applicant submits that the combination of Saito with Laird would be inconstant with use of the resin-filled housing of Saito that is intentionally provided for the purpose of protecting the sensor components inside the housing. Thus, any such proposed modification of Saito based on Lin would operate to frustrate the intent and principal of operation of Saito and is improper as explained above in Section IV. In view thereof, Applicant submits that claim 10 is properly patentable and nonobvious over the combination of Saito and Laird, and respectfully requests that the rejection of claim 10 under 35 U.S.C. §103 based on the combination of Saito and Laird be reconsidered and withdrawn.

VI. Rejection of Claims Under Section 103 Based on Saito and Lin

Claims 16 to 18, 37 to 39, and 55 to 57 have been rejected under 35 U.S.C. §103 as being allegedly unpatentable over Saito in view of Lin (US Pub 2019/0187027). Applicant has amended independent claims 1, 28, and 41 in the manner described above in Section III, and submits that Saito fails to disclose or remotely suggest the features of such amended independent claims for the same reasons presented in Section III.

Lin discloses a tire sensor system and is relied on by the Examiner to allegedly disclose an electrical sensor device comprising a global positioning device, which feature is admittedly not disclosed in Saito. However, like Saito, Lin also fails to disclose a sensor assembly or system comprising the features presently recited in each of amended independent claims 1, 28, and 41 as explained above in Section III. Further, Applicant submits that any proposed

combination of Lin to modify Saito to include features recited in such amended independent claims would frustrate the principal of operation of Saito for the same reasons explained above in Section IV.

In view of the above, Applicant submits that one skilled in the art taking Saito and Lin in combination would not find motivation or suggestion to make Applicant's sensor assembly and system comprising the features presently recited in amended independent claims 1, 28, and 41, which features are missing in both references. For all of these reasons, Applicant submits that its sensor assembly and system as recited in amended independent claims 1, 28, and 41 is properly patentable and nonobvious over the combination of Saito and Lin, and respectfully requests that the rejection of the above-noted claims (depending from respective amended independent claims 1, 28, and 41) under 35 U.S.C. §103 based on the combination of Saito and Lin be reconsidered and withdrawn.

VII. Allowable Subject Matter

Claim 30 has been identified by the Examiner as being allowable if rewritten into independent form. Applicant acknowledged with appreciation the Examiner's noted allowability of claim 30 and has rewritten claim 30 to recite the features of independent claim 28 to thereby place claim 30 into independent form. In view thereof, Applicant submits that amended claim 30 is in proper allowable form and hereby accepts the same.

VIII. Conclusion and Examiner Interview Request

For all of the reasons presented above, Applicant respectfully requests that the claim rejections under 35 U.S.C. §§§ 112, 102 and 103, and on the grounds of nonstatutory double patenting, all be reconsidered and withdrawn, and that the claims pending in this patent application be passed to allowance along with claim 30.

In the event that the Examiner, after evaluating Applicant's response, believes that the claims as presented therein are not in proper condition for allowance, Applicant respectfully requests that the Examiner please contact its below-designated patent attorney for the purposes of discussing the same in the spirit of most efficiently advancing this patent application to allowance.

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The Commissioner is hereby authorized to charge any fees, which may be required, or credit any overpayment, to Deposit Account No. 19-2814.

Respectfully submitted,

Date: May 23, 2023

/ Grant T. Langton/

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/084,483	Filing Date 10/29/2020	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $240 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	05/22/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 57	Minus	** 57	= 0		x $40 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 3	= 1		x $192 =	192
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	192

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/JERMAINE D MINOR/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

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

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

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20210370726	A1	2021-12-02	Dodani et al.	

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

FOREIGN PATENT DOCUMENTS Remove

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

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

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Revvo v. Cerebrum
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2855
	Examiner Name	Jenkins, Jermaine L.
	Attorney Docket Number	90608.01000

	1	Non-Final Office Action dated August 15, 2022 in corresponding U.S. Application No. 16/671,105 filed October 31, 2019; total 23 pages.
	2	Notice of Allowance dated April 11, 2023 in corresponding U.S. Application No. 16/671,105 filed October 31, 2019; total 9 pages.

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Revvo's Exhibit 1002
Revvo v. Cerebrum
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	90608.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-04-25
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

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UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

125632 7590 04/11/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

EXAMINER	
ALLEN, ANDRE J	
ART UNIT	PAPER NUMBER
2855	

DATE MAILED: 04/11/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/671,105	10/31/2019	Keith George Ferry	67838.00700	2653

TITLE OF INVENTION: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	07/11/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

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

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

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

Revvo's Exhibit 1002
Revvo v. Cerebrum
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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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

125632 7590 04/11/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

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

Certificate of Mailing or Transmission

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

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/671,105	10/31/2019	Keith George Ferry	67838.00700	2653

TITLE OF INVENTION: SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	07/11/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
ALLEN, ANDRE J	2855	342-357520

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

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

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

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

1 _____
2 _____
3 _____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

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

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via Patent Center or EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Revvo's Exhibit 1002
Revvo v. Cerebrum
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/671,105	10/31/2019	Keith George Ferry	67838.00700	2653

125632 7590 04/11/2023

Snell & Wilmer (LA)
1 East Washington Street
Suite 2700
Phoenix, AZ 85004

EXAMINER	
ALLEN, ANDRE J	
ART UNIT	PAPER NUMBER
2855	

DATE MAILED: 04/11/2023

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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

PTOL-85 (Rev. 02/11)

Revvo's Exhibit 1002
Revvo v. Cerebrum
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OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

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

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

Notice of Allowability	Application No. 16/671,105	Applicant(s) Ferry, Keith George	
	Examiner ANDRE J ALLEN	Art Unit 2855	AIA (FITF) Status Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to the amndts. / req. for reconsideration filed 3-28-2023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-55 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

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

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/ANDRE J ALLEN/
Primary Examiner, Art Unit 2855

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 281

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

2. Acknowledgment is made of the timely response to the 8-15-2022 non-final rejection, filed 3-28-2023.

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on 3-28-2023 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Response to Amendment

4. Acknowledgement is made of the amendment(s) to claims 1-3, 5, 10, 22, 25, 29, 39, 41 and the addition of new claim 55 in the timely filed request for reconsideration.

Allowable Subject Matter

5. Claims 1-55 are allowed.

The following is an examiner's statement of reasons for allowance:

The allowable subject matter is stated in the 3-28-2023 argument(s) wherein the prior art does not explicitly or inherently teach the structural limitations of the invention. Since the previous O.A. clearly points out the reason for rejection and the Applicant's reply explicitly presents why the claims are patentable over the reference, the reasons for allowance are in all probability evident from the record and no statement should be necessary when no prior art was found upon further search.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 20210370726 A1 Method for installing and securing tire sensor dock to inner surface of pneumatic tire of vehicle, involves applying base to inner liner of tire to cross-link underside of base with inner liner, when tire sensor dock is permanently affixed to inner surface of tire

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDRE J ALLEN whose telephone number is (571)272-2174. The examiner can normally be reached Mon-Fri. 9am-5PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Macchiarolo can be reached on (571)272-2375. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at

866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service

Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ANDRE J ALLEN/
Primary Examiner, Art Unit 2855

Electronic Patent Application Fee Transmittal

Application Number:	17084483
Filing Date:	29-Oct-2020
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Filer:	Grant T. Langton/Lauren Coyle
Attorney Docket Number:	90608.01000

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	104	104
		Total in USD ($)		**104**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/671,105	10/31/2019	Keith George Ferry	67838.00700	2653

125632 7590 08/15/2022

Snell & Wilmer (LA)
400 East Van Buren Street
One Arizona Center
Phoenix, AZ 85004

EXAMINER	
ALLEN, ANDRE J	

ART UNIT	PAPER NUMBER
2856	

NOTIFICATION DATE	DELIVERY MODE
08/15/2022	ELECTRONIC

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

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

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

IPLADOCKET@swlaw.com
glangton@swlaw.com
lcoyle@swlaw.com

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Office Action Summary	Application No. 16/671,105	Applicant(s) Ferry, Keith George	
	Examiner ANDRE J ALLEN	Art Unit 2856	AIA (FITF) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☑ Responsive to communication(s) filed on 10-31-2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

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

Disposition of Claims*

5) ☑ Claim(s) 1-54 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-13 and 16-54 is/are rejected.

8) ☑ Claim(s) 14-15 is/are objected to.

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

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

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

11)☑ The drawing(s) filed on 3-18-2020 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

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

4) ☐ Other: _____.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 289

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Information Disclosure Statement

2. The information disclosure statement(s) (IDS) submitted on 8-4-2021 & 5-7-2021 are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Objections

3. Claims 3 & 22 is objected to because of the following informalities:

Regarding claim 3 lines 6-7 the recitation “or integral” appears to be a typo.

Appropriate correction is required.

Claim 22 includes an additional (two separate claims) “claim 23” beginning in line 2.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 12-15, 48 and 51 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Regarding claims 12-13, 15, 22, 31, 34, 48 and 51 the recitation(s) with respect to an accelerometer and / or accelerometer sensor data sensor data.", is deemed non-enabling. The applicant has not provided support in the specification with respect to usage of an accelerometer.

Regarding claims 14, 33 and 50 the recitation "a specific rotational speed" is deemed non-enabling. The applicant has not provided support in the specification with respect to detecting and / or monitoring rotational speed

5. The following is a quotation of 35 U.S.C. 112(b):

(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 3 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

Regarding claim 3 the recitation “the top cover, wall structure and base section may be formed from the same or different materials,” is deemed ambiguous and overly broad. With emphasis on the phrase “may be formed” this is a relative phrase and does not clearly define the claimed wall structure. Furthermore, the recitation raises the question as to whether the wall structure is formed from same / different materials or not?

Claim Rejections - 35 USC § 102

6. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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

Claim(s) 1,3, 4-8, 11-13, 20, 22-23, 25-28, 31, 32 and 45 is/are rejected under 35 U.S.C. 102(a)(1) as being anticipated by SAITO (US 2019/0184773 A1).

Regarding claims 1,23, 25 & 27 Saito a housing 2 22 comprising an outer surface and an internal cavity (fig. 3) that is enclosed [0045]-[0044] within the housing 2 22 ; an electrical sensor device 2 that is disposed within the internal cavity [0023]-[0040][0050] attached therein to prevent movement (via 22f) [claim 1][abstract]of the device within the internal cavity [0046], wherein the electrical sensor device 2 22 is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with a vulcanized rubber article [0031]-[0041]; and a retaining member 22f that is configured to accommodate attachment of the housing therewith, wherein the retaining member 22f [0041] has an outside surface configured for attachment with the vulcanized rubber article [0041]-[0051].

Regarding claim 3 Saito teaches the housing comprises a top cover, a wall structure, and a base section (fig. 3-4) that define the internal cavity, and wherein the top cover, wall structure and base section may be formed from the same or different materials, and wherein one or more of

the top cover, wall section, and base section may separate or integral with one another [0047]-[0051] (figs.3-4, 7-9).

Regarding claim 4 Saito teaches wherein one of the top cover 22fa or base section is removably attached (fig. 3) with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity [0047]-[0060](figs. 3-4, 7-9).

Regarding claim 6 Saito teaches the electrical sensor device 2 22 is encapsulated by the inner cavity of the housing 2 22 during a process of making the housing 2 22 that operates to retain the position of the electrical sensor device 2 22 within the housing (figs. 3-4, 7-9).

Regarding claim 7 Saito teaches the housing 2 22 and retaining member 22f are configured having a complementary shape (figs. 3-4, 7-9) to facilitate attachment of the housing 2 22 with the retaining member 22f (figs. 3-4, 7-9).

Regarding claim 8 Saito teaches the housing 2 22 comprises a wall structure [0020-]0030] (figs. 3-4, 7-9) that surrounds the internal cavity, and wherein the retaining member 22f comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith (figs. 3-4, 7-9).

Regarding claims 11 & 25, Saito discloses the sensing system comprises a receiver 3 that is external from the object and that is configured to receive data from the electrical sensor 2 22 device by wireless communication (Abstract)[(0022]- [0035].

Regarding claims 12,13,26, 32, and 45 Saito teaches the electrical sensor device comprises accelerometer 22aa sensor that determines tread depth connected therewith and is configured to send data from the accelerometer sensor 22aa wirelessly to the external receiver (Abstract) [(0030]-[0040].

Regarding claims 20 and 25 Saito teaches the electrical sensor device (para [0024]- a sensor device 22) comprises: a printed circuit board (22b) comprising electrical circuitry (para [0029]-[0030], [0037]- The circuit board 22b is a board on which the sensor chip 22a, peripheral elements (not shown), and the like are mounted, and is configured by a printed circuit board or the like on which the circuit pattern is formed); a portable power source for providing power to the electrical sensor device (para [0029]- a battery 22c corresponding to a power supply); a least one sensor element (para (0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa); and an antenna for receiving and/or transmitting information from the electrical sensor device (para (0035]- the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit).

Regarding claims 22 & 31 Saito teaches the electrical sensor device comprises one or both of an accelerometer sensor and a global positioning device (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa).

Regarding claim 23, Saito teaches the sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object (para [0031]- the acceleration sensor 22aa is disposed to detect an acceleration in accordance with the ground state of the corresponding tire 71a to 71d).

Regarding claim 28 Saito teaches one of the top cover or the bottom section are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity (figs 3-4, 7-9).

Claim Rejections - 35 USC § 103

7. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim(s) 2, 5 ,9, 32, 33 and 50 is/are rejected under 35 U.S.C. 103 as being unpatentable over SAITO (US 2019/0184773 A1) in view of BRUSAROSCO (US 2011/0186200).

Regarding claim 2, SAITO discloses the sensor assembly as recited in claim 1, SAITO does not disclose wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member. BRUSAROSCO is drawn to tire monitoring device, discloses, wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member (para [0172], para [0194]- graphical signs 67 are predisposed on the top of the hooping member 63, such graphical signs 67 allowing a correct orientation of the monitoring device 10 during the fastening operation).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Saito display features or indicia that are viewable to a user to increase the reliability and lifetime of the monitoring device as disclosed in BRUSAROSCO (see BRUSAROSCO, para [001 1)

Regarding claim 5, Saito discloses the sensor assembly as recited in claim 1, wherein the electrical sensor device is attached within the internal cavity by one or more surface features

within the cavity that contact the electrical sensor device to retain its position therein (Fig. 3; para (0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown); para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber. In addition, the dimension of an opening of the second housing 22fab is reduced on the upper surface side). SAITO does not disclose wherein there is open space above and below the electrical sensor device within the internal cavity. BRUSAROSCO discloses wherein there is open space above and below the electrical sensor device within the internal cavity (Fig. 2d; para [0127]-[0128}- the housing cavity has size such to ensure the formation of at least one interspace between the outer surface of the electronic unit 20 (in particular the containment body 26 thereof) and the inner walls of said connecting member 30 defining said housing cavity).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Saito open space above and below the electrical sensor device within the internal cavity to increase the reliability and lifetime of the monitoring device as disclosed in BRUSAROSCO (see BRUSAROSCO, para [0011)).

Regarding claim 9, SAITO discloses the sensor assembly as recited in claim 1, wherein the retaining member is formed from an elastically deformable rubber (para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028)- The holding portion 21b is also made of an elastically deformable rubber or the like), when the retaining member is attached to the object and the housing is attached to the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor

holding member, and a sensor device 22; para [0027]-[0028]- The holding portion 21b is formed of, for example, a cylindrical member having a hollow portion into which the sensor device 22 is fitted). SAITO does not disclose an elastomeric material that mitigates transmission of shock forces from the object to the housing. However, BRUSAROSCO discloses an elastomeric material that mitigates transmission of shock forces from the object to the housing (para [0010)- describe monitoring devices equipped with particular members for connecting to the tyre, such connecting members provided with a cavity inside of which the electronic unit is housed; para [0011]- The Applicant found that the presence of two portions separated from each other allows distributing and dampening in a particularly effective manner the deformations caused by the stresses transmitted to the deformation member by the tyre during rolling (also at high and very high speed); para [0125]- Preferably the connecting member 30 is made of elastomeric material).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of SAITO an elastomeric material that mitigates transmission of shock forces from the object to the housing to increase the reliability and lifetime of the monitoring device as disclosed in BRUSAROSCO (see BRUSAROSCO, para (001)

Regarding claim 32, SAITO discloses the sensor assembly and sensing system as recited in claim 28. SAITo does not disclose wherein open space exists above and below the electrical sensor device when disposed within the internal cavity. However, BRUSAROSCO discloses wherein open space exists above and below the electrical sensor device when disposed within the internal cavity (para [0128]- the housing cavity has size such to ensure the formation of at least one interspace between the outer surface of the electronic unit 20 (in particular the containment

body 26 thereof) and the inner walls of said connecting member 30 defining said housing cavity).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of SAITO open space above and below the electrical sensor device within the internal cavity to increase the reliability and lifetime of the monitoring device as disclosed in BRUSAROSCO (see BRUSAROSCO para 0011)

Regarding claim 33, SAITO discloses the sensor assembly and sensing system as recited in claim 28, wherein the retaining member is formed from an elastically deformable rubber (para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- The holding portion 21b is also made of an elastically deformable rubber or the like), the housing attached with the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22; para [0028]- The holding portion 21b is formed of, for example, a cylindrical member having a hollow portion into which the sensor device 22 is fitted). SAITO does not disclose an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching. However, BRUSAROSCO discloses an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching (para porter describe monitoring devices equipped with particular members tor connecting to the tyre, such connecting members provided with a cavity inside of which the electronic unit is housed; para {0011]- The Applicant found that the presence of two portions separated from each other allows distributing and dampening in a particularly effective manner the deformations caused by the stresses transmitted to the deformation member by the tyre

during rolling (also at high and very high speed); para {0125]- Preferably the connecting member 30 is made of elastomeric material).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Saito an elastomeric material that mitigates transmission of shock forces from the object when attached to the object before reaching to increase the reliability and lifetime of the monitoring device as disclosed in BRUSAROSCO (see BRUSAROSCO, para (001 1]).

8. Claim(s) 10 is/are rejected under 35 U.S.C. 103 as being unpatentable over SAITO (US 2019/0184773 A1) in view of Laird et al (US 2011/025487).

Regarding claim 10 Saito does not disclose wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device. Laird teaches a tire pressure sensor that discloses, wherein the housing includes an opening through the outside surface to the internal cavity [0004] some tire pressure sensors have a housing for encasing the sensor electronic components and circuitry. An opening is provided in the housing), and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device (para [0004] some tire pressure sensors have a housing for encasing the sensor electronic components and circuitry. An opening is provided in the housing, and a filter covers the opening. The filter permits only gases (e.g. the tire's pressurized air), and not liquids).

It would have been obvious to a person of ordinary skill in the art before the effective filing date of the claimed invention to dispose sensor assembly of Saito with a housing that includes an opening through the outside surface to the internal cavity, and a filter that is positioned to filter air passing into the internal cavity as taught by Lin et al for the purpose of preventing damage to the sensor electronic components and circuitry in the housing.

9. Claim(s) 16-17, 35, 36 and 52 is/are rejected under 35 U.S.C. 103 as being unpatentable over SAITO (US 2019/0184773 A1) in view of Lin et al (US 2019/0187027).

Regarding claims 16-17 & 35 , Saito does not disclose wherein the electrical sensor device comprises a global positioning device. However, Lin et discloses an electrical sensor device comprises a global positioning device [0039]-[0050].

It would have been obvious to a person of ordinary skill in the art before the effective filing date of the claimed invention to dispose the sensor assembly of Saito with a global positioning device as taught by Lin for the purpose of reducing cost and complexity as disclosed in Lin et al.

10. Claim(s) 18,19, 29, 32, 37-39, 40, 41,47 and 53-54 is/are rejected under 35 U.S.C. 103 as being unpatentable over SAITO (US 2019/0184773 A1) in view of ATSUMI et al (US 2016/0332493).

Regarding claims 18,19,37 and 38 Saito does not disclose the electrical sensor device comprises a gyroscope used to determine one or more of tire alignment, tire

orientation, and a tread depth of the tire . However, Atsumi et al teaches a semiconductor device wherein the electrical sensor device comprises a gyroscope [0095].

It would have been obvious to a person of ordinary skill in the art before the effective filing date of the claimed invention to dispose sensor assembly of Saito with a gyroscope to provide a moving object with a high degree of safety.

Regarding claim 26 Saito does not disclose comprising an external transmitter for sending information wirelessly to the electronic sensor device. However, Atsumi et al discloses an external transmitter for sending information wirelessly to the electronic sensor device (para (0078)]- the semiconductor device 400 preferably includes an antenna 401 and sensor elements 412 to 414; para (0083]- The antenna 401 is capable of converting a wireless signal into an electric signal or converting an electric signal into a wireless signal to receive and transmit a signal from/to an external terminal such as an interrogator).

It would have been obvious to a person of ordinary skill in the art before the effective filing date of the claimed invention to dispose sensor assembly of Saito an external transmitter for sending information wirelessly to the electronic sensor device to provide a moving object with a high degree of safety as disclosed in Atsumi (see Atsumi , para [0007)).

Regarding claim 39, Saito discloses the sensor assembly and sensing system as recited in claim 28. Saito does not disclose wherein the electrical sensor device comprises a gyroscope. However, Atsumi et al discloses wherein the electrical sensor device comprises a gyroscope (para [0095}- The sensor element can include any of various sensors...a gyro sensor; para [(0107]- Examples of an object having a sealed space include a tire).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Saito a gyroscope to provide a moving object with a high degree of safety as disclosed in Atsumi (see Atsumi , para [0007]).

Regarding claim 40, Saito in view of Atsumi discloses the sensing system as recited in claim 39, Saito further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and information is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth (para (0031]-[0045] More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]-[0050] when the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). Atsumi discloses information from the gyroscope (para [(0095]- The sensor element can include any of various sensors...a gyro sensor; para [0082]- the semiconductor device 400 includes three sensors, the sensor elements 412 to 414. For example, the sensor elements 412 to 414 can each include a sensor selected from a pressure sensor, a temperature sensor, a strain sensor, an acceleration sensor, and the like. One sensor element can have a plurality of functions).

Regarding claim 41, Saito discloses a method for using a sensor assembly and sensing system with an object that rotates in use (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire; para [(0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22) comprising the steps of: installing an electrical sensor device within an internal cavity of a housing (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown)), wherein the housing includes an outer structure that defines the internal cavity (Fig. 3; para [0045]- The housing 22fa is formed of the hollow member that provides the accommodation chamber inside; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab), and wherein the electrical sensor device comprises a sensor (22aa), a portable power source (22c), an antenna (22d), a printed circuit board (22b), and related electrical circuitry (para [0029]-[0030}- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa; para [0029]- a battery 22c corresponding to a power supply; para [0035)- the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0037]- The circuit board 22b is a board on which the sensor chip 22a, peripheral elements (not shown), and the like are mounted, and is configured by a printed circuit board or the like on which the circuit pattern is formed); attaching the housing after the step of installing to a retaining member (Fig. 3; para [0026}- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027}- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like, and the holding portion 21b extends from the other surface of the bottom portion 21a opposite to the one surface to be adhered to the corresponding tire 71a to 71d), wherein the retaining member is configured to

accommodate attachment with the housing by mechanical or bonding technique (para [0027}- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like), wherein the retaining member is connected with the object before or after formation of the object (para [0027}- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like); and monitoring an operating parameter of the object through the use of the electrical sensing device (para [0031]- the acceleration sensor 22aa is disposed to detect an acceleration in accordance with the ground state of the corresponding tire 71a to 71d; para (0091]), wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly (para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0091)).

11. Claim(s) 24, 27, & 44-46, 48-49 is/are rejected under 35 U.S.C. 103 as being unpatentable over SAITO (US 2019/0184773 A1) in view of So et al (US 2019/0160895).

Regarding claim 24, Saito discloses the object is a vehicle tire (para [0023}- The tire- mounted sensor 2 is a tire side device provided on a tire), and wherein the retaining member is attached to an inside surface of the vehicle tire or an element attached with the tire that rotates with the tire(para (0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner

wall surface of the corresponding tire 71a to 71d; para [0027]). Saito does not disclose vulcanized rubber tire. However, So et al, drawn to container structure for sensors, discloses, a vulcanized rubber tire (para [0107]- a method of manufacturing a tire-integrated container structure according to an embodiment can perform a step of preparing a vulcanized tire (S110)).

It would have been obvious to a person of ordinary skill in the art before the effective filing date of the claimed invention at the time of the invention to dispose sensor the assembly of Saito into a vulcanized rubber tire as taught by So et al for the purpose of preventing breakdown of a sensor due to high temperature.

Regarding claim 27, Saito in view of So et al discloses the sensor assembly as recited in claim 24, Saito further discloses wherein the retaining member is attached to the inside surface of the vehicle tire by an adhesive layer (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027}- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like). So et al discloses after the vehicle tire has been vulcanized (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130)).

Regarding claim 44 Saito does not disclose wherein the object is a made from vulcanized rubber, and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object after the object has been formed. However, So et discloses wherein the object is a made from vulcanized rubber (para [0107]- a method of manufacturing a tire-integrated container structure according to an embodiment can perform a step of preparing a

vulcanized tire (S110)), and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object after the object has been formed (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130)).

It would have been obvious to a person of ordinary skill in the art before the effective filing date of the claimed invention at the time of the invention to dispose the sensor assembly of Saito with an object made from vulcanized rubber as taught y So et al for the purpose of preventing breakdown of a sensor due to high temperature as disclosed in Hankook (see Hankook, para [0010]).

Regarding claim 45, Saito in view of So et al discloses the method as recited in claim 44, Saitofurther discloses wherein the retaining member is attached to a surface of the object by use of an adhesive layer (para (0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Regarding claim 46, Saito in view of So et al discloses the method as recited in claim 45, Saito further discloses wherein the retaining member is attached to the object after the step of attaching the housing to the retaining member (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0050}- The tire-mounted sensor 2 configured as described above is provided by, for example, pushing out the hollow portion of the rubber bracket 21 by elastic deformation and disposing the sensor device 22 in a space surrounded by the rubber bracket 21. Then, in this state, the adhesive 23 is applied to the back surface of the bottom portion 21a of the rubber

bracket 21, and the tire-mounted sensor 2 is attached to the inner wall surface of the corresponding tire 71a to 71d).

Regarding claim 48, Saito in view of So et al discloses the method as recited in claim 44, Saito further discloses wherein the object is a vehicle tire (para (0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein the retaining member is attached to a surface that is inside of the vehicle tire (para (0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANDRE J ALLEN whose telephone number is (571)272-2174. The examiner can normally be reached Mon-Fri. 9am-5PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Macchiarolo can be reached on (571) 272-2375. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/ANDRE J ALLEN/
Primary Examiner, Art Unit 2856

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Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
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Warnings:					
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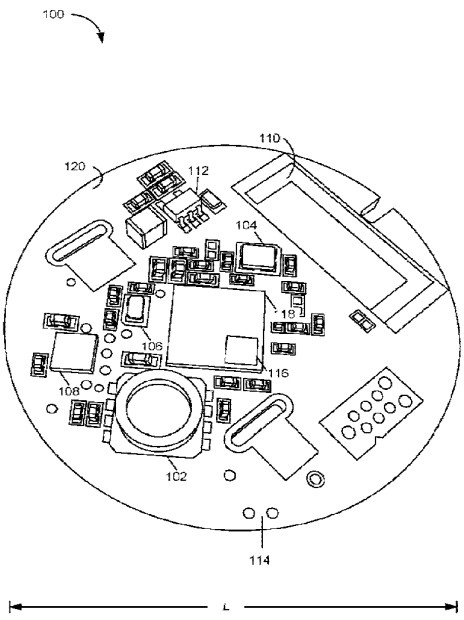

FIG. 1

(57) **Abstract:** A tire sensor device for monitoring a condition of a tire includes a plurality of sensors including a temperature sensor and an accelerometer. The tire sensing device further includes memory configured to store data received by the plurality of sensors and one or more processors coupled with the memory. The one or more processors are configured to perform one or more initial processing operations on the data received by the plurality of sensors. The tire sensor device further includes an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices.

WO 2020/036859 A1

TIRE SENSOR DEVICE

RELATED APPLICATIONS

[0001] The application claims priority to U.S. Provisional Application No. 62/717,887, filed August 12, 2018, and titled, "Sensor Module and System for Determining Driving Conditions and Tire Degradation," which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The disclosed embodiments relate generally to a tire sensor device for determining driving conditions and tire degradation, and more specifically to a tire sensor device adapted to be disposed on the inner surface of a tire tread.

BACKGROUND

[0003] Tire wear and maintenance are critical aspects of vehicle safety. As the tire is worn, driver safety and performance are compromised.

[0004] However, tire tread wear has generally been a subjective measurement performed by professionals associated with the tire-installation process. One technology for monitoring a tire is the tire pressure monitoring sensor (TPMS). TPMS was developed to monitor the pressure in a tire and alert the driver of the vehicle to below-standard pressure.

SUMMARY

[0005] The present disclosure provides a tire sensor device for monitoring a condition of a tire. The tire sensor device includes a plurality of sensors including, optionally, a microphone, a temperature sensor, and an accelerometer. The tire sensor device further includes memory configured to store data (e.g., measurements) received by the plurality of sensors. The tire sensor device further includes a microprocessor coupled with the memory. The microprocessor is configured to perform one or more initial processing operations on the data received by the plurality of sensors. The one or more initial processing operations include determining one or more tire characteristics using data from the plurality of sensors acquired at a frequency greater than a frequency of rotation of the tire. The tire sensor device

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further includes an antenna, coupled with the microprocessor, configured to wirelessly communicate with one or more external devices (note, however, that the antenna may be separate from and communicatively coupled with the tire sensor device). The tire sensor device has dimensions less than 5 cm x 5 cm x 2 cm.

[0006] Further, the present disclosure provides another tire sensor device for monitoring a condition of a tire. The tire sensor device includes a plurality of sensors including, optionally, a microphone, a temperature sensor, and an accelerometer. The tire sensor device further includes memory configured to store data received by the plurality of sensors. The tire sensor device further includes one or more processors coupled with the memory. The one or more processors are configured to perform one or more initial processing operations on the data received by the plurality of sensors. The tire sensor device further includes an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices (note, however, that the antenna may be separate from and communicatively coupled with the tire sensor device).

[0007] Further, the present disclosure provides a method of alerting a user to changes in tire characteristics. The method includes receiving data from a plurality of sensors disposed within a tire. The plurality of sensors include, optionally, a microphone, a temperature sensor, and an accelerometer. The data from the plurality of sensors are acquired at a frequency greater than a frequency of rotation of the tire. The method includes determining one or more characteristics of the tire using the data from the plurality of sensors acquired at a frequency greater than a frequency of rotation of the tire, the one or more characteristics of the tire selected from the group consisting of: a wheel misalignment; a slow leak; a puncture; rubber decay; low tread depth; excessive load; and a mileage limit exceeded. The method further includes providing a user alert indicating the one or more characteristics of the tire.

[0008] Further, the present disclosure provides a method of monitoring tire conditions for a plurality of vehicles (e.g., a fleet of vehicles). The method includes receiving information from the plurality of vehicles indicating presence or absence of a plurality of tire conditions, including one or more tire conditions selected from the group consisting of: wheel misalignment; a slow leak; a puncture; rubber decay; low tread depth; excessive load; and a

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mileage limit exceeded. The method further includes displaying a dashboard summary of the one or more tire conditions for the plurality of vehicles.

[0009] Further, some embodiments provide a computer system that includes one or more processors, memory, and optionally a display. The memory (e.g., a non-transitory computer-readable storage medium) stores instructions for execution by the one or more processors, including instructions for performing any of the methods described herein.

[0010] Further, some embodiments provide a non-transitory computer readable storage medium storing instructions, which, when executed by a computer system that includes one or more processors and optionally a display, causes the computer system to perform any of the methods described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The embodiments disclosed herein are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings. Like reference numerals refer to corresponding parts throughout the drawings and specification.

[0012] FIG. 1 is an illustration of a sensor board of a tire sensor device, in accordance with some embodiments.

[0013] FIGS. 2A-2B illustrate a tire sensor device disposed on an inner surface of a tire opposite a tread, in accordance with some embodiments.

[0014] FIG. 3 is a block diagram illustrating a tire monitoring system, in accordance with some embodiments.

[0015] FIG. 4A is a block diagram illustrating a tire monitoring server, in accordance with some embodiments.

[0016] FIG. 4B is a block diagram illustrating a client device, in accordance with some embodiments.

[0017] FIGS. 5A-5C illustrate example user interfaces for providing information (e.g., user alerts) about tire characteristics and/or tire conditions for one or more vehicles, in accordance with some embodiments.

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[0018] FIG. 6 illustrates an example of a user interface that includes a dashboard summary of tire characteristics and/or tire conditions for a plurality of vehicles (e.g., a fleet of vehicles), in accordance with some embodiments.

[0019] FIGS. 7A-7C are schematic diagrams of antennas for use in a tire sensor device, in accordance with some embodiments.

[0020] FIG. 8 illustrates schematic diagrams of additional embodiments of antennas for use in a tire sensor device, in accordance with some embodiments.

[0021] FIG. 9 is a flow diagram of a method for providing a user alert indicating one or more characteristics of a tire, in accordance with some embodiments.

[0022] FIG. 10 is a flow diagram of a method for providing a dashboard summary of one or more tire conditions for a plurality of vehicles, in accordance with some embodiments.

[0023] FIGS. 11A-11B show a tire sensor dock, in accordance with some embodiments.

DETAILED DESCRIPTION

[0024] Some embodiments of the present disclosure provide a tire sensor device (e.g., a sensor board and/or a packaged) that is adapted to be mounted to a tire without invasive mounting requirements. The tire sensor device includes a plurality of sensors beyond a TPMS, including, optionally, a high-frequency accelerometer, a microphone, and/or a temperature sensor. The tire sensor device is further adapted to capture, measure, and analyze data from the tire using the plurality of sensors. The data may be transmitted to a server, which may analyze the data to quantify and characterize the effects of various external factors. These factors include, but are not limited to, road conditions, driver behavior, and environmental changes. By using a high-frequency accelerometer, for example, characteristics of individual rotations of each tire (e.g., the tires "footprint") can be determined. Tire conditions and degradation, such as rubber decay and/or low tread, can be identified by quantifying, characterizing, and removing the effects of external factors (e.g., road conditions).

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[0025] The present disclosure also provides methods and devices for alerting users to changes in tire conditions and/or providing dashboard summaries of tire conditions for a fleet of vehicles.

[0026] Thus, systems are provided with improved methods for detecting and reporting tire degradation in one or more vehicles. These systems and methods use an unconventional combination of measurement apparatuses (e.g., sensors) to improve safety, performance, and efficiency (e.g., fuel and/or energy economy) of vehicles by improving tire maintenance.

[0027] Reference will now be made to embodiments, examples of which are illustrated in the accompanying drawings. In the following description, numerous specific details are set forth in order to provide an understanding of the various described embodiments. However, it will be apparent to one of ordinary skill in the art that the various described embodiments may be practiced without these specific details. In other instances, well-known methods, procedures, components, circuits, and networks have not been described in detail so as not to unnecessarily obscure aspects of the embodiments.

[0028] FIG. 1 is an illustration of a sensor board 100 of a tire sensor device, in accordance with some embodiments. The sensor board 100 has several components, including but not limited to a pressure sensor 102, a microphone 104, a temperature sensor 106, an accelerometer 108, an antenna 110, a voltage regulator 112, an analog input 114, memory 116, and one or more processors 118. The various sensors are configured to collect data and supply the data to the memory 116 and/or one or more processors 118. In some embodiments, the several components including the various sensors are affixed to a common (i.e., the same) polychlorinated biphenyl (PCB) board 120 (e.g., the various sensors have a fixed position with respect to one another). In some embodiments, the PCB board 120 has printed thereon wires to connect the several components to one another. Note that, in various embodiments, any of the aforementioned sensors may be omitted. For example, in some embodiments, sensor board 100, or a tire sensor device that includes sensor board 100, does not include a microphone, does not includes a temperature sensors, and/or does not include an accelerometer.

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[0029] In some embodiments, any or all of the sensors described herein have a sampling rate sufficient to acquire data (e.g., measurements) at a frequency greater than a frequency of rotation of the tire (e.g., at a predefined speed and for a predefined tire size and/or circumference). For example, in some embodiments, the tire sensor device is adapted to operate (e.g., acquire multiple samples per wheel rotation from one or more of the sensors or each of the sensors) at speeds up to 120 miles per hour (mph) in a P215/60R16 tire.

[0030] In some embodiments, sensor board 100 has a characteristic length L (e.g., a maximum length in any particular direction) that is less than 5 centimeters (cm). For example, in some embodiments, sensor board 100 has a diameter that is approximately 3.4 cm.

[0031] In some embodiments, the pressure sensor 102 is adapted to capture and/or measure the pressure of a tire to which the sensor board 100 is affixed. For example, the pressure sensor 102 may be part number MS580305BA01-00 (MS5803-05BA), manufactured by TE CONNECTIVITY.

[0032] In some embodiments, the microphone 104 is adapted to capture changes in frequency, for example, as the tire is driven on a road surface. For example, the microphone 104 may be part number ICS-41350, manufactured by INVENSENSE.

[0033] In some embodiments, the temperature sensor 106 is adapted to measure temperature variation within and/or proximate to the tire, for example, as the tire is driven on a road surface. For example, the temperature sensor 106 may be part number TMP102-Q1, manufactured by TEXAS INSTRUMENTS.

[0034] In some embodiments, the accelerometer 108 is adapted to detect and/or measure changes in the motion of the tire, for example, as the tire is driven on a road surface. For example, the accelerometer 108 may be part number ADXL372, manufactured by ANALOG DEVICES. In some embodiments, the accelerometer has a sampling rate of at least 3000 Hertz (Hz) (or 4000 Hz or 5000 Hz). In some embodiments, the accelerometer 108 has a sampling rate of 6400 Hz. In some embodiments, the accelerometer 108 has a sampling rate sufficient to acquire data (e.g., measurements) at a frequency greater than a frequency of rotation of the tire (e.g., at a predefined speed and for a predefined tire size and/or predefined

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circumference). For example, in some embodiments, the tire sensor device is adapted to operate (e.g., acquire multiple samples per wheel rotation) at speeds up to 120 miles per hour (mph) in a P215/60R16 tire.

[0035] In some embodiments, the antenna 110 (e.g., a radio frequency (RF) antenna) is adapted to transmit data from the sensor board. For example, the antenna may be a printed on-board antenna. In some embodiments, the antenna 110 is adapted to communicate in an industrial, scientific and medical (ISM) radio band. In some embodiments, as described in greater detail with reference to FIGS. 7A-7C and FIG. 8, the antenna 110 is adapted to communicate over a plurality of bands (e.g., the antenna 110 is a multi-mode antenna). In some embodiments, the antenna 110 is adapted to communicate over BLUETOOTH (e.g., in a 2.4 GHz band). In some embodiments, antenna 110 is adapted to communicate over a 900 MHz Global System for Mobile Communications (GSM) band. In some embodiments, antenna 110 is adapted to communicate over a 415 MHz ISM band. In some embodiments, antenna 110 is an integral part of the tire sensor devices described herein (e.g., tire sensor device 200, FIG. 2). In some embodiments, an antenna is separate from and communicatively coupled to the tire sensor devices described herein.

[0036] In some embodiments, the voltage regulator 112 is adapted to regulate battery power (e.g., ensures that the antenna 110 receives a consistent voltage within specifications). Regulating the voltage to antenna 110 helps reduce transient noise in the signal sent from the antenna 110, reducing the overall power draw and improving efficiency. For example, the voltage regulator 112 may be part number TPS62740, manufactured by TEXAS INSTRUMENTS.

[0037] In some embodiments, the analog input 114 is adapted to receive inputs from off-board analog sensors such as to connect to data cables in order to download raw data from memory 116.

[0038] In some embodiments, the one or more processors 118 are adapted to analyze data stored in the memory 116 and/or received from one or more of the sensors on the sensor board. In some embodiments, the one or more processors 118 comprise one or more microprocessors (e.g., the microprocessor comprises one or more central processing units

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(CPUs) and/or general processing units (GPUs)). In some embodiments, the one or more processors 118 comprise one or more field programmable gate arrays (FPGAs). In some embodiments, the one or more processors 118 comprise one or more application specific integrated circuits (ASICs). In some embodiments, the one or more processors 118 are embodied as a system-on-chip (SoC) (e.g., part number nRF52832, or a similar part such as nRF52840, manufactured by NORDIC SEMICONDUCTOR). The nRF52832 is an ultra-low power multiprotocol SoC with hardware support on-chip for BLUETOOTH® 5. The nRF52832 may further includes near-field communication (NFC) capabilities.

[0039] In some embodiments, memory 116 is adapted to store data captured and/or generated by one or more sensors on the sensor board 100. In some embodiments, memory 116 includes high-speed random access memory, such as DRAM, SRAM, DDR RAM, or other random access solid-state memory devices; and may include non-volatile memory, such as one or more flash memory devices, or other non-volatile solid-state storage devices. Memory 116 optionally includes one or more storage devices remotely located from one or more processors 118. Memory 116, or, alternatively, the non-volatile solid-state memory device(s) within memory 116, includes a non-transitory computer-readable storage medium. In some embodiments, memory 116 comprises flash memory. For example, the flash memory may be part number W25N01GVZEIG TR (W25N01GV), manufactured by WINBOND ELECTRONICS. In some embodiments, memory 116 is packaged with the one or more processors 118 (e.g., as a single microprocessor).

[0040] In some embodiments, the one or more processors 118 perform one or more initial processing operations on the data received by the plurality of sensors (e.g., before the data are transmitted to tire monitoring server 304, FIG. 3). For example, the one or more initial processing operations include determining one or more tire characteristics using data from the plurality of sensors acquired at a frequency greater than a frequency of rotation of the tire. In some embodiments, the one or more tire characteristics include a duration (e.g., length of time) of a rotation of the tire (e.g., a duration of every rotation of the tire); a length of a footprint of the tire (e.g., a length of a footprint of every rotation of the tire); a wheel misalignment; a slow leak; a puncture; rubber decay; low tread depth; excessive load; and a mileage limit exceeded. In some embodiments, the initial processing operations include

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identifying (e.g., and counting), using data from the plurality of sensors, a plurality of individual rotations of the tire. Alternatively, some of these operations may be performed by a device that receives data from sensor board 100 (e.g., tire monitoring server 304 and/or electronic device 302-1, FIG. 3).

[0041] FIGS. 2A-2B illustrate a tire sensor device 200 disposed on an inner surface of a tire 202 opposite a tread, in accordance with some embodiments. In some embodiments, the tire sensor device 200 has dimensions less than 5 cm (e.g., in width *W*) x 5 cm (e.g., in length *L*) x 2 cm (e.g., in height *H* above the inner surface of the tire 202). In some embodiments, the tire sensor device 200 has dimensions less than 10 cm x 10 cm x 4 cm. In some embodiments, tire sensor device 200 incudes a plurality of sensors including a microphone, a temperature sensor, and an accelerometer (e.g., includes sensor board 100, FIG. 1). In some embodiments, tire sensor device 200 is configured to operate (e.g., obtain measurements from the plurality of sensors) while tire 202 is in use (e.g., while the vehicle is moving and the tire is pressurized to a pressure above 30 pounds per square inch (psi)).

[0042] As illustrated, the tire sensor device 200 is affixed to the inner surface of the tire. For example, the sensor may be affixed to the inner surface of the tire using an industrial strength epoxy. As a result, there is no need to modify the manufacturing process of the tire and no damage results from affixing the sensor module to the tire. The sensor module may be affixed to the tire in any other suitable, non-invasive manner. In some circumstances, the tire sensor device 200 is installed at the time of manufacture, although the tire sensor device 200 may also be installed at a later time. In some circumstances, the tire sensor device 200 is mounted at a midline of the inner surface of the tire, opposite the tread, although tire sensor device 200 may be installed elsewhere. In addition, two or more tire sensor devices 200 may be installed on a single tire. In some embodiments, the tire sensor device 200 is installed with a particular alignment relative to the tire (e.g., a first predetermined axis of the tire sensor device 200 is installed in a direction aligned with a circumference of the tire, such that the tire sensor device 200's accelerometers are aligned along a known axis with respect to the tire).

[0043] In some embodiments, the tire sensor device 200 is affixed to the inner surface of the tire through a tire sensor dock (e.g., tire sensor dock 1100, FIGS. 11A-11B).

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[0044] FIG. 3 is a block diagram illustrating a tire monitoring system 300, in accordance with some embodiments. The tire monitoring system 300 includes one or more electronic devices 302 (e.g., electronic device 302-1 through electronic device 302-m, where m is an integer greater than one), one or more tire monitoring servers 304, and/or one or more tire sensor devices 200 (e.g., tire sensor device 200-1 through tire sensor device 200-n, where n is an integer greater than 1) affixed to tires on one or more vehicles 306.

[0045] One or more networks 314 communicably couple the components of the tire monitoring system 300. In some embodiments, the one or more networks 314 include public communication networks, private communication networks, or a combination of both public and private communication networks. For example, the one or more networks 314 can be any network (or combination of networks) such as the internet, other wide area networks (WAN), local area networks (LAN), virtual private networks (VPN), metropolitan area networks (MAN), peer-to-peer networks, and/or ad-hoc connections.

[0046] In some embodiments, an electronic device 302 is associated with one or more users (e.g., vehicle owners or fleet managers). In some embodiments, an electronic device 302 is a personal computer, mobile electronic device, wearable computing device, laptop computer, tablet computer, mobile phone, feature phone, smart phone, television (TV), digital versatile disk (DVD) player, dongle, and/or any other electronic device capable of communicating with a tire sensor device 200 and presenting information to a user. Electronic devices 302 may connect to each other wirelessly and/or through a wired connection (e.g., directly through an interface, such as an HDMI interface). In some embodiments, electronic devices 302-1 and 302-m are the same type of device (e.g., electronic device 302-1 and electronic device 302-m are smart phones). Alternatively, electronic device 302-1 and electronic device 302-m include two or more different types of devices (e.g., electronic device 302-1 is a portable multifunction device, such as a smart phone, and electronic device 302-m is a desktop computer or smart television).

[0047] In some embodiments, electronic device 302-1 communicates directly with one or more tire sensor devices 200 (as illustrated by the dotted line connecting tire sensor devices 200 and electronic device 302-1). For example, electronic device 302-1 is able to communicate directly (e.g., through a wired connection (e.g., analog input 114, FIG. 1)

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and/or through a short-range wireless signal (e.g., using antenna 110. FIG. 1), such as those associated with personal-area-network (e.g., BLUETOOTH / BLE) communication technologies, radio-frequency-based near-field communication technologies, infrared communication technologies, etc.) with a tire sensor device 200. In some embodiments, electronic device 302-1 communicates with the tire sensor device 200 through network(s) 314. In some embodiments, electronic device 302-1 uses the direct connection with tire sensor device 200 to receive data from the plurality of sensors on the tire sensor device 200. For example, electronic device 302-1 acts as a transceiver for data from the plurality of sensors on tire sensor device 200 and uploads the data to a tire monitoring server 304. Alternatively, the tire sensor device may communicate with an onboard diagnostic (OBD) dongle (e.g., an OBD-II data dongle) on a vehicle or a vehicle modem, which acts as a transceiver for data from the plurality of sensors on tire sensor device 200 and uploads the data to a tire monitoring server 304.

[0048] In some embodiments, the data are received by the one or more tire monitoring servers 304 for data processing and analytics. For example, the tire monitoring servers may be associated with AMAZON WEB SERVICES or GOOGLE CLOUD PLATFORM. The tire monitoring servers may be adapted with machine-learning models to identify the causes for tire life reduction. Such causes may include, but are not limited to, road surface conditions (e.g., potholes, icy conditions), temperature conditions, and driver behavior (e.g., aggressive driving, hard turning, rapid acceleration).

[0049] FIG. 4A is a block diagram illustrating an electronic device 302 (e.g., a computer system/client device, such as electronic device 302-1 and/or electronic device 302-m, FIG. 3), in accordance with some embodiments. The electronic device 302 includes one or more CPUs 402, one or more network (or other communications) interfaces 410, memory 412, and one or more communication buses 414 for interconnecting these components. The communication buses 414 optionally include circuitry (sometimes called a chipset) that interconnects and controls communications between system components.

[0050] In some embodiments, the electronic device 302 includes a user interface 404, including output device(s) 406 and/or input device(s) 408. In some embodiments, the input devices 408 include a keyboard, mouse, or track pad. In some embodiments, output devices

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406 include a display device 450. In some embodiments, the display device 450 includes a touch-sensitive surface, in which case the display device 450 is a touch-sensitive display. In electronic devices that have a touch-sensitive display, a physical keyboard is optional (e.g., a soft keyboard may be displayed when keyboard entry is needed). In some embodiments, the output devices 406 include a speaker 452 (e.g., speakerphone device) and/or an audio jack. In some embodiments, the electronic device 302 includes an audio input device (e.g., a microphone 454) to capture audio (e.g., speech from a user).

[0051] In some embodiments, the electronic device 302 includes a location-detection device 440, such as a global navigation satellite system (GNSS) (e.g., GPS (global positioning system), GLONASS, Galileo, BeiDou) or other geo-location receiver, and/or location-detection software for determining the location of the electronic device 302 (e.g., module for finding a position of the electronic device 302 using trilateration of measured signal strengths for nearby devices).

[0052] In some embodiments, the one or more network interfaces 410 include wireless and/or wired interfaces for receiving data from and/or transmitting data to other electronic devices 302, a tire monitoring server 304, and/or other devices or systems. In some embodiments, data communications are carried out using any of a variety of custom or standard wireless protocols (e.g., NFC, RFID, IEEE 802.15.4, WI-FI, ZIGBEE, 6LOWPAN, THREAD, Z-WAVE, BLUETOOTH, ISA100.11A, WIRELESSHART, MIWI, etc.). Furthermore, in some embodiments, data communications are carried out using any of a variety of custom or standard wired protocols (e.g., USB, FIREWIRE, ETHERNET, etc.). For example, the one or more network interfaces 410 include a wireless interface 460 for enabling wireless data communications with other electronic devices 302, and/or or other wireless (e.g., BLUETOOTH-compatible) devices (e.g., tire sensor devices 200). Furthermore, in some embodiments, the wireless interface 460 (or a different communications interface of the one or more network interfaces 410) enables data communications with other WLAN-compatible devices (e.g., electronic device(s) 302) and/or the tire monitoring server 304 (via the one or more network(s) 314, FIG. 3).

[0053] In some embodiments, electronic device 302 includes one or more sensors including, but not limited to, accelerometers, gyroscopes, compasses, magnetometers, light

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sensors, near field communication transceivers, barometers, humidity sensors, temperature sensors, proximity sensors, range finders, and/or other sensors/devices for sensing and measuring various environmental conditions.

[0054] Memory 412 includes high-speed random-access memory, such as DRAM, SRAM, DDR RAM, or other random-access solid-state memory devices; and may include non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid-state storage devices. Memory 412 may optionally include one or more storage devices remotely located from the CPU(s) 402. Memory 412, or alternately, the non-volatile memory solid-state storage devices within memory 412, includes a non-transitory computer-readable storage medium. In some embodiments, memory 412 or the non-transitory computer-readable storage medium of memory 412 stores the following programs, modules, and data structures, or a subset or superset thereof:

- an operating system 416 that includes procedures for handling various basic system services and for performing hardware-dependent tasks;
- network communication module(s) 418 for connecting the electronic device 302 to other computing devices (e.g., other electronic device(s) 302, and/or tire monitoring server 304) via the one or more network interface(s) 410 (wired or wireless) connected to one or more network(s) 314;
- a user interface module 420 that receives commands and/or inputs from a user via the user interface 404 (e.g., from the input devices 408) and provides outputs for presentation and/or display on the user interface 404 (e.g., the output devices 406);
- a tire monitoring application 422 for receiving and displaying information from one or more vehicles indicating presence or absence of a plurality of tire conditions (e.g., as determined using data from one or more tire sensors 200 mounted within the vehicle's tires);
- a web browser application 424 (e.g., INTERNET EXPLORER or EDGE by MICROSOFT, FIREFOX by MOZILLA, SAFARI by APPLE, and/or CHROME by GOOGLE) for accessing, viewing, and/or interacting with web sites. In some

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embodiments, the web browser application 424 may be used to access and display a dashboard summary of the one or more tire conditions for the plurality of vehicles (e.g., provided by tire monitoring server 304, FIG. 3); and

- other applications 436, such as applications for word processing, calendaring, mapping, weather, stocks, time keeping, virtual digital assistant, presenting, number crunching (spreadsheets), drawing, instant messaging, e-mail, telephony, video conferencing, photo management, video management, a digital music player, a digital video player, 2D gaming, 3D (e.g., virtual reality) gaming, electronic book reader, and/or workout support.

[0055] Each of the above identified modules stored in memory 412 corresponds to a set of instructions for performing a function described herein. The above identified modules or programs (i.e., sets of instructions) need not be implemented as separate software programs, procedures, or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. In some embodiments, memory 412 optionally store a subset or superset of the respective modules and data structures identified above. Furthermore, memory 412 optionally store additional modules and data structures not described above.

[0056] FIG. 4B is a block diagram illustrating a tire monitoring server 304 (e.g., a computer system), in accordance with some embodiments. The tire monitoring server 304 typically includes one or more central processing units (CPUs) 472, one or more network interfaces 474, memory 476, and one or more communication buses 478 for interconnecting these components.

[0057] Memory 476 includes high-speed random access memory, such as DRAM, SRAM, DDR RAM, or other random access solid-state memory devices; and may include non-volatile memory, such as one or more magnetic disk storage devices, optical disk storage devices, flash memory devices, or other non-volatile solid-state storage devices. Memory 476 optionally includes one or more storage devices remotely located from one or more CPUs 472. Memory 476, or, alternatively, the non-volatile solid-state memory device(s) within memory 476, includes a non-transitory computer-readable storage medium. In some

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embodiments, memory 476, or the non-transitory computer-readable storage medium of memory 476, stores the following programs, modules and data structures, or a subset or superset thereof:

- an operating system 480 that includes procedures for handling various basic system services and for performing hardware-dependent tasks;
- a network communication module 482 that is used for connecting the tire monitoring server 304 to other computing devices via one or more network interfaces 474 (wired or wireless) connected to one or more networks 314;
- one or more server application modules 484 for performing various functions with respect to monitoring tire conditions, the server application modules 484 including, but not limited to, one or more of:
    - data processing and analytics module 486 that receives data from one or more sensors (e.g., accelerometers, temperature sensors, microphones, or any of the other sensors described herein) on tire sensor devices (e.g., tire sensor devices 200, FIG. 2) and determines one or more characteristics of tires (e.g., rubber decay, low tread depth, excessive load, or any of the other characteristics described herein) using the data from the sensors. In some embodiments, the determination of the one or more characteristics of the tires is made in real-time (e.g., as the data is received) without user intervention (e.g., a client device need not request the determination); and
    - web-interface reporting dashboard module 488 (e.g., executed as an application program interface (API)) for transmitting, for display (e.g., on a client device, such as electronic device 302-1 or 302-m), a dashboard summary of the one or more tire conditions for the plurality of vehicles and/or for providing a user alert indicating the one or more characteristics of the tire. In some embodiments, the dashboard summary provides a user with information from tire sensor devices registered to the user (e.g., in sensor registration database 496).

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- one or more server data module(s) 490 for handling the storage of and/or access to data (e.g., measurements) from tire sensors (e.g., tire sensor devices 200, FIG. 2) and registration of tire sensors; in some embodiments, the one or more server data module(s) 490 include:
    - sensor measurement database 494 for storing raw data (e.g., measurements) from one or more sensors (e.g., accelerometers, temperature sensors, microphones, or any of the other sensors described herein) on a tire sensor device (e.g., tire sensor device 200, FIG. 2) and/or partially processed data from said one or more sensors (e.g., where the tire sensor device performed one or more initial processing operations on the data to produce the partially processed data);
    - sensor registration database 496 for storing registration information for a plurality of users, a plurality of tire sensor devices, and a plurality of tires on which the plurality of tire sensor devices are mounted. For example, sensor registration database 496 stores a data structure (e.g., a table) that includes, for each user of a plurality of users: one or more tire sensor devices, identified using a unique device identifier, registered by the user (and thus associated with the user's account) and information about the tire on which each tire sensor device of the one or more tire sensor devices corresponding to the user is mounted. In some embodiments, the tire information includes a make, model, and/or year of the tire. In some embodiments, the tire information includes one or more characteristics determined by data processing and analytics module 486 (e.g., a mileage on the tire, a projected lifetime of the tire). In some embodiments, the tire information includes one or more characteristics input during registrations. For example, in some embodiments, the tire information includes one or more characteristics input by the user and/or one or more characteristics obtained using image analysis of a photograph of the tire (e.g., using text recognition to read the model, make, age, serial number, and/or size of the tire off of tire codes imprinted on the tire's sidewall).

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[0058] In some embodiments, the tire monitoring server 304 includes web or Hypertext Transfer Protocol (HTTP) servers, File Transfer Protocol (FTP) servers, as well as web pages and applications implemented using Common Gateway Interface (CGI) script, PHP Hyper-text Preprocessor (PHP), Active Server Pages (ASP), Hyper Text Markup Language (HTML), Extensible Markup Language (XML), Java, JavaScript, Asynchronous JavaScript and XML (AJAX), XHP, Javelin, Wireless Universal Resource File (WURFL), and the like.

[0059] Each of the above identified modules stored in memory 476 corresponds to a set of instructions for performing a function described herein. The above identified modules or programs (i.e., sets of instructions) need not be implemented as separate software programs, procedures, or modules, and thus various subsets of these modules may be combined or otherwise re-arranged in various embodiments. In some embodiments, memory 476 optionally store a subset or superset of the respective modules and data structures identified above. Furthermore, memory 476 optionally store additional modules and data structures not described above.

[0060] Although FIG. 4B illustrates the tire monitoring server 304 in accordance with some embodiments, FIG. 4B is intended more as a functional description of the various features that may be present in one or more tire monitoring servers than as a structural schematic of the embodiments described herein. In practice, and as recognized by those of ordinary skill in the art, items shown separately could be combined and some items could be separated. For example, some items shown separately in FIG. 4B could be implemented on single servers and single items could be implemented by one or more servers. In some embodiments, server data modules 490 are stored on devices (e.g., other servers) that are accessed by server application modules 484. The actual number of servers used to implement the tire monitoring server 304, and how features are allocated among them, will vary from one implementation to another and, optionally, depends in part on the amount of data traffic that the server system handles during peak usage periods as well as during average usage periods.

[0061] FIGS. 5A-5C illustrate example user interfaces for providing information (e.g., user alerts) about tire characteristics and/or tire conditions for one or more vehicles, in

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accordance with some embodiments. In some embodiments, the user interfaces shown in FIGS. 5A-5C are displayed on a client device (e.g., a client, such as electronic device 302-1, of tire monitoring server 304, FIG. 3).

[0062] FIG. 5A illustrates a user interface 502 for registering a tire sensor device with a user's account. To that end, user interface 502 includes an affordance for pairing sensors (e.g., through BLUETOOTH, NFC, or some other communications protocol), an affordance for inputting tire information in correspondence with the paired sensor (e.g., a make, model, year, and/or manufacture date of the tire on which the paired tire sensor device is mounted), and an affordance for inputting vehicle information in correspondence with the paired sensor (e.g., a make, model, and/or year of the vehicle on which the paired tire sensor device is mounted). In some embodiments, a user can register (e.g., associate) tire sensor devices on a plurality of vehicles with the same account, and thus user interface 502 can be used to register tire sensor devices for a fleet of vehicles.

[0063] In some embodiments, tire information is input by taking a picture of a tire. For example, a user may take a picture of a tire and one or more characteristics (e.g., make, model, size, year of manufacture, serial number, and/or size of the tire) may be determined using image analysis. For example, the one or more characteristics may be read off of the tire (automatically, without user intervention) using text recognition (e.g., using text recognition to read the model, make, age, serial number, and/or size of the tire off of tire codes imprinted on the tire's sidewall). Note that a user may be asked to confirm the values for the one or more characteristics after the values for the one or more characteristics have been obtained using an image.

[0064] FIG. 5B illustrates a user interface 504 for providing information and user alerts indicating characteristics of tires on a vehicle, as determined from tire sensor devices in each tire on the vehicle. In some embodiments, the user interface 504 indicates required service on a per tire basis for a respective vehicle. For example, user interface 504 may provide, for each tire on the vehicle (e.g., for each tire in which a tire sensor device is mounted), a user alert in response to determining a wheel misalignment; a slow leak; a puncture; rubber decay; low tread depth; excessive load; and a mileage limit exceeded. In addition, user interface 504 may provide, for each tire on the vehicle (e.g., for each tire in

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which a tire sensor device is mounted), information (e.g., data) such as the tire's pressure, remaining life (e.g., a projected remaining lifetime based on the driver's driving habits and the conditions experienced by the tire (e.g., road conditions, temperature conditions, etc.), as determined by the tire sensor device mounted on the tire). In some embodiments, user interface 504 includes, for a respective vehicle, a plurality of visual representations 506 of tires (e.g., a visual representation 506 of a tire for each tire in which a tire sensor device is mounted). In some embodiments, visual representations 506 of tires having a corresponding alert condition are visually distinguished from representations of tires that do not have an alert condition. In some embodiments, a visual representation 506 of a respective tire having a corresponding alert condition is visually distinguished from visual representations 506 of tires that do not have an alert condition by color coding (e.g., tires shown in red have an alert indicating an issue that requires attention, such as a slow leak or a mileage limit exceeded, whereas tires shown in green do not have an alert condition).

[0065] FIG. 5C illustrates another user interface 508 for providing information and user alerts indicating characteristics of tires on a vehicle. In some embodiments, when updated information is received (e.g., by tire monitoring server 304) from the vehicle (e.g., from a tire sensor device 200 on the vehicle) indicating that an alert condition for tire on the vehicle is met, an alert is automatically provided indicating that the tire on the respective vehicle requires service (e.g., a text message is provided as shown in FIG. 5C). For example, a text message is provided to the user (e.g., in real-time, without the user's intervention), when a change in characteristics of a tire prompt an alert. As a more specific example, when tire monitoring server 304 determines that a tire has a predefined amount of tread life remaining (e.g., 25%, 10%, 0%), the tire monitoring server 304 sends a text message to the user informing the user of the remaining tread life. In some embodiments, analogous user alerts are provided based on other tire conditions, characteristics, and/or changes in characteristics discussed herein (e.g., detection of a slow leak or a puncture, excessive load, wheel misalignment, etc.).

[0066] FIG. 6 illustrates an example of a user interface 600 that includes a dashboard summary of tire characteristics and/or tire conditions for a plurality of vehicles (e.g., a fleet of vehicles), in accordance with some embodiments. In some embodiments, user interface 600 is

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displayed on a client device (e.g., a client, such as electronic device 302-m, of tire monitoring server 304, FIG. 3).

[0067] In some embodiments, user interface 600 includes a plurality of representations 604 of vehicles (e.g., representations 604-1 through 604-6). Each representation 604 of a vehicle corresponds to a vehicle that is registered to the same user. The representations 604 of vehicles may include analogous information as the user interface 504 (FIG. 5B). For example, in some embodiments, representations 604 indicate required service on a per tire basis for each respective vehicle of a plurality of vehicles registered to the user. The representations 604 of vehicles may provide color coded representations of tires, where the color of the tire indicates a user alert condition (e.g., a slow leak, wheel misalignment, etc.) For brevity, the details described above are not repeated here. In some embodiments, user interface 600 includes a representation 604 of each vehicle in a fleet of vehicles.

[0068] In some embodiments, user interface 600 further includes an indication 606 of a number of tires (e.g., registered to the user) requiring service for each of one or more tire conditions (e.g., wheel misalignment, slow leak, puncture, rubber decay, low tread depth, excessive load, and/or mileage exceeded) as determined by tire sensor devices mounted on the tires. In some embodiments, user interface 600 further includes an indication 608 of a number of vehicles (e.g., registered to the user) requiring service (e.g., the vehicles' tires require service, as determined by tire sensor devices mounted on the tires).

[0069] In some embodiments, user interface 600 provides a fleet map 610 showing geographical locations of vehicles in the plurality of vehicles that are represented by representations 604.

[0070] In some embodiments, user interface 600 is updated automatically, without user intervention, as updated data is received from a respective vehicle of the plurality of vehicles. For example, when the updated information indicates that a tire on the respective vehicle requires service (e.g., in accordance with a determination that an alert condition for a tire is met), user interface 600 provides an alert indicating that the tire on the respective vehicle requires service.

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[0071] In some embodiments, although not shown in detail, user interface 600 provides playback (e.g., replay) of data from tire sensor devices (e.g., through recordings affordance 612). For example, a user can select any date and time in the recorded history of any tire in the fleet of vehicles and view pressure, temperature, and/or speed changes over a predefined time window (e.g., 15 minutes, 30 minutes, an hour, etc.). Thus, user interface 600 helps the user understand specific events in a tire's history (e.g., where a tire hit a nail on the road).

[0072] FIGS. 7A-7C are schematic diagrams of antennas 700 for use in a tire sensor device, in accordance with some embodiments. In particular, FIG. 7A illustrates an example implementation of a rigid antenna 700-1 disposed on a PCB board with a SubMiniature version A (SMA) connector 708. FIG. 7B illustrates an example implementation of a flexible antenna 700-2 with a connection pad 710. The flexible antenna 700-2 may be adhered to the inner surface of a tire and, by virtue of its flexibility, contour to the inner surface of the tire, as shown in FIG. 7C. In some embodiments, flexible antenna 700-2 may be integrated or embedded in a tire sensor dock, as described with reference to FIGS. 11A-11B.

[0073] Alternatively, an antenna may be printed or otherwise provided on the same circuit board as a plurality of sensors, as shown and described with reference to sensor board 100, FIG. 1.

[0074] In some embodiments, antennas 700 are multi-mode antennas (e.g., comprise a single antenna structure that simultaneously transmits and receives data over a plurality of bands). In some embodiments, the plurality of bands include a 2.4 GHz band (e.g., for BLUETOOTH), 900 MHz GSM band, and a 415 MHz ISM band. FIGS. 7A shows an example implementation of the triple mode antenna 700-1 showing the antenna elements 704 covering the 2.4 GHz, 900 MHz and 415 MHz bands (e.g., the 2.4 GHz band is covered by a combination of element 704-1, element 704-2, and element 704-3; the 900 MHz band is covered by a combination of element 704-1 and 704-2; and the 415 MHz band is covered by element 704-1). The antenna 700-1 includes inductance traces 706 (e.g., an inductance trace 706-1 having an inductance value L1 and an inductance trace 706-2 having an inductance value L2). In some embodiments, the values of the inductances L1 and L2 are adjusted to tune the transmission and reception of signals.

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[0075] FIG. 8 illustrates schematic diagrams of additional embodiments of antennas 800 (e.g., antenna 800-1 through antenna 800-4) for use in a tire sensor device, in accordance with some embodiments. In particular, FIG. 8 illustrates various shapes of antenna elements. In accordance with some embodiments, the shapes and sizes of the antenna elements can be adjusted, enhanced, or modified to improve performance in the frequencies (e.g., bands) of interest. Note that some elements, such as the inductance traces and connectors, have been omitted from the drawings of various antennas 800.

[0076] FIG. 9 is a flow diagram of a method 900 for providing a user alert indicating one or more characteristics of a tire, in accordance with some embodiments. In some embodiments, various operations of method 900 are performed by a tire sensor device (e.g., tire sensor device 200, FIG. 2). In some embodiments, various operations of method 900 are performed by a tire monitoring server (e.g., tire monitoring server 304, FIG. 3) that receives data from a tire sensor device. In some embodiments, various operations of method 900 are performed by an electronic device (e.g., electronic device 302-1 and/or electronic device 302-2, FIG. 3) communicatively-coupled with a tire sensor device and/or communicatively-coupled with a tire monitoring server.

[0077] Method 900 provides an improved process for detecting and reporting tire degradation in one or more vehicles. In some embodiments, method 900 uses an unconventional combination of measurement apparatuses (e.g., sensors) disposed within a tire to improve safety, performance, and efficiency (e.g., fuel and/or energy economy) of vehicles by improving tire maintenance.

[0078] The method 900 includes receiving (902) data from a plurality of sensors disposed within a tire. The plurality of sensors include a microphone, a temperature sensor, and an accelerometer. The data from the plurality of sensors are acquired at a frequency greater than a frequency of rotation of the tire (e.g., at a predefined speed and for a predefined tire size and/or circumference). For example, the data from the plurality of sensors are acquired at a frequency greater than the frequency of rotation of the tire when the vehicle is moving less than a maximum speed of 120 mph (e.g., accounting for the tires size and/or circumference). In some embodiments, data from the plurality of sensors are acquired at a frequency greater than twice the frequency of rotation of the tire. In some embodiments, data

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from the plurality of sensors are acquired at a frequency greater than a Nyquist frequency based on relevant features in the data when the tire is rotating at a predefined speed. In some embodiments, data from the plurality of sensors are acquired at a frequency of at least 3000 Hz, 4000 Hz, or 5000 Hz.

[0079] The method 900 further includes determining (904) one or more characteristics of the tire using the data from the plurality of sensors acquired at the frequency greater than the frequency of rotation of the tire. The one or more characteristics of the tire are selected from the group consisting of: a wheel misalignment; a slow leak; a puncture; rubber decay; low tread depth; excessive load; and a mileage limit exceeded.

[0080] In some embodiments, the determination of the one or more characteristics of the tire using the data from the plurality of sensors acquired at the frequency greater than the frequency of rotation of the tire is based on one or more features of a power spectral density of data from the plurality of sensors, wherein the one or more features have characteristic frequencies greater than the frequency of rotation of the tire (e.g., the method includes analyzing a power spectral density of the data from the plurality of sensors at the frequency greater than the frequency of rotation of the tire).

[0081] Further, in some embodiments, high-frequency vibrations in a tire (e.g., vibrations at a frequency greater than the frequency of rotation of the tire) can be sensed by the microphone and/or the accelerometer. These vibrations can be used to understand the road surface, and/or the friction between the tire and the road surface. Thus, in some embodiments, determining the one or more characteristics of the tire using the data from the plurality of sensors acquired at the frequency greater than the frequency of rotation of the tire includes accounting for (e.g., correcting for) one or more driving conditions, such as a road surface and/or ambient temperature.

[0082] In some embodiments, determining that the rubber on the tire has decayed includes detecting anomalies and/or trends in the motion and vibration of the tire (e.g., by detecting trends in vibration signals, as measured by the accelerometer and/or microphone). For example, determining that the rubber on the tire has decayed includes detecting an

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emergent peak in the power spectral density of the accelerometer and/or microphone data and determining that the emergent peak is not due to driving conditions.

[0083] In some embodiments, determining that the tire is mounted to a misaligned wheel includes analyzing motion (e.g., wobble) of the tire as determined by data from the accelerometer and other sensors (e.g., the microphone). For example, the accelerometer is a three-axis accelerometer and determining that the tire is mounted to a misaligned wheel includes detecting that data from the accelerometer include periodic motion of the tire along an axis of rotation of the tire (e.g., at the frequency of rotation of the tire).

[0084] In some embodiments, the plurality of sensors includes a pressure sensor and determining that the tire has a slow leak includes detecting that the data from the pressure sensor has decreased below a predefined rate (e.g., has decreased slowly). In some embodiments, determining that the tire has a slow leak includes determining that the decrease in pressure is not due to changes in ambient temperature.

[0085] In some embodiments, the plurality of sensors includes a pressure sensor and determining that the tire has a puncture includes detecting that the data from the pressure sensor has decreased above a predefined rate (e.g., has decreased quickly).

[0086] In some embodiments, determining that the tire has an excessive load includes correlating two or more of pressure, vehicle speed, and footprint length. In some embodiments, determining that the tire has an excessive load includes comparing footprint lengths between tires.

[0087] In some embodiments, determining that a mileage limit of the tire is exceeded includes counting a number of rotations (e.g., revolutions) of the tire to determine a total mileage of the tire. In some embodiments, the total mileage of the tire is compared to a specification mileage limit for the tire to determine that the mileage limit is exceeded.

[0088] In some embodiments, method 900 further includes determining a duration of a rotation of the tire (e.g., by determining a length of time of a single revolution of the tire from the accelerometer and/or microphone data and/or the power spectral density of the accelerometer and/or microphone data). In some embodiments, method 900 further includes

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determining a length of a footprint of the tire (e.g., by multiplying the duration of the rotation of the tire by a known circumference of the tire).

[0089] In some embodiments, method 900 includes mounting a tire sensor device on the tire. The tire sensor device includes the plurality of sensors. The tire sensor device further includes memory configured to store data received by the plurality of sensors and one or more processors coupled with the memory. The one or more processors are configured to perform one or more initial processing operations on the data received by the plurality of sensors; and an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices. The information from the plurality of sensors is received from the tire sensor device.

[0090] The method 900 further includes providing (906) a user alert indicating the one or more characteristics of the tire (e.g., through the dashboard summary of user interface 600, FIG. 6, or as a text message as shown in FIG. 5C).

[0091] Although FIG. 9 illustrates a number of logical stages in a particular order, stages which are not order dependent may be reordered and other stages may be combined or broken out. Some reordering or other groupings not specifically mentioned will be apparent to those of ordinary skill in the art, so the ordering and groupings presented herein are not exhaustive. Moreover, it should be recognized that the stages could be implemented in hardware, firmware, software, or any combination thereof. Further, method 900 may include any of the operations described elsewhere in this document (e.g., with respect to method 1000, FIG. 10).

[0092] FIG. 10 is a flow diagram of a method 1000 for providing a dashboard summary of one or more tire conditions for a plurality of vehicles, in accordance with some embodiments. In some embodiments, various operations of method 1000 are performed by a tire sensor device (e.g., tire sensor device 200, FIG. 2). In some embodiments, various operations of method 1000 are performed by a tire monitoring server (e.g., tire monitoring server 304, FIG. 3) that receives data from a tire sensor device. In some embodiments, various operations of method 1000 are performed by an electronic device (e.g., electronic

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device 302-1 and/or electronic device 302-2, FIG. 3) communicatively-coupled with a tire sensor device and/or communicatively-coupled with a tire monitoring server.

[0093] Method 1000 provides an improved process for detecting and reporting tire degradation in one or more vehicles (e.g., a fleet of vehicles). In some embodiments, method 1000 uses an unconventional combination of measurement apparatuses (e.g., sensors) disposed within a tire to improve safety, performance, and efficiency (e.g., fuel and/or energy economy) of vehicles by improving tire maintenance.

[0094] In some embodiments, method 1000 include mounting (1002) a tire sensor device (e.g., tire sensor device 200) on a respective tire of each vehicle of a plurality of vehicles. The tire sensor device includes: a plurality of sensors including a microphone, a temperature sensor, and an accelerometer; and memory configured to store data received by the plurality of sensors. The one or more processors are coupled with the memory and configured to perform one or more initial processing operations on the data received by the plurality of sensors. The tire sensor device optionally includes an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices.

[0095] Method 1000 further includes receiving (1004) information (e.g., data from tire sensor devices) from the plurality of vehicles indicating presence or absence of a plurality of tire conditions, including one or more tire conditions selected from the group consisting of: wheel misalignment; a slow leak; a puncture; rubber decay; low tread depth; excessive load; and a mileage limit exceeded. In some embodiments, the information indicating the presence or absence of a plurality of tire conditions is received from a plurality of sensors disposed within a respective tire from the plurality of vehicles, the plurality of sensors including a microphone, a temperature sensor, and an accelerometer. Various embodiments for determining and/or detecting the presence or absence of such tire conditions are described above with reference to method 900, FIG. 9. For brevity, those details are not repeated here.

[0096] In some embodiments, method 1000 further includes displaying (1006) a dashboard summary of the one or more tire conditions for the plurality of vehicles (e.g., the dashboard summary of user interface 600, FIG. 6). In some embodiments, method 1000

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includes enabling display of a dashboard summary of the one or more tire conditions for the plurality of vehicles (e.g., transmitting the dashboard summary, via and API, to a client device to be displayed in a web browser).

[0097] In some embodiments, the dashboard summary indicates a number of tires requiring service for each of the one or more tire conditions (e.g., as described with reference to indication 608, FIG. 6).

[0098] In some embodiments, the dashboard summary indicates required service on a per tire basis for a respective vehicle of the plurality of vehicles (e.g., as described with reference to representations 604, FIG. 6). In some embodiments, the dashboard summary includes visual representations of each tire of the respective vehicle. The visual representation of a respective tire indicates whether the respective tire requires service. In some embodiments, a color of the visual representation of the respective tire indicates whether the respective tire requires service.

[0099] In some embodiments, method 1000 further includes receiving updated information from a respective vehicle of the plurality of vehicles indicating that a tire on the respective vehicle requires service and providing an alert indicating that the tire on the respective vehicle requires service (e.g., by updating a visual appearance of the visual representation of a respective tire and/or by providing a text alert such as that shown in FIG. 5C).

[00100] In some embodiments, method 1000 includes, prior to operation 1002, receiving registration information from a plurality of tire sensor devices mounted on tires in the plurality of vehicles (e.g., as described with reference to FIG. 5A). In some embodiments, method 1000 includes associating the plurality of tire sensor devices with the tires on the plurality of vehicles. In some embodiments, method 1000 includes associating the plurality of tire sensor devices with a user's account (e.g., in a table, e.g., sensor registration database 496, FIG. 4B). In some embodiments, the dashboard summary is a dashboard summary for the user's account. In some embodiments, receiving registration information from a tire sensor device includes receiving an image of the tire on which the tire sensor device is mounted and performing image analysis to determine one or more characteristics of the tire

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(e.g., using text recognition to read the model, make, age, serial number, and/or size of the tire off of tire codes imprinted on the tire's sidewall).

[00101] Although FIG. 10 illustrates a number of logical stages in a particular order, stages which are not order dependent may be reordered and other stages may be combined or broken out. Some reordering or other groupings not specifically mentioned will be apparent to those of ordinary skill in the art, so the ordering and groupings presented herein are not exhaustive. Moreover, it should be recognized that the stages could be implemented in hardware, firmware, software, or any combination thereof. Further, method 1000 may include any of the operations described elsewhere in this document (e.g., with respect to method 900, FIG. 9).

[00102] FIGS. 11A-11B shows a tire sensor dock 1100, in accordance with some embodiments. In some embodiments, tire sensor dock 1100 is adapted to receive a tire sensor device 1110 (FIG. 11B) (e.g., which may be functionally analogous to tire sensor device 200, FIG. 2). For example, tire sensor dock 1100 includes an opening 1104 that provides a snug fit with the tire sensor device 1110. In some embodiments, tire sensor dock 1100 is adapted to receive (e.g., mate with) a tire sensor device 1110 such that the tire sensor device 1110 is non-rotatably positioned within the sensor dock. For example, tire sensor dock 1100 includes or has formed therein a boss 1102 which abuts the tire sensor device 1110 and prevents rotation (e.g., the tire sensor device 1110 has formed therein a complementary feature that receives the boss 1102 and prevents rotation). Alternatively, tire sensor dock 1100 is adapted to receive a boss formed on the tire sensor device 1110.

[00103] A bottom surface 1106 of the tire sensor dock 1100 is further adapted to be affixed to the inner surface of a tire. In some embodiments, the tire sensor dock 1100 is made of natural rubber. The tire sensor dock 1100 is affixed and chemically bonded to the tire using a gum (e.g., a rubber vulcanizing cement) that cross-links with inner surface of the tire (e.g., thus, the tire sensor dock 1100 is permanently affixed to the tire). The durometer of the rubber of the tire sensor dock 1100 is similar to that of a tire after vulcanization (e.g., ranges between 40-80 depending on the stiffness required). In some embodiments, the tire sensor dock 1100 has a similar stiffness (e.g., within 5% or within 10%) to that of the tire so that the tire sensor dock 1100 flexes in a similar manner as the tire as it is rolling on the ground.

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Having a similar stiffness as the tire reduces shear stresses between the tire and the sensor dock caused by vibrations while in use and increases the lifespan of the tire sensor dock 1100 (e.g., the tire sensor dock 1100 can withstand speeds up to 300 mph and is designed to last at least 5 years).

[00104] The foregoing description, for purpose of explanation, has been described with reference to specific embodiments. However, the illustrative discussions above are not intended to be exhaustive or to limit the embodiments to the precise forms disclosed. Many modifications and variations are possible in view of the above teachings. The embodiments were chosen and described in order to best explain the principles and their practical applications, to thereby enable others skilled in the art to best utilize the embodiments and various embodiments with various modifications as are suited to the particular use contemplated.

[00105] It will also be understood that, although the terms first, second, etc., are, in some instances, used herein to describe various elements, these elements should not be limited by these terms. These terms are used only to distinguish one element from another. For example, a first electronic device could be termed a second electronic device, and, similarly, a second electronic device could be termed a first electronic device, without departing from the scope of the various described embodiments. The first electronic device and the second electronic device are both electronic devices, but they are not the same electronic device.

[00106] The terminology used in the description of the various embodiments described herein is for the purpose of describing particular embodiments only and is not intended to be limiting. As used in the description of the various described embodiments and the appended claims, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will also be understood that the term "and/or" as used herein refers to and encompasses any and all possible combinations of one or more of the associated listed items. It will be further understood that the terms "includes," "including," "comprises," and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do

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not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[00107] As used herein, the term "if" is, optionally, construed to mean "when" or "upon" or "in response to determining" or "in response to detecting" or "in accordance with a determination that," depending on the context. Similarly, the phrase "if it is determined" or "if [a stated condition or event] is detected" is, optionally, construed to mean "upon determining" or "in response to determining" or "upon detecting [the stated condition or event]" or "in response to detecting [the stated condition or event]" or "in accordance with a determination that [a stated condition or event] is detected," depending on the context.

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WHAT IS CLAIMED IS:

1. A tire sensor device for monitoring a condition of a tire, the tire sensor device comprising:

a plurality of sensors including a temperature sensor and an accelerometer;

memory configured to store data received by the plurality of sensors;

a microprocessor coupled with the memory, the microprocessor configured to perform one or more initial processing operations on the data received by the plurality of sensors, the one or more initial processing operations including determining one or more tire characteristics using data from the plurality of sensors acquired at a frequency greater than a frequency of rotation of the tire; and

an antenna, coupled with the microprocessor, configured to wirelessly communicate with one or more external devices;

wherein the tire sensor device has dimensions less than 5 cm x 5 cm x 2 cm.

2. The tire sensor device of claim 1, wherein the one or more initial processing operations include determining, using data from the plurality of sensors, one or more tire characteristics selected from the group consisting of:

a duration of a rotation of the tire;

a length of a footprint of the tire;

a wheel misalignment;

a slow leak;

a puncture;

rubber decay;

low tread depth;

excessive load; and

a mileage limit exceeded.

3. The tire sensor device of claim 1, wherein the microprocessor is configured to identify, using data from the plurality of sensors, a plurality of individual rotations of the tire.

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4. The tire sensor device of claim 1, further including a voltage regulator adapted to regulate a voltage provided to the antenna.

5. The tire sensor device of claim 1, wherein the antenna is adapted to communicate in an industrial, scientific and medical (ISM) radio band.

6. The tire sensor device of claim 1, wherein the accelerometer has a sampling rate of at least 3000 Hz.

7. The tire sensor device of claim 1, wherein the plurality of sensors further includes a pressure sensor.

8. The tire sensor device of claim 1, wherein the tire sensor device is adapted to be disposed on an inner surface of the tire opposite a tread.

9. A tire sensor device for monitoring a condition of a tire, the tire sensor device comprising:

a plurality of sensors including a temperature sensor and an accelerometer;

memory configured to store data received by the plurality of sensors;

one or more processors coupled with the memory, the one or more processors configured to perform one or more initial processing operations on the data received by the plurality of sensors; and

an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices.

10. The tire sensor device of claim 9, wherein the one or more initial processing operations include determining, using data from the plurality of sensors, one or more tire characteristics selected from the group consisting of:

a duration of a rotation of the tire;

a length of a footprint of the tire;

a wheel misalignment;

a slow leak;

a puncture;

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rubber decay;
low tread depth;
excessive load; and
a mileage limit exceeded.

11. The tire sensor device of claim 10, wherein the one or more tire characteristics are determined, by the one or more processors, using data from the plurality of sensors acquired at a frequency greater than a frequency of rotation of the tire.

12. The tire sensor device of claim 9, wherein the one or more processors are configured to identify, using data from the plurality of sensors, a plurality of individual rotations of the tire.

13. The tire sensor device of claim 9, further including a voltage regulator adapted to regulate a voltage provided to the antenna.

14. The tire sensor device of claim 9, wherein the antenna is adapted to communicate in an industrial, scientific and medical (ISM) radio band.

15. The tire sensor device of claim 9, wherein the accelerometer has a sampling rate of at least 3000 Hz.

16. The tire sensor device of claim 9, wherein the plurality of sensors further includes a pressure sensor.

17. The tire sensor device of claim 9, wherein the tire sensor device is adapted to be disposed on an inner surface of the tire opposite a tread.

18. The tire sensor device of claim 9, wherein the tire sensor device has dimensions less than 5 cm x 5 cm x 2 cm.

19. The tire sensor device of claim 9, wherein the one or more processors comprise a microprocessor.

20. A method, comprising:

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receiving data from a plurality of sensors disposed within a tire, wherein:

the plurality of sensors include a temperature sensor and an accelerometer; and

the data from the plurality of sensors are acquired at a frequency greater than a frequency of rotation of the tire;

determining one or more characteristics of the tire using the data from the plurality of sensors acquired at the frequency greater than the frequency of rotation of the tire, the one or more characteristics of the tire selected from the group consisting of:

a wheel misalignment;

a slow leak;

a puncture;

rubber decay;

low tread depth;

excessive load; and

a mileage limit exceeded;

providing a user alert indicating the one or more characteristics of the tire.

21. A method of monitoring tire conditions for a plurality of vehicles, comprising:

receiving information from the plurality of vehicles indicating presence or absence of a plurality of tire conditions, including one or more tire conditions selected from the group consisting of:

wheel misalignment;

a slow leak;

a puncture;

rubber decay;

low tread depth;

excessive load; and

a mileage limit exceeded; and

displaying a dashboard summary of the one or more tire conditions for the plurality of vehicles.

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22. The method of claim 21, wherein the dashboard summary indicates a number of tires requiring service for each of the one or more tire conditions.

23. The method of claim 21, wherein the dashboard summary indicates required service on a per tire basis for a respective vehicle of the plurality of vehicles.

24. The method of claim 23, wherein:

the dashboard summary includes visual representations of each tire of the respective vehicle; and

the visual representation of a respective tire indicates whether the respective tire requires service.

25. The method of claim 24, wherein a color of the visual representation of the respective tire indicates whether the respective tire requires service.

26. The method of claim 21, wherein the information indicating the presence or absence of a plurality of tire conditions is received from a plurality of sensors disposed within a respective tire from the plurality of vehicles, the plurality of sensors including a temperature sensor and an accelerometer.

27. The method of claim 21, further including:

receiving updated information from a respective vehicle of the plurality of vehicles indicating that a tire on the respective vehicle requires service; and

providing an alert indicating that the tire on the respective vehicle requires service.

28. The method of claim 21, further including:

mounting a tire sensor device on a respective tire of each vehicle of the plurality of vehicles, the tire sensor device including:

a plurality of sensors including a temperature sensor and an accelerometer;

memory configured to store data received by the plurality of sensors;

one or more processors coupled with the memory, the one or more processors configured to perform one or more initial processing operations on the data received by the plurality of sensors; and

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an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices;

wherein the information from the plurality of vehicles is received from the tire sensor device.

29. A computer system comprising:

a display;

one or more processors;

memory storing instructions for execution by the one or more processors, including instructions for:

receiving information from a plurality of vehicles indicating presence or absence of a plurality of tire conditions, including one or more tire conditions selected from the group consisting of:

wheel misalignment;

a slow leak;

a puncture;

rubber decay;

low tread depth;

excessive load; and

a mileage limit exceeded; and

displaying a dashboard summary of the one or more tire conditions for the plurality of vehicles.

30. A computer system comprising:

a display;

one or more processors;

memory storing instructions for execution by the one or more processors, including instructions for performing the method of any of claims 20-28.

31. A non-transitory computer readable storage medium storing instructions, which, when executed by a computer system that includes one or more processors and a display, causes the computer system to:

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receive information from a plurality of vehicles indicating presence or absence of a plurality of tire conditions, including one or more tire conditions selected from the group consisting of:

wheel misalignment;
a slow leak;
a puncture;
rubber decay;
low tread depth;
excessive load; and
a mileage limit exceeded; and

display a dashboard summary of the one or more tire conditions for the plurality of vehicles.

32. A non-transitory computer readable storage medium storing instructions, which, when executed by a computer system that includes one or more processors and a display, causes the computer system to perform the method of any of claims 20-28.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 353

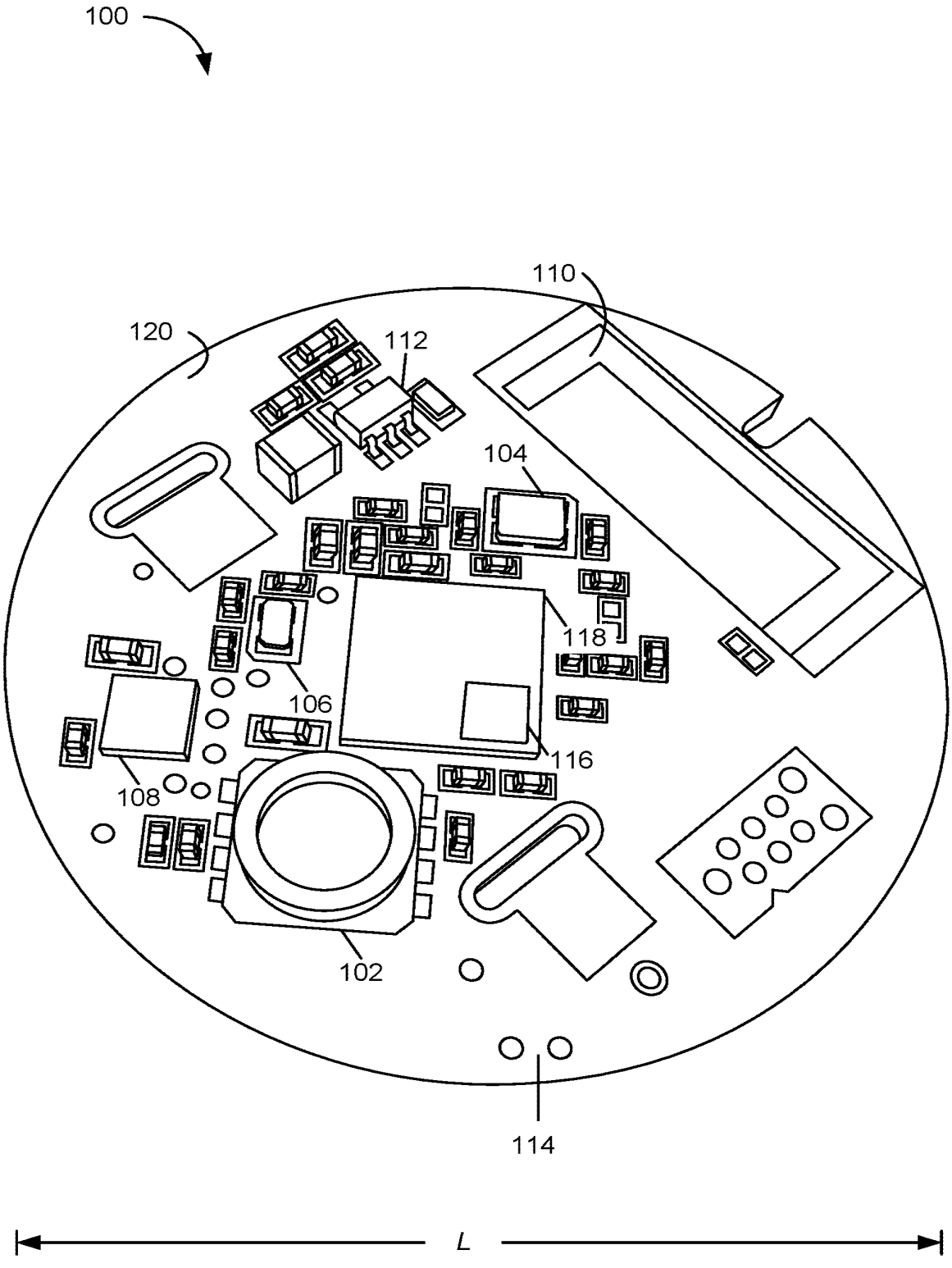

FIG. 1

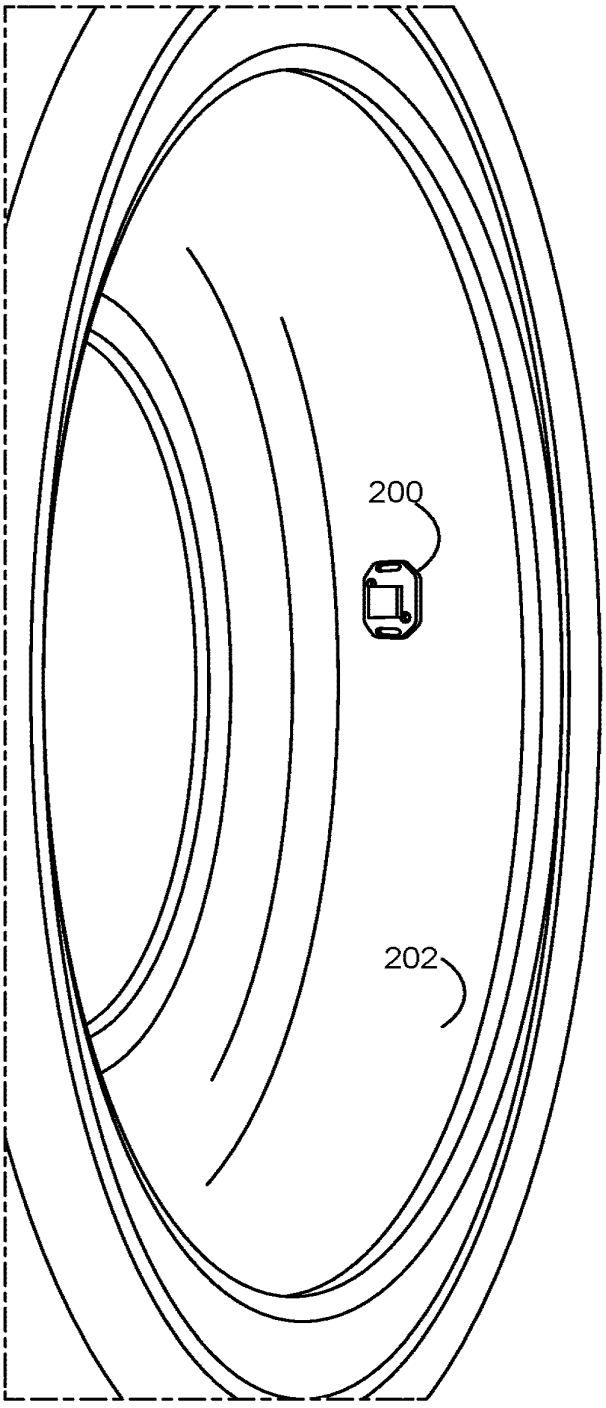

FIG. 2A

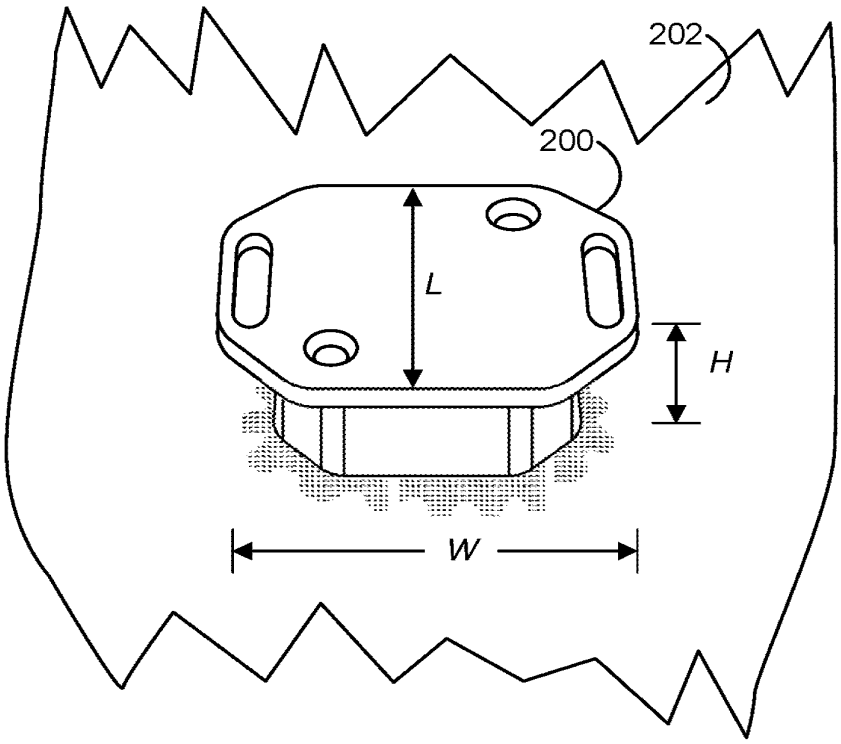

FIG. 2B

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Revvo v. Cerebrum
IPR2025-00632 - Page 356

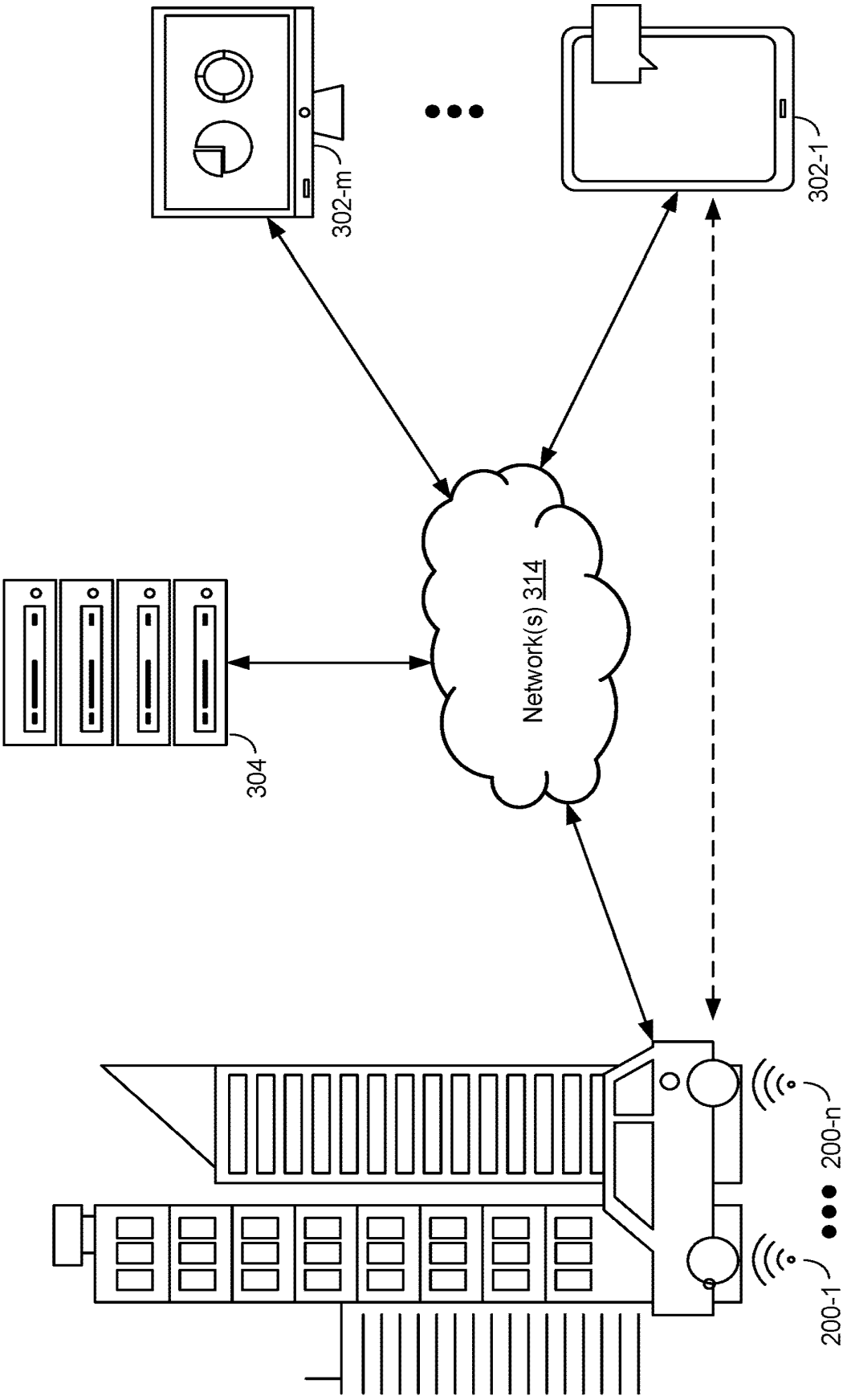


FIG. 3

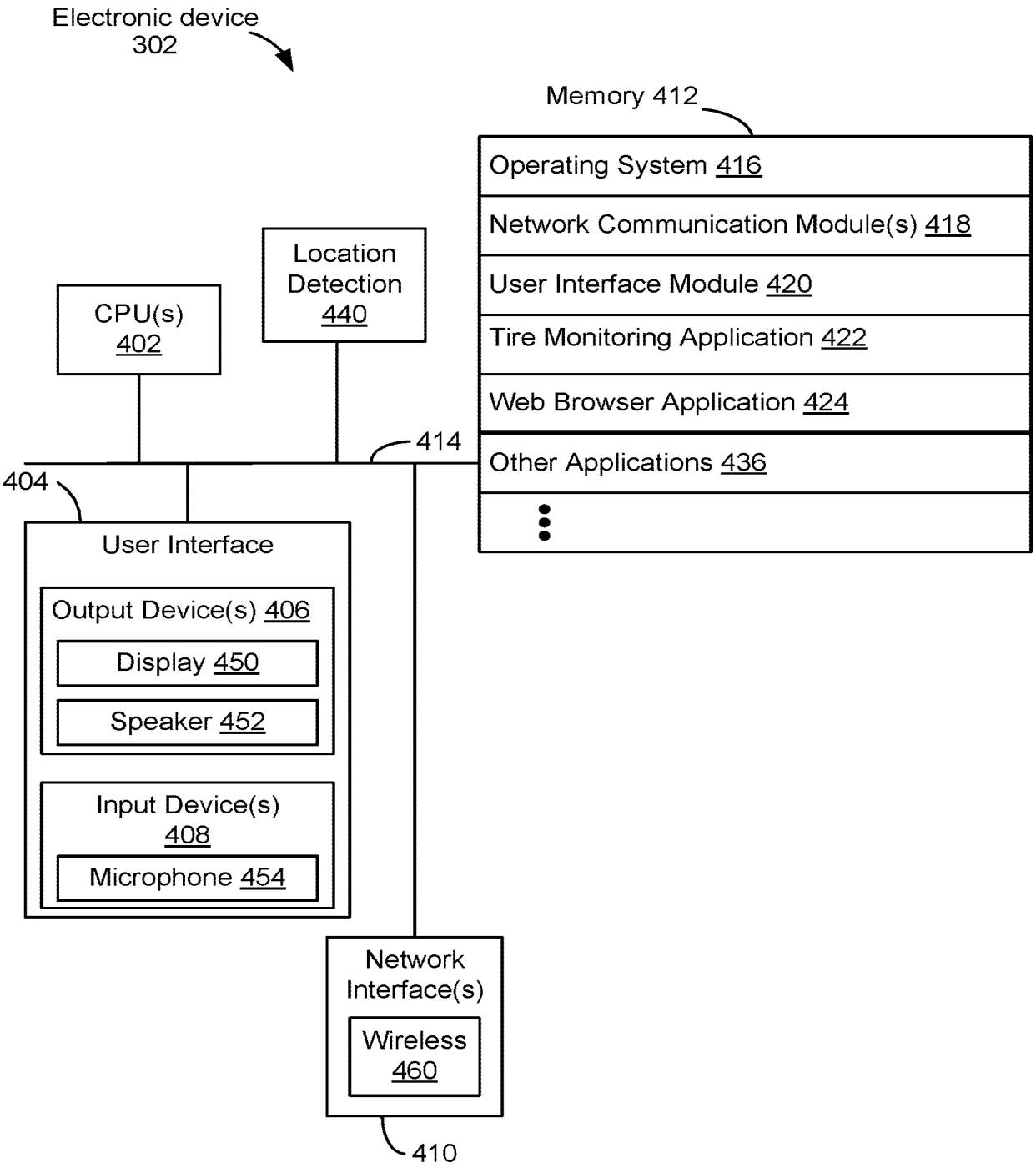

Electronic device
302
Memory 412
Operating System 416
Network Communication Module(s) 418
User Interface Module 420
Tire Monitoring Application 422
Web Browser Application 424
Other Applications 436
Location
Detection
440
CPU(s)
402
414
404
User Interface
Output Device(s) 406
Display 450
Speaker 452
Input Device(s)
408
Microphone 454
Network
Interface(s)
Wireless
460
410

FIG. 4A

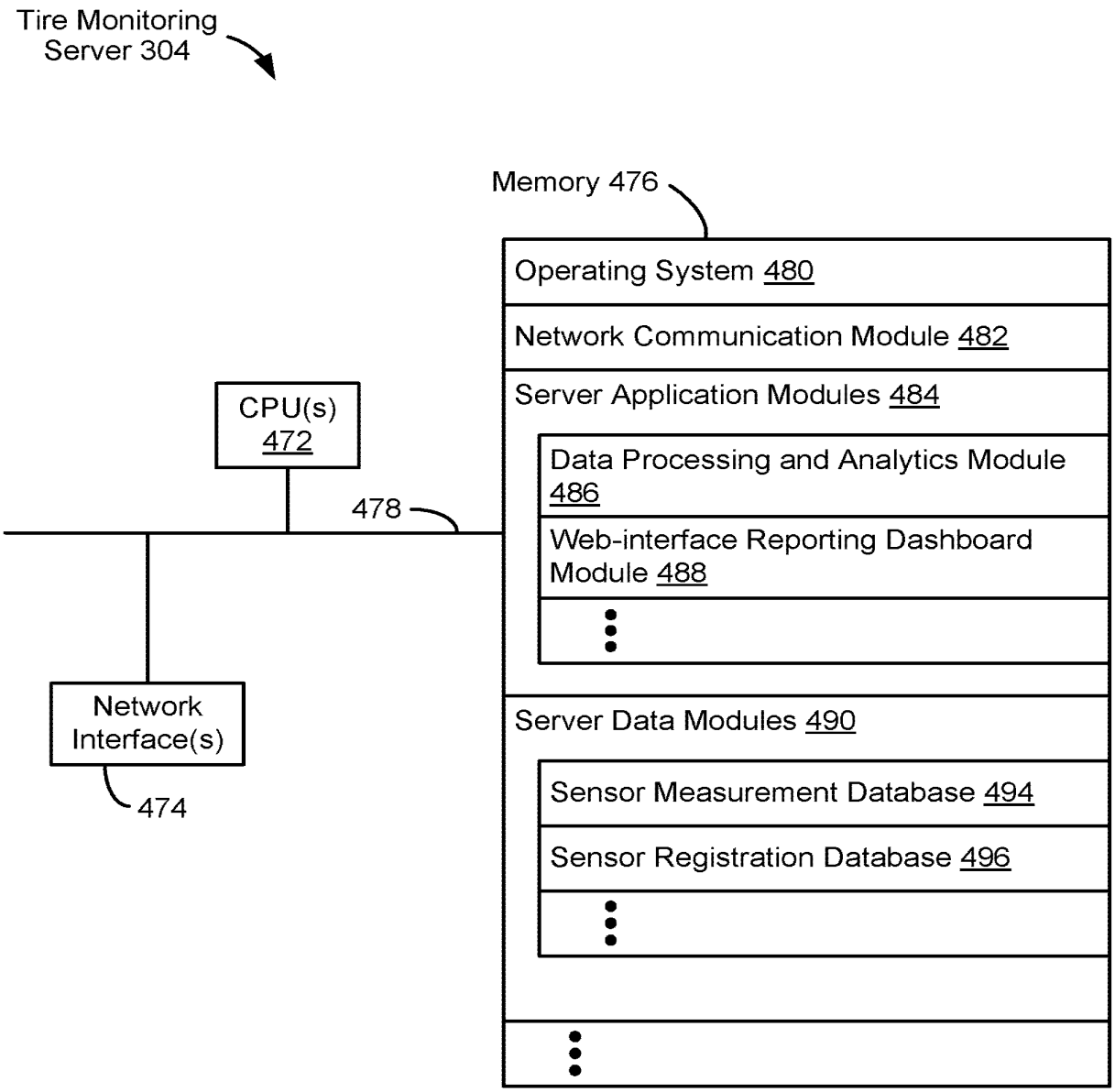

Tire Monitoring Server 304
Memory 476
Operating System 480
Network Communication Module 482
Server Application Modules 484
Data Processing and Analytics Module 486
Web-interface Reporting Dashboard Module 488
Server Data Modules 490
Sensor Measurement Database 494
Sensor Registration Database 496
CPU(s) 472
478
Network Interface(s)
474

FIG. 4B

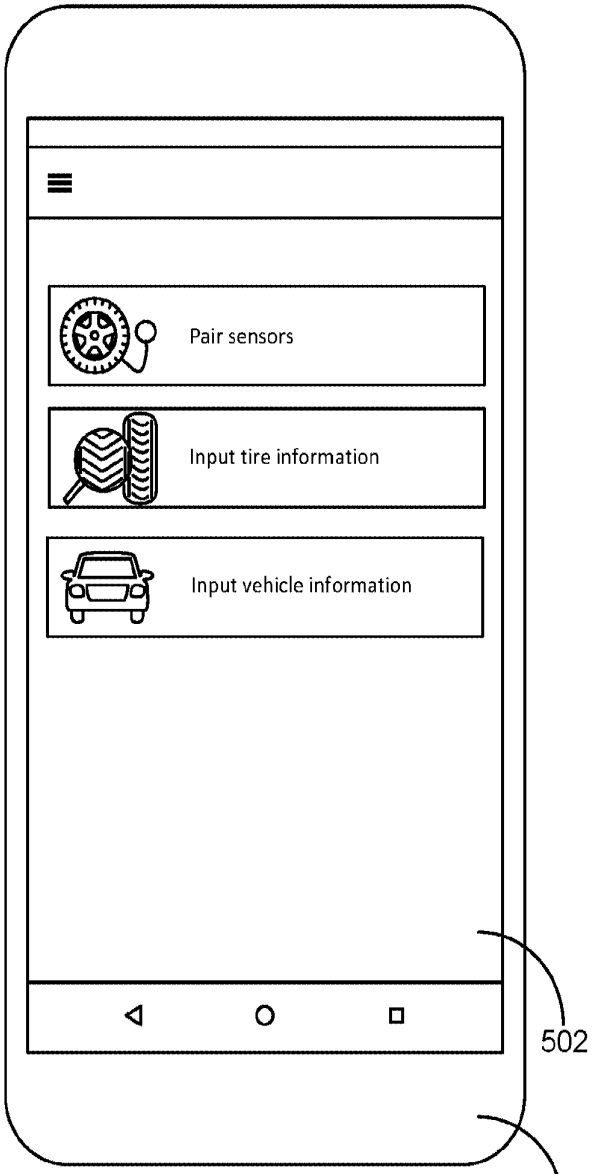


FIG. 5A

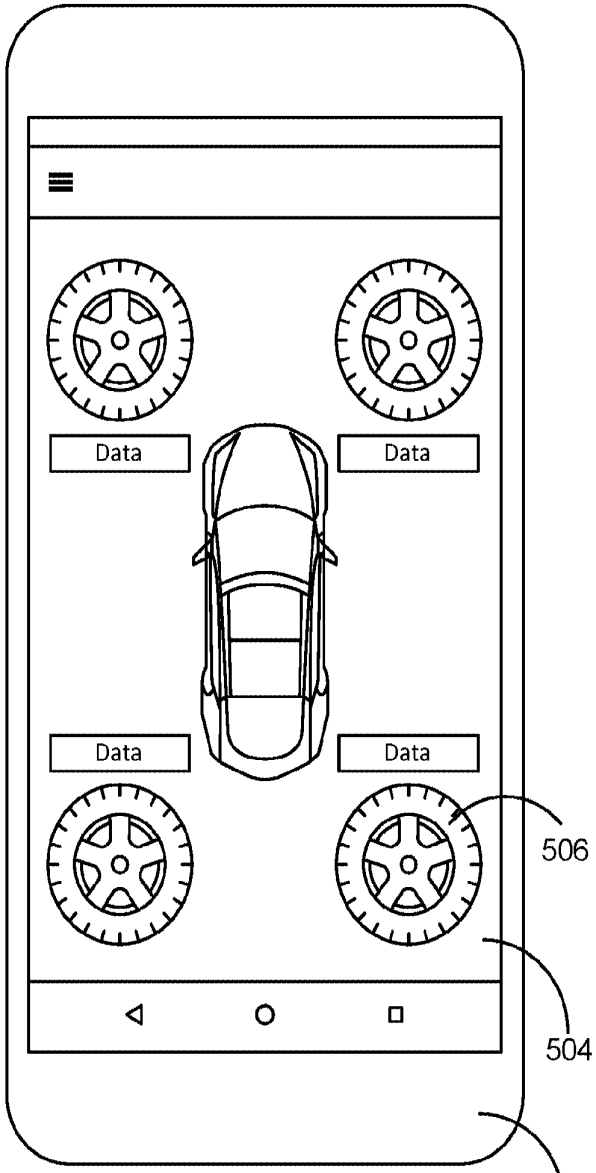


FIG. 5B

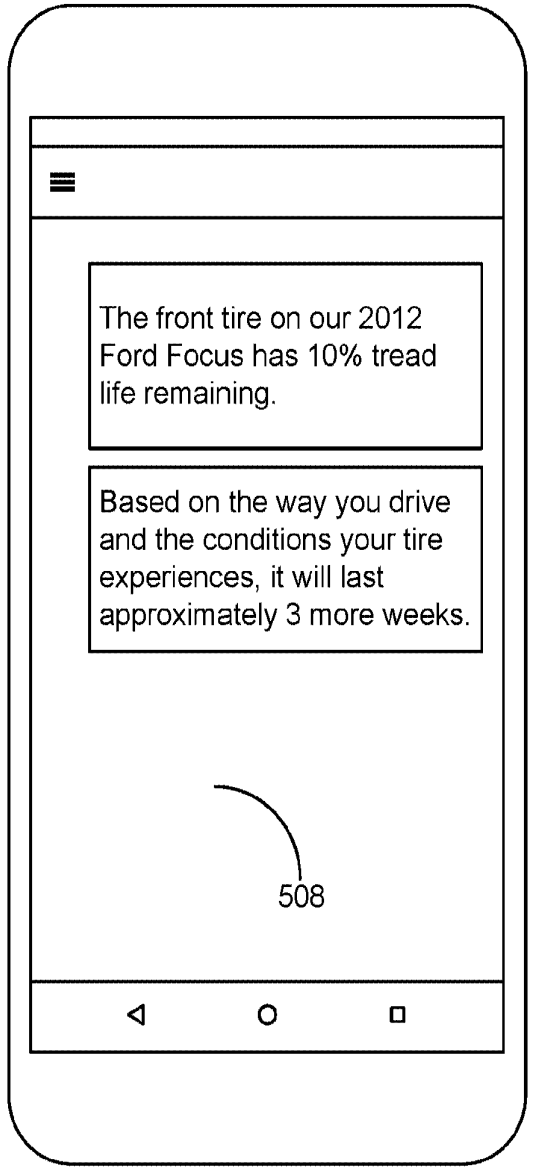
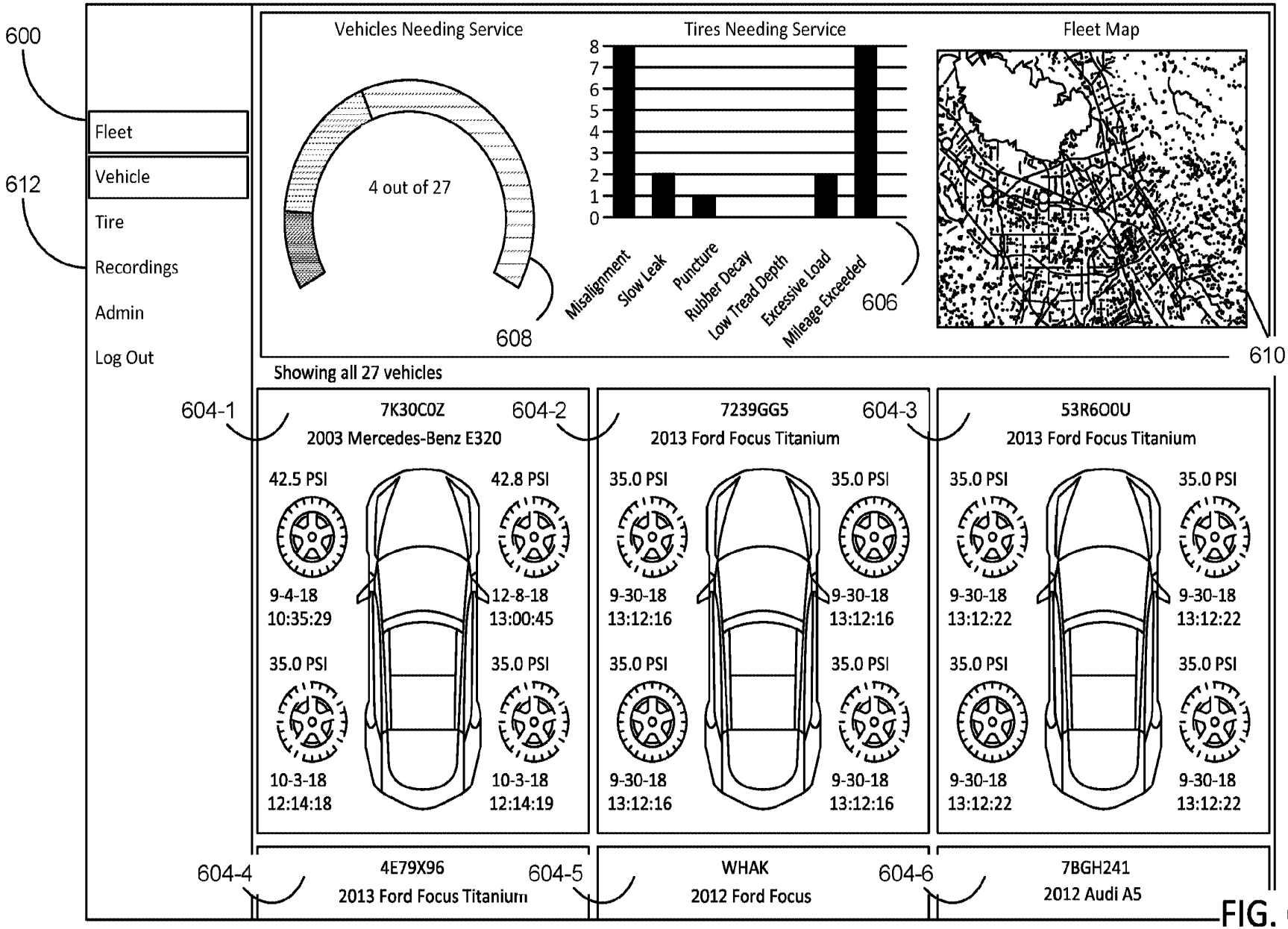


FIG. 5C


600
Fleet
612
Vehicle
Tire
Recordings
Admin
Log Out
Vehicles Needing Service
4 out of 27
608
Tires Needing Service
8
7
6
5
4
3
2
1
0
Misalignment
Slow Leak
Puncture
Rubber Decay
Low Tread Depth
Excessive Load
Mileage Exceeded
606
Fleet Map
610
Showing all 27 vehicles
604-1
7K30C0Z
2003 Mercedes-Benz E320
42.5 PSI
42.8 PSI
9-4-18
10:35:29
12-8-18
13:00:45
35.0 PSI
35.0 PSI
10-3-18
12:14:18
10-3-18
12:14:19
604-2
7239GG5
2013 Ford Focus Titanium
35.0 PSI
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13:12:22
9-30-18
13:12:22
604-4
4E79X96
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604-5
WHAK
2012 Ford Focus
604-6
7BGH241
2012 Audi A5

FIG. 6

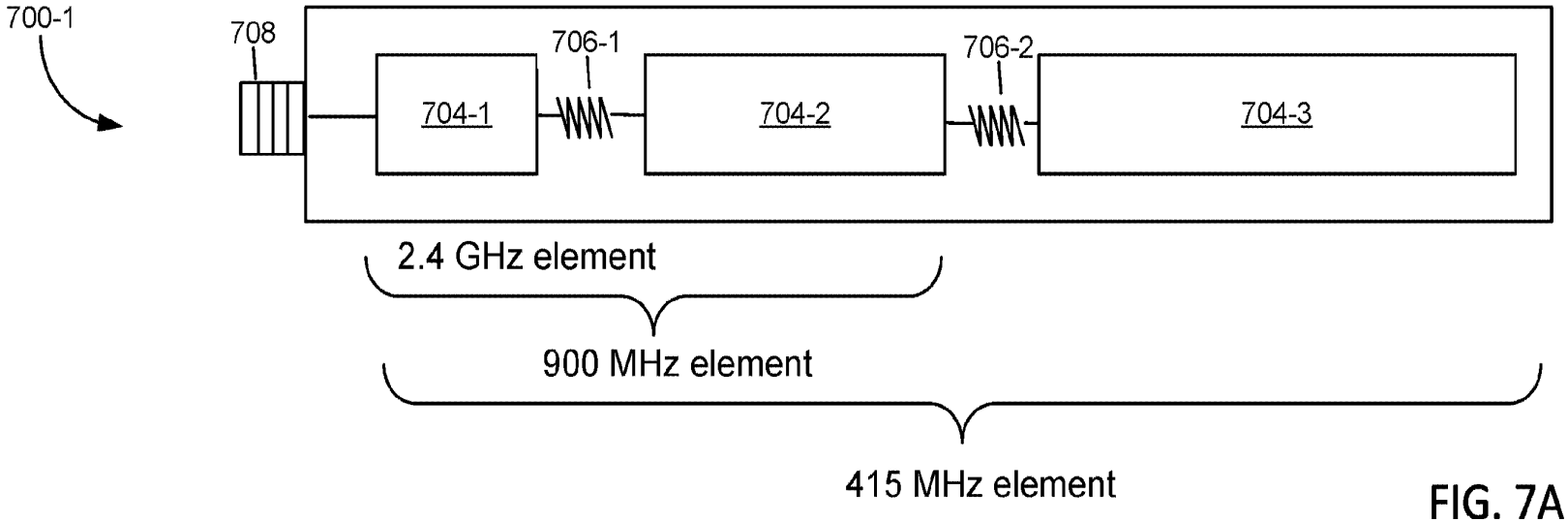

FIG. 7A

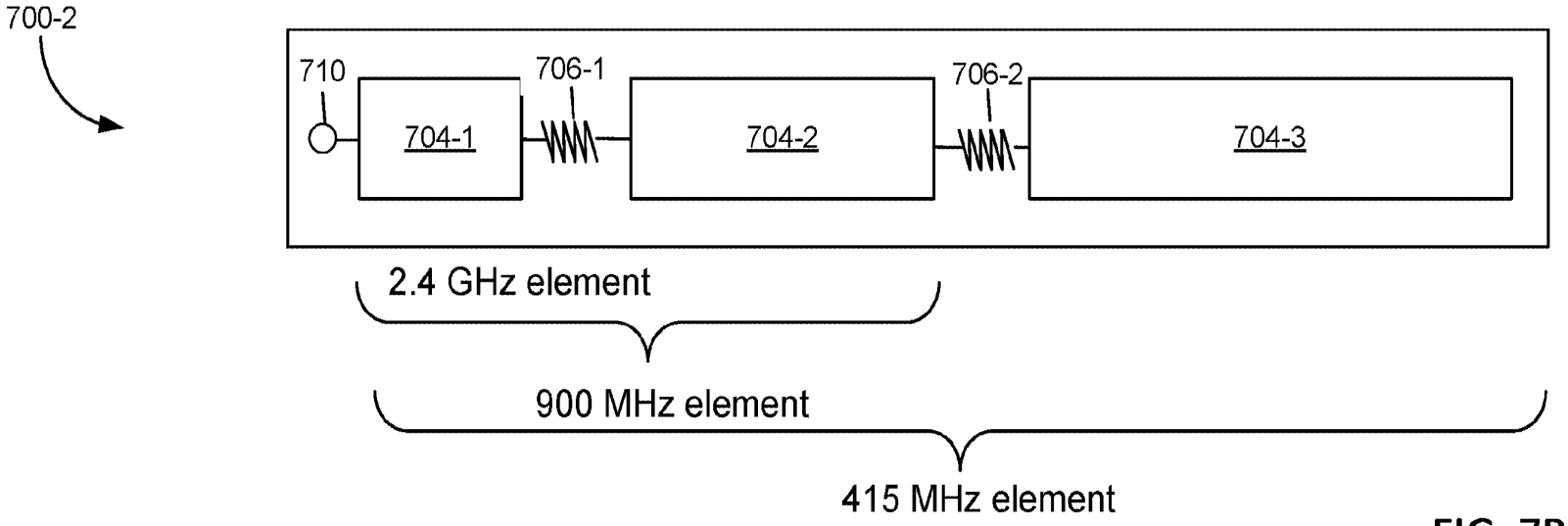

FIG. 7B

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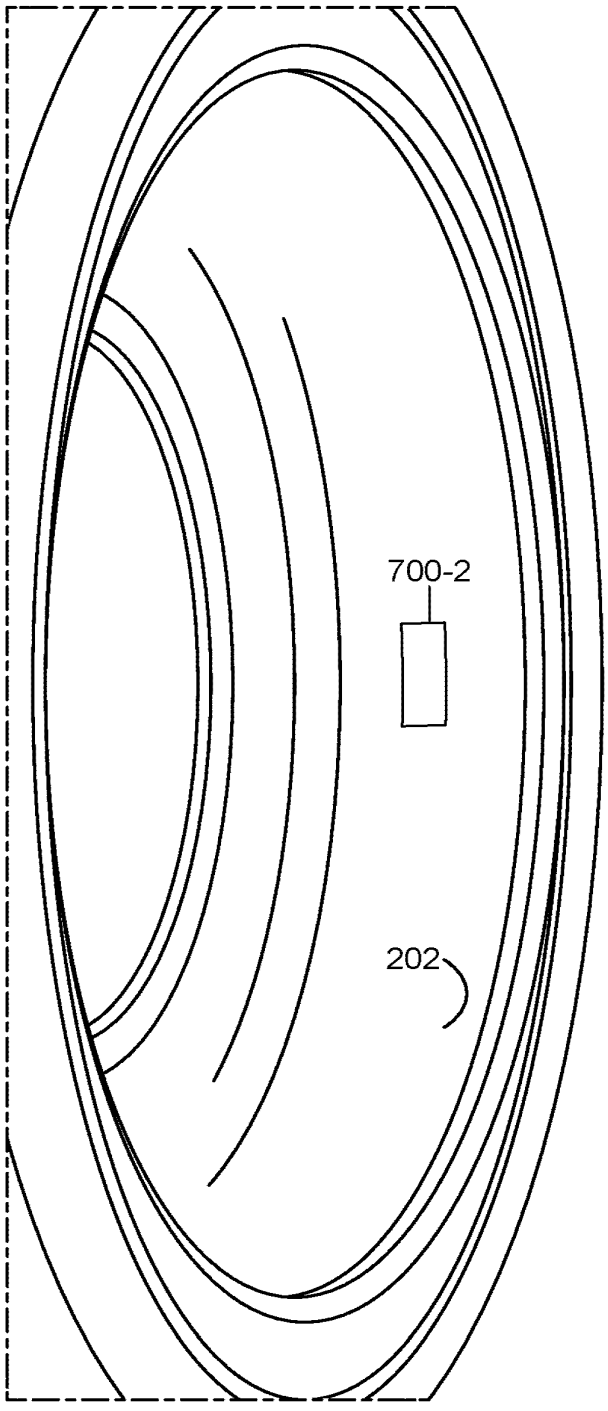

FIG. 7C

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Revvo v. Cerebrum
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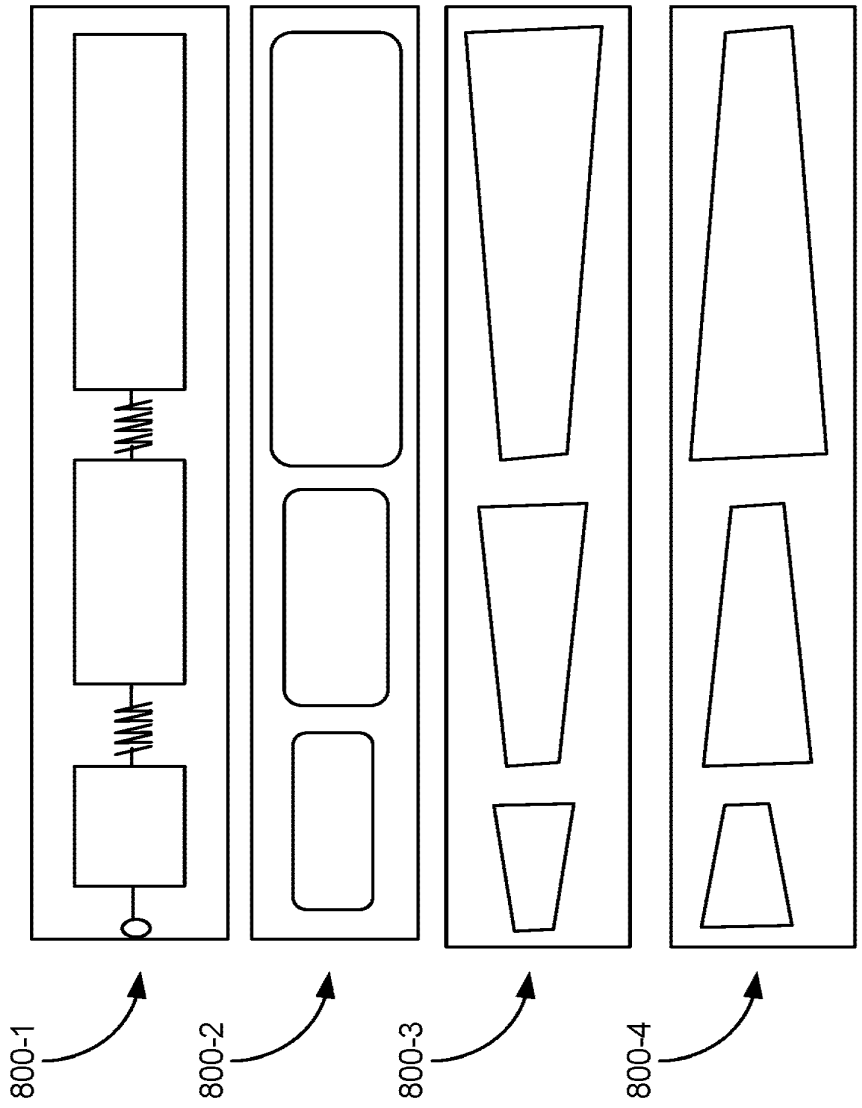

FIG. 8

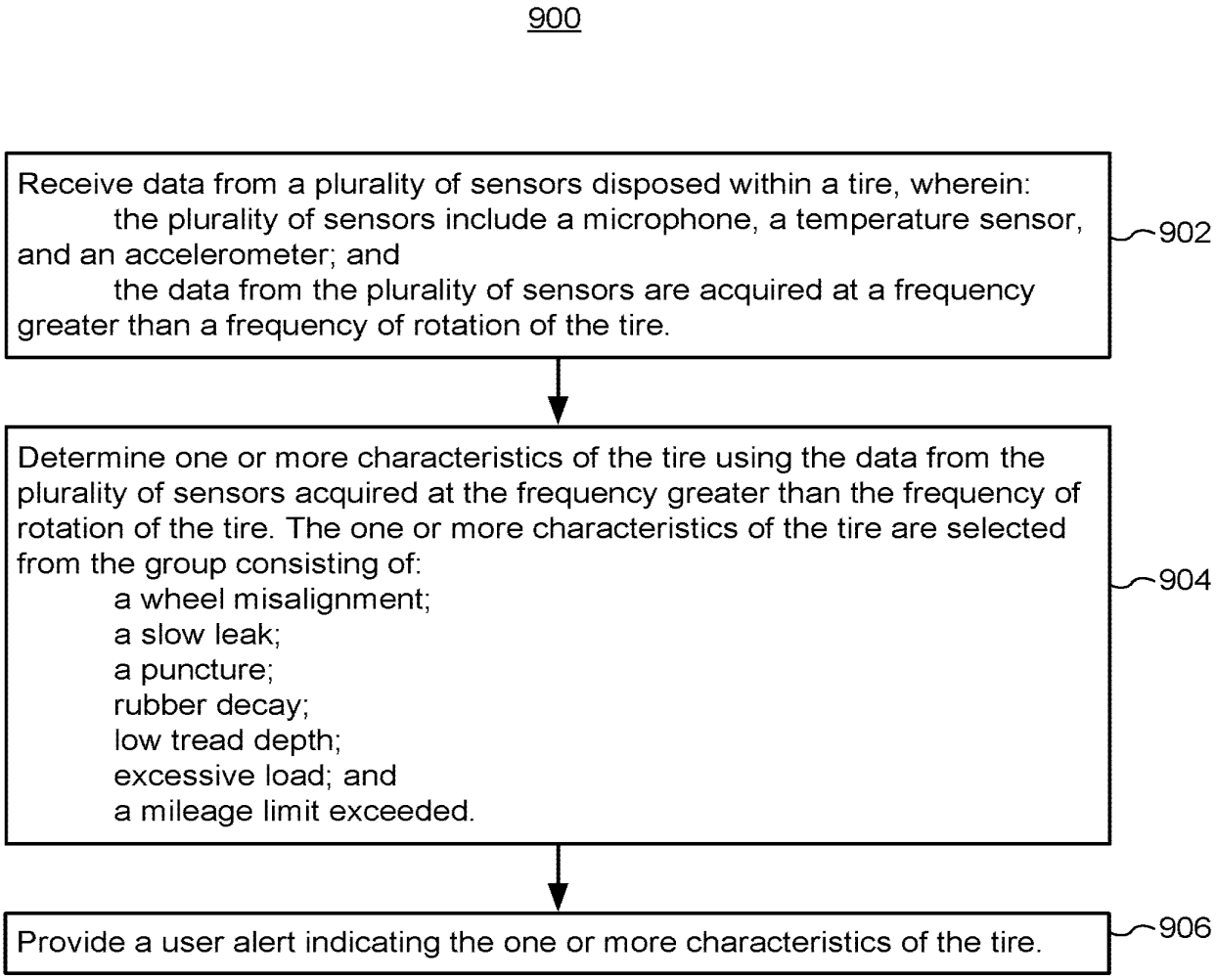
900
Receive data from a plurality of sensors disposed within a tire, wherein:
the plurality of sensors include a microphone, a temperature sensor, and an accelerometer; and
the data from the plurality of sensors are acquired at a frequency greater than a frequency of rotation of the tire.
902
Determine one or more characteristics of the tire using the data from the plurality of sensors acquired at the frequency greater than the frequency of rotation of the tire. The one or more characteristics of the tire are selected from the group consisting of:
a wheel misalignment;
a slow leak;
a puncture;
rubber decay;
low tread depth;
excessive load; and
a mileage limit exceeded.
904
Provide a user alert indicating the one or more characteristics of the tire.
906

FIG. 9

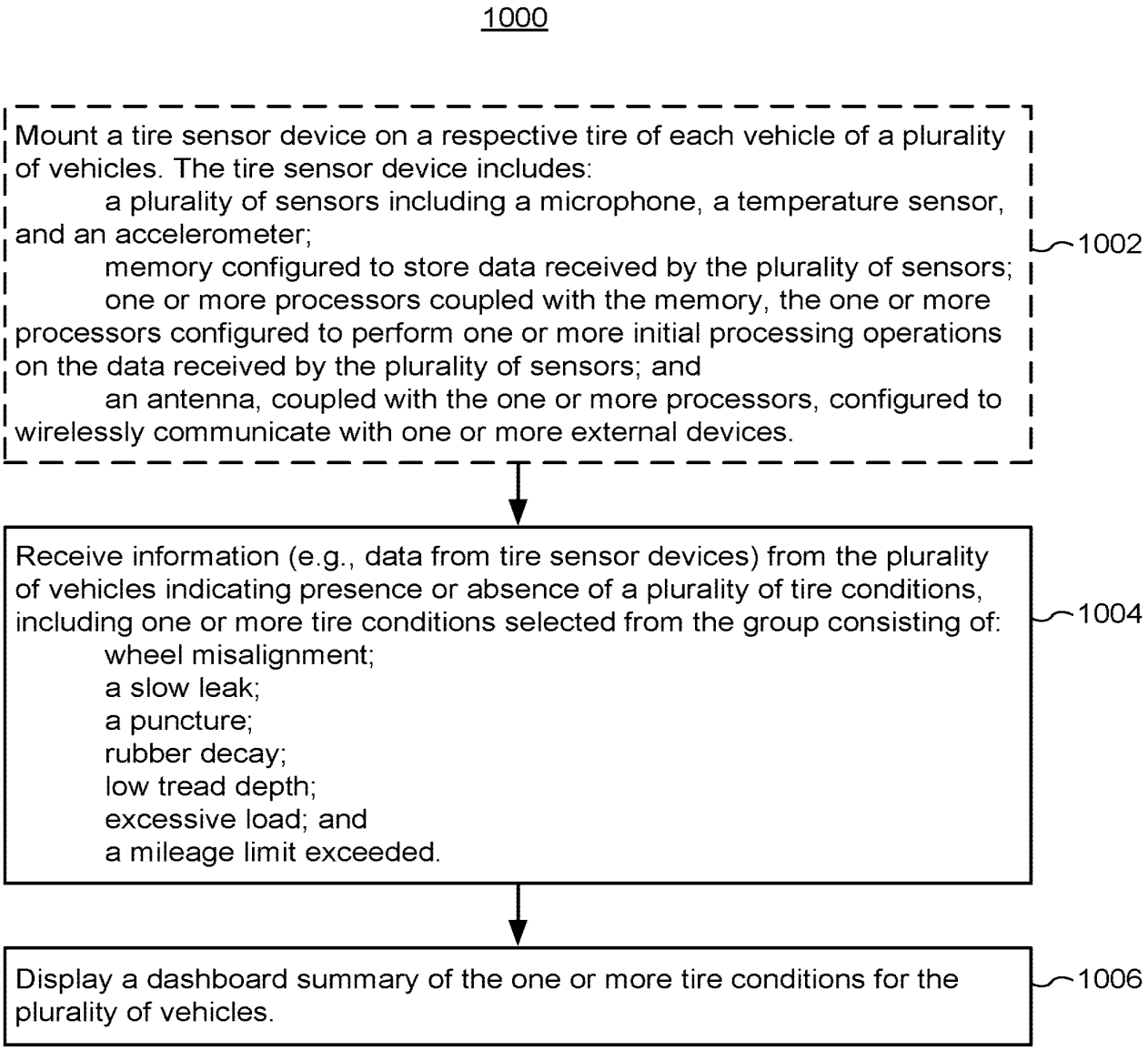
1000
Mount a tire sensor device on a respective tire of each vehicle of a plurality of vehicles. The tire sensor device includes:
a plurality of sensors including a microphone, a temperature sensor, and an accelerometer;
memory configured to store data received by the plurality of sensors;
one or more processors coupled with the memory, the one or more processors configured to perform one or more initial processing operations on the data received by the plurality of sensors; and
an antenna, coupled with the one or more processors, configured to wirelessly communicate with one or more external devices.
1002
Receive information (e.g., data from tire sensor devices) from the plurality of vehicles indicating presence or absence of a plurality of tire conditions, including one or more tire conditions selected from the group consisting of:
wheel misalignment;
a slow leak;
a puncture;
rubber decay;
low tread depth;
excessive load; and
a mileage limit exceeded.
1004
Display a dashboard summary of the one or more tire conditions for the plurality of vehicles.
1006

FIG. 10

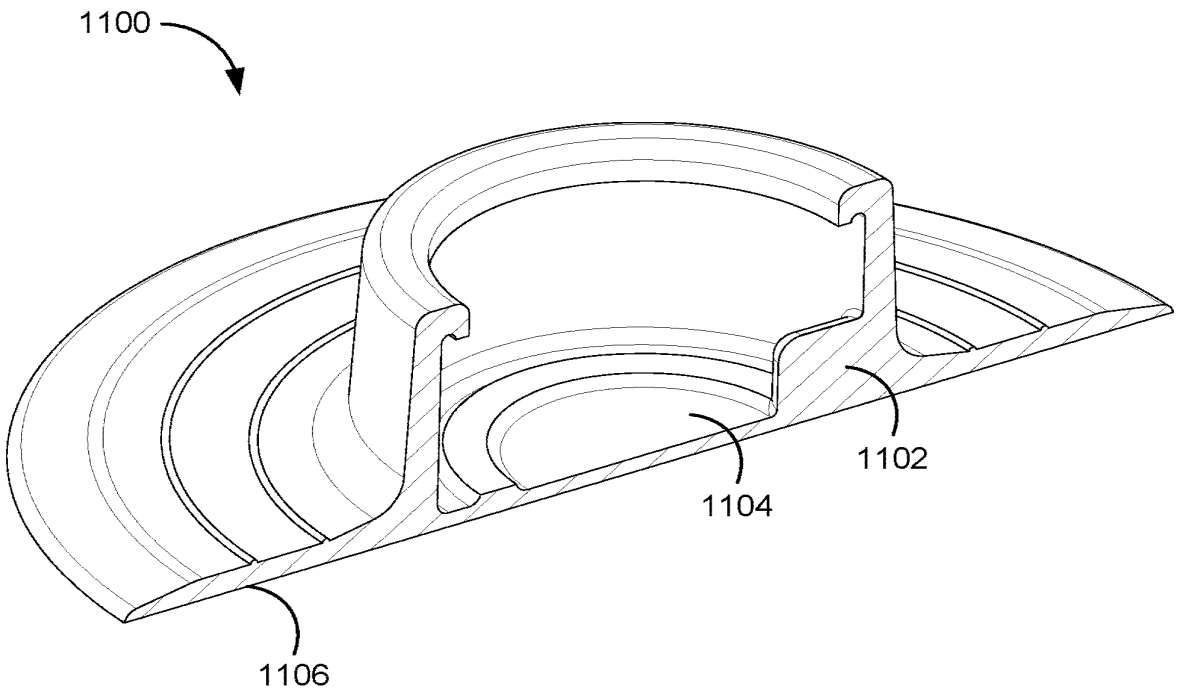

FIG. 11A

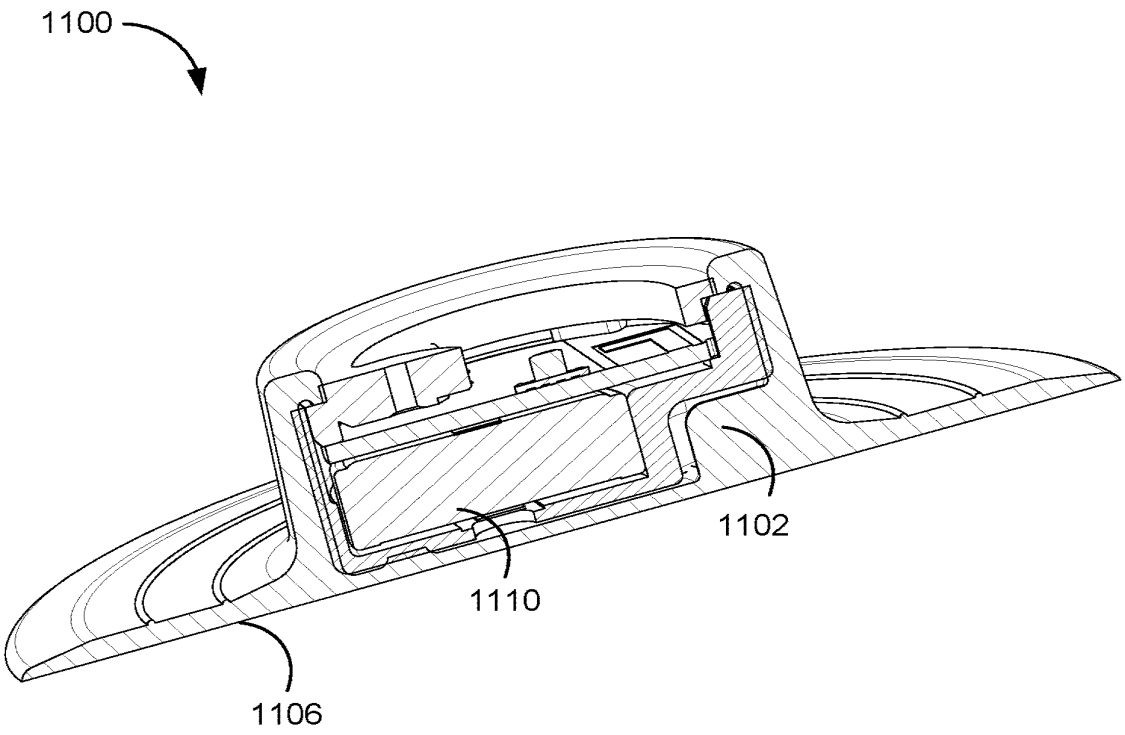

FIG. 11B

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Revvo v. Cerebrum
IPR2025-00632 - Page 368

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US19/46133

A. CLASSIFICATION OF SUBJECT MATTER

IPC - B60C 23/02, 23/06, 23/20 (2019.01)

CPC - B60C 23/0401, 23/0488, 23/0489, 23/061, 23/065

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1711354 B1 (SCHRADER BRIDGEPORT INTERNATIONAL, INC) 22 April 2009; para [0031], [0043], [0044], [0107], [0108], [0136]	9-12, 16, 19
---		---
Y		1-8, 13-15, 17, 18
Y	US 4045738 A (BUZZELL, C) 30 August 1977; column 6, line 16-24	1-8, 18
Y	EP 2266203 B1 (STMICROELECTRONICS SA) 23 May 2012; see machine translation	4, 6, 13, 15
Y	US 7730772 B2 (HONEYWELL INTERNATIONAL INC.) 08 June 2010; column 6, line 6-10	5, 14
Y	US 6105423 A (PROTTEY, F) 22 August 2000; abstract	8, 17

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 October 2019 (14.10.2019)	12DEC 2019
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Shane Thomas Telephone No. PCT Helpdesk: 571-272-4300

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US19/46133

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group I: Claims 1-19; Group II: Claims 20-32

-***-Continued in extra sheet-***-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-19

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US19/46133

-***-Continued from Box No. III - Observations where unity of invention is lacking-***-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-19 are directed towards a tire sensor device comprising an antenna and having dimensions less than 5 cm x 5 cm x 2 cm.
Group II: Claims 20-32 are directed towards a method and computer system providing a user alert indicating characteristics of the tire.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I include at least a tire sensor device comprising: memory configured to store data received by the plurality of sensors; an antenna, coupled with the microprocessor, configured to wirelessly communicate with one or more external devices; wherein the tire sensor device has dimensions less than 5 cm x 5 cm x 2 cm, which are not present in Group II.

The special technical features of Group II include at least a method comprising: a computer system comprising: a display; one or more processors; memory storing instructions for execution by the one or more processors, including instructions for; and non-transitory computer readable storage medium storing instructions, which, when executed by a computer system that includes one or more processors and a display, causes the computer system to, respectively, receiving information from the plurality of vehicles indicating presence or absence of a plurality of tire conditions, including one or more tire conditions selected from the group consisting of: wheel misalignment; a slow leak; a puncture; rubber decay; low tread depth; excessive load; and a mileage limit exceeded; and displaying a dashboard summary, and providing a user alert, of the one or more tire conditions for the plurality of vehicles, which are not present in Group I.

The common technical features shared by Groups I-II are monitoring a condition of a tire; a plurality of sensors including a temperature sensor and an accelerometer; a microprocessor coupled with the memory, the microprocessor configured to perform one or more initial processing operations on the data received by the plurality of sensors, the one or more initial processing operations including determining one or more tire characteristics using data from the plurality of sensors acquired at a frequency greater than a frequency of rotation of the tire.

However, these common features are previously disclosed by EP 1711354 B1 SCHRADER BRIDGEPORT INTERNATIONAL, INC. (hereinafter "SCHRADER"). SCHRADER discloses monitoring a condition of a tire (tire monitoring system; abstract); a plurality of sensors including a temperature sensor (temperature sensor; para [0043]) and an accelerometer (a dual axis accelerometer and determine first acceleration along a first axis and second acceleration a long a second axis; para [0044]); a microprocessor coupled with the memory, the microprocessor configured to perform one or more initial processing operations on the data received by the plurality of sensors (processor operates in response to data and instructions stored in the memory circuit; para [0052]), the one or more initial processing operations including determining one or more tire characteristics using data from the plurality of sensors acquired at a frequency greater than a frequency of rotation of the tire (tire monitor samples the signal sixteen times during a sampling period (initial processing operations determining tire characteristics using data from the sensors acquired at a frequency), where the period is for a shock sensor sample signal that is periodic at the same frequency of rotation of the wheel on which the tire is mounted (greater than a frequency of rotation of the tire); para [0108], [0136]).

Since the common technical features are previously disclosed by SCHRADER, these common features are not special and so Groups I-II lack unity.

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PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20210181063	A1	2021-06-17	DODANI et al.	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2020036859	WO	A1	2020-02-20	REVVO TECHNOLOGIES, INC.		

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

Revvo's Exhibit 1002
Revvo v. Cerebrum
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2855
	Examiner Name	Jenkins, Jermaine L.
	Attorney Docket Number	67838.01000

	1	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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Revvo v. Cerebrum
IPR2025-00632 - Page 373

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-03-28
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 374

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 375

Electronic Acknowledgement Receipt

EFS ID:	47756446
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	67838.01000
Receipt Date:	28-MAR-2023
Filing Date:	29-OCT-2020
Time Stamp:	19:09:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$104
RAM confirmation Number	E20233RJ10236750
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	032823_IDS_as_filed_67273_01000.pdf	1263366 4bcff5b43a1d0fbb524ffa0b13f89d6bb095502d	no	4
Warnings:					
Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Other reference-Patent/Application/ Search Documents	WO2021087391-IPRP1-20220503-1135.pdf	1207967 ee7e895aa564879265cf836a9a8103ca94ce338f	no	14
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	37901 35e735156d55cecee5bdddb7de89643049c3024d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	2509234		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronic Patent Application Fee Transmittal

Application Number:	17084483
Filing Date:	29-Oct-2020
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Filer:	Grant T. Langton/Lauren Coyle
Attorney Docket Number:	67838.01000

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	2806	1	104	104
		Total in USD ($)		**104**

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-22)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1							

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 381

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2855
	Examiner Name	Jenkins, Jermaine L.
	Attorney Docket Number	67838.01000

	1	International Preliminary Report on Patentability dated May 3, 2022 in corresponding International Application No. PCT/US2020/058402 filed October 30, 2020; total 14 pages.

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 382

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2855
Examiner Name	Jenkins, Jermaine L.
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2023-03-28
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Revvo's Exhibit 1002
Revvo v. Cerebrum
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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).

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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.

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 67838-00716	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2020/058402	International filing date *(day/month/year)* 30 October 2020 (30.10.2020)	Priority date *(day/month/year)* 31 October 2019 (31.10.2019)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant FERRY, Keith, George		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 14 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 03 May 2022 (03.05.2022)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Xiaofan Tang e-mail pct.team2@wipo.int

Form PCT/IB/373 (revised January 2020)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: GRANT T. LANGTON
SNELL & WILMER L.L.P.
400 EAST VAN BUREN STREET
ONE ARIZONA CENTER
SUITE 1900
PHOENIX, AZ 85004-2202

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	02 FEB 2021
Applicant's or agent's file reference 67838-00716	**FOR FURTHER ACTION** See paragraph 2 below

International application No	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 20/58402	30 October 2020 (30.10.2020)	31 October 2019 (31.10.2019)

International Patent Classification (IPC) or both national classification and IPC

IPC - B60C 23/00, 23/02, 23/04, 23/20 (2020.01)

CPC - B60C 23/00, 23/0408, 23/0433, 11/243, 11/246, 23/02, 23/04, 23/0493, 23/0452, 23/20; B60G 2204/113, 2400/52, 2800/984; G01M 17/02

Applicant FERRY, KEITH G

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	29 December 2020	Lee Young PCT Help Desk Telephone No. 571-272-4300

Form PCT/ISA/237 (cover sheet) (revised January 2019)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 20/58402

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(b)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

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Revvo v. Cerebrum
IPR2025-00632 - Page 387

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 20/58402

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	2, 5, 9, 10, 14-19, 24-27, 29, 30, 32, 33, 36-40, 44-51, 54-57	YES
	Claims	1, 3, 4, 6-8, 11-13, 20-23, 28, 31, 34, 35, 41-43, 52, 53	NO
Inventive step (IS)	Claims	14, 15, 30, 36, 54	YES
	Claims	1-13, 16-29, 31-35, 37-53, 55-57	NO
Industrial applicability (IA)	Claims	1-57	YES
	Claims	NONE	NO

2. Citations and explanations:
Claims 1, 3, 4, 6-8, 11-13, 20-23, 28, 31, 34, 35, 41-43, 52, and 53 lack novelty under PCT Article 33(2) as being anticipated by US 2019/0184773 A1 to DENSO CORPORATION (hereinafter Denso).

Regarding claim 1, Denso discloses a sensor assembly (2) configured for attachment with an object that is rotated in use (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22), the sensor assembly comprising:
a housing (22fa, 22fab) comprising an outer surface and an internal cavity that is enclosed within the housing (Fig. 3; para [0045]- The housing 22fa is formed of the hollow member that provides the accommodation chamber inside; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab);
an electrical sensor device (22a, 22b) that is disposed within the internal cavity attached therein to prevent movement of the device within the internal cavity (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown); para [0045]- and the housing 22fa is filled with the resin sealing portion 22fb to protect each component of the tire-mounted sensor 2), wherein the electrical sensor device (22) is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with an object and the object is rotated in use (para [0029]- the sensor device 22 includes a sensor chip 22a, a circuit board 22b on which peripheral elements (not shown) and the like are mounted; para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa and a microcomputer 22ab in a molding resin 22ac; para [0031]- The acceleration sensor 22aa corresponds to a vibration detection element for detecting the vibration applied to the corresponding tire 71a to 71d; para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0041]- Each of the vibration transmission members 22e serves to transmit the vibration applied to the corresponding tire 71a to 71d to the sensor chip 22a; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0061] temperature sensor); and a retaining member (21) that is configured to accommodate attachment of the housing therewith (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d, for example, on a back surface of a tread; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22), wherein the retaining member has an outside surface configured for attachment to rotate with the object when the object is rotated in use (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Regarding claim 3, Denso discloses the sensor assembly as recited in claim 1, wherein the housing comprises a top cover, a wall structure, and a base section (22faa) that define the internal cavity (para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber), and wherein the top cover, wall structure and base section may be formed from the same or different materials (para [0048]- The second housing 22fab is made of, for example, resin; para [0047]- The first housing 22faa is made of, for example, a circular resin or the like), and wherein one or more of the top cover, wall section, and base section may separate or integral with one another (para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber).

Regarding claim 4, Denso discloses the sensor assembly as recited in claim 1, wherein one of the top cover or base section is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity (Fig. 3; para [0047]-[0048]- in cooperation with the first housing 22faa... the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber).

Regarding claim 6, Denso discloses the sensor assembly as recited in claim 1, wherein the electrical sensor device is encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical sensor device within the housing (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa and a microcomputer 22ab in a molding resin 22ac; para [0036]- The molding resin 22ac covers the acceleration sensor 22aa and the microcomputer 22ab to protect those components; para [0045]-and the housing 22fa is filled with the resin sealing portion 22fb to protect each component of the tire-mounted sensor 2).
--see Supplemental Box

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 28, as drafted, lacks antecedent basis for "the tire." For purposes of this written opinion "the tire" is taken to read "a tire" in accordance with proper antecedent basis.

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Regarding claim 7, Denso discloses the sensor assembly as recited in claim 1, wherein the housing and retaining member are configured having a complementary shape to facilitate attachment of the housing with the retaining member (Fig. 3; para [0028]- the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22).

Regarding claim 8, Denso discloses the sensor assembly as recited in claim 7, wherein the housing comprises a wall structure that surrounds the internal cavity (Fig. 3; para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber), and wherein the retaining member comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith (Fig. 3; para [0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22).

Regarding claim 11, Denso discloses a sensing system comprising the sensor assembly as recited in claim 1, wherein the sensing system comprises a receiver that is external from the object and that is configured to receive data from the electrical sensor device by wireless communication (Abstract; para [0022]- The receiver 3 and the ECU 5 are fixed to a vehicle body 6 of the vehicle 1; para [0035]- Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit. In the present embodiment, the RF circuit is used as the transmission unit because a signal in an RF band is used).

Regarding claim 12, Denso discloses the sensing system as recited in claim 11, wherein the electrical sensor device comprises an accelerometer sensor connected therewith and is configured to send data from the accelerometer sensor wirelessly to the external receiver (Abstract; para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa; para [0022]- The receiver 3 and the ECU 5 are fixed to a vehicle body 6 of the vehicle 1; para [0035]- Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit. In the present embodiment, the RF circuit is used as the transmission unit because a signal in an RF band is used).

Regarding claim 13, Denso discloses the sensing system as recited in claim 12, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire radial load, vehicle camber and/or toe alignment is determined from the accelerometer sensor data measuring in a radial direction of the vehicle tire (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth of the tire).

Regarding claim 20, Denso discloses the sensor assembly as recited in claim 1, wherein the electrical sensor device (para [0024]- a sensor device 22) comprises: a printed circuit board (22b) comprising electrical circuitry (para [0029]-[0030], [0037]- The circuit board 22b is a board on which the sensor chip 22a, peripheral elements (not shown), and the like are mounted, and is configured by a printed circuit board or the like on which the circuit pattern is formed); a portable power source for providing power to the electrical sensor device (para [0029]- a battery 22c corresponding to a power supply); a least one sensor element (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa); and an antenna for receiving and/or transmitting information from the electrical sensor device (para [0035]- the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit).

Regarding claim 21, Denso discloses the sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of a storage element and a processor (para [0034]- The microcomputer 22ab is a well-known one including a CPU, a ROM, a RAM, an I/O, and the like).

Regarding claim 22, Denso discloses the sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of an accelerometer sensor and a global positioning device (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa).

Regarding claim 23, Denso discloses the sensor assembly as recited in claim 20, wherein the sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object (para [0031]- the acceleration sensor 22aa is disposed to detect an acceleration in accordance with the ground state of the corresponding tire 71a to 71d).

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Regarding claim 28, Denso discloses a sensor assembly (2) and sensing system for rise with an object that rotates in use (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22) comprising: a housing (22fa, 22fab) comprising an outer structure that defines an open internal cavity therein (Fiig. 3; para [0045]- The housing 22fa is formed of the hollow member that provides the accommodation chamber inside; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab), an electrical sensor device disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown); para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber. In addition, the dimension of an opening of the second housing 22fab is reduced on the upper surface side), wherein the electrical sensor device is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location (para [0029]- the sensor device 22 includes a sensor chip 22a, a circuit board 22b on which peripheral elements (not shown) and the like are mounted; para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa and a microcomputer 22ab in a molding resin 22ac; para [0031]- The acceleration sensor 22aa corresponds to a vibration detection element for detecting the vibration applied to the corresponding tire 71a to 71d; para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0041]- Each of the vibration transmission members 22e serves to transmit the vibration applied to the corresponding tire 71a to 71d to the sensor chip 22a; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit), wherein the electrical sensor device comprises:
a portable power source (para [0029]- a battery 22c corresponding to a power supply);
a sensor (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa); and
an antenna (22d) for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor (para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit); a retaining member (21) having an outside surface configured for attaching with a surface of the object or an element connected with the object to rotate with the object in use (Fig. 3; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like), wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the retaining member (Fig. 3; para [0027]-[0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22); and a receiver external from the vehicle tire that is configured to receive information from the electrical sensor device wirelessly (para [0022]- The receiver 3 and the ECU 5 are fixed to a vehicle body 6 of the vehicle 1; para [0035]- Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit. In the present embodiment, the RF circuit is used as the transmission unit because a signal in an RF band is used).

Regarding claim 31, Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein one of the top cover (22fab) or the bottom section (22faa) are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity (para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab; para [0047]- The first housing 22faa is made of, for example, a circular resin or the like. The first housing 22faa is disposed adjacent to the rear surface of the tread of the corresponding tire 71a to 71d than the second housing 22fab, and is brought into contact with the bottom portion 21a of the rubber bracket 21; para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa).

Regarding claim 34, Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises an accelerometer sensor and is configured to send data from the accelerometer sensor wirelessly to the external receiver (para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit).

Regarding claim 35, Denso discloses the sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and the system is configured to determine one or more parameters consisting of a tire diameter, a tire tread depth, a tire radial load, and vehicle camber and/or toe alignment from the accelerometer sensor data (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth of the tire).

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Regarding claim 41, Denso discloses a method for using a sensor assembly and sensing system with an object that rotates in use (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22) comprising the steps of: installing an electrical sensor device within an internal cavity of a housing (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown)), wherein the housing includes an outer structure that defines the internal cavity (Fig. 3; para [0045]- The housing 22fa is formed of the hollow member that provides the accommodation chamber inside; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab), and wherein the electrical sensor device comprises a sensor (22aa), a portable power source (22c), an antenna (22d), a printed circuit board (22b), and related electrical circuitry (para [0029]-[0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa; para [0029]- a battery 22c corresponding to a power supply; para [0035]- the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0037]- The circuit board 22b is a board on which the sensor chip 22a, peripheral elements (not shown), and the like are mounted, and is configured by a printed circuit board or the like on which the circuit pattern is formed); attaching the housing after the step of installing to a retaining member (Fig. 3; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like, and the holding portion 21b extends from the other surface of the bottom portion 21a opposite to the one surface to be adhered to the corresponding tire 71a to 71d), wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like), wherein the retaining member is connected with the object before or after formation of the object (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like); and monitoring an operating parameter of the object through the use of the electrical sensing device (para [0031]- the acceleration sensor 22aa is disposed to detect an acceleration in accordance with the ground state of the corresponding tire 71a to 71d; para [0091]), wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly (para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0091]).

Regarding claim 42, Denso discloses the method as recited in claim 41, wherein during the step of installing, the housing includes a wall structure having an opening through which the electrical sensor device is installed (Fig. 3; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab; para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa...Also, the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber) and, after the step of installing, the opening is closed by attaching a top cover or bottom section to the opening (Fig. 3; para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa...Also, the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber).

Regarding claim 43, Denso discloses the method as recited in claim 41, wherein during the step of installing, the electrical sensor device is attached in place within the internal cavity by contact between the electrical sensor device and one or more surface features in the internal cavity (see Fig. 3, elements 22b and 22fab; para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface; para [0029]- a circuit board 22b on which peripheral elements (not shown) and the like are mounted).

Regarding claim 52, Denso discloses the method as recited in claim 41, wherein the sensor assembly electrical sensor device comprises an accelerometer sensor (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa).

Regarding claim 53, Denso discloses the method as recited in claim 52, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein during the step of monitoring, on or more of a tire outside diameter, a tire tread depth, a tire radial load, and a vehicle camber and/or toe alignment parameter is determined from information sent wirelessly from the sensor assembly (para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0091] groove depth of the tire).

Claims 2, 5, 9, 32, 33, and 50 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2018/0186200 A1 to PIRELLI TYRE S.P. A. (hereinafter Pirelli).

Regarding claim 2, Denso discloses the sensor assembly as recited in claim 1, Denso does not disclose wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member. However, Pirelli, drawn to tire monitoring device, discloses, wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member (para [0172], para [0194]- graphical signs 67 are predisposed on the top of the hooping member 63, such graphical signs 67 allowing a correct orientation of the monitoring device 10 during the fastening operation). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso display features or indicia that are viewable to a user to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]). --see next page

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Regarding claim 5, Denso discloses the sensor assembly as recited in claim 1, wherein the electrical sensor device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical sensor device to retain its position therein (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown); para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber. In addition, the dimension of an opening of the second housing 22fab is reduced on the upper surface side). Denso does not disclose wherein there is open space above and below the electrical sensor device within the internal cavity. However, Pirelli discloses wherein there is open space above and below the electrical sensor device within the internal cavity (Fig. 2d; para [0127]-[0128]- the housing cavity has size such to ensure the formation of at least one interspace between the outer surface of the electronic unit 20 (in particular the containment body 26 thereof) and the inner walls of said connecting member 30 defining said housing cavity). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso open space above and below the electrical sensor device within the internal cavity to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 9, Denso discloses the sensor assembly as recited in claim 1, wherein the retaining member is formed from an elastically deformable rubber (para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- The holding portion 21b is also made of an elastically deformable rubber or the like), when the retaining member is attached to the object and the housing is attached to the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22; para [0027]-[0028]- The holding portion 21b is formed of, for example, a cylindrical member having a hollow portion into which the sensor device 22 is fitted). Denso does not disclose an elastomeric material that mitigates transmission of shock forces from the object to the housing. However, Pirelli discloses an elastomeric material that mitigates transmission of shock forces from the object to the housing (para [0010]- describe monitoring devices equipped with particular members for connecting to the tyre, such connecting members provided with a cavity inside of which the electronic unit is housed; para [0011]- The Applicant found that the presence of two portions separated from each other allows distributing and dampening in a particularly effective manner the deformations caused by the stresses transmitted to the deformation member by the tyre during rolling (also at high and very high speed); para [0125]- Preferably the connecting member 30 is made of elastomeric material). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso an elastomeric material that mitigates transmission of shock forces from the object to the housing to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 32, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose wherein open space exists above and below the electrical sensor device when disposed within the internal cavity. However, Pirelli discloses wherein open space exists above and below the electrical sensor device when disposed within the internal cavity (para [0128]- the housing cavity has size such to ensure the formation of at least one interspace between the outer surface of the electronic unit 20 (in particular the containment body 26 thereof) and the inner walls of said connecting member 30 defining said housing cavity). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso open space above and below the electrical sensor device within the internal cavity to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 33, Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein the retaining member is formed from an elastically deformable rubber (para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- The holding portion 21b is also made of an elastically deformable rubber or the like), the housing attached with the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22; para [0028]- The holding portion 21b is formed of, for example, a cylindrical member having a hollow portion into which the sensor device 22 is fitted). Denso does not disclose an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching. However, Pirelli discloses an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching (para [0010]- describe monitoring devices equipped with particular members for connecting to the tyre, such connecting members provided with a cavity inside of which the electronic unit is housed; para [0011]- The Applicant found that the presence of two portions separated from each other allows distributing and dampening in a particularly effective manner the deformations caused by the stresses transmitted to the deformation member by the tyre during rolling (also at high and very high speed); para [0125]- Preferably the connecting member 30 is made of elastomeric material). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso an elastomeric material that mitigates transmission of shock forces from the object when attached to the object before reaching to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 50, Denso discloses the method as recited in claim 41, wherein during the step of attaching (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d), the housing is positioned relative to the retaining member (para [0028]- the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22). Denso does not disclose according to a display feature that is positioned on the housing.
Pirelli discloses according to a display feature that is positioned on the housing (para [0172], [0194]- graphical signs 67 are predisposed on the top of the hooping member 63, such graphical signs 67 allowing a correct orientation of the monitoring device 10 during the fastening operation). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso according to a display feature that is positioned on the housing to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

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Claim 10 lacks an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2011/0025487 A1 to Laird et al. (hereinafter Laird).

Regarding claim 10, Denso discloses the sensor assembly as recited in claim 1. Denso does not disclose wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device. However, Laird, drawn to tire pressure sensor, discloses, wherein the housing includes an opening through the outside surface to the internal cavity (para [0004]- some tire pressure sensors have a housing for encasing the sensor electronic components and circuitry. An opening is provided in the housing), and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device (para [0004]- some tire pressure sensors have a housing for encasing the sensor electronic components and circuitry. An opening is provided in the housing, and a filter covers the opening. The filter permits only gases (e.g. the tire's pressurized air), and not liquids). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the housing includes an opening through the outside surface to the internal cavity, and a filter that is positioned to filter air passing into the internal cavity to prevent damage to the sensor electronic components and circuitry in the housing as disclosed in Laird (see Laird, para [0004]).

Claims 16, 17, 37, 38, and 55 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2019/0187027 A1 to The Goodyear Tire & Rubber Company (hereinafter Goodyear).

Regarding claim 16, Denso discloses the sensing system as recited in claim 11. Denso does not disclose wherein the electrical sensor device comprises a global positioning device. However, Goodyear, drawn to integrated tire sensor, discloses, wherein the electrical sensor device comprises a global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a global positioning device to reduce cost and complexity as disclosed in Goodyear (see Goodyear, para [0006]).

Regarding claim 17, Denso in view of Goodyear discloses the sensing system as recited in claim 16, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and Goodyear discloses a location of the vehicle tire is determined from information provided by the global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed).

Regarding claim 37, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose wherein the electrical sensor device comprises a global positioning device. However, Goodyear discloses wherein the electrical sensor device comprises a global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a global positioning device to reduce cost and complexity as disclosed in Goodyear (see Goodyear, para [0006]).

Regarding claim 38, Denso in view of Goodyear discloses the sensor assembly and sensing system as recited in claim 37. Goodyear furhter discloses the system is configured to determine a location of the vehicle tire from information provided by the global positioning device (Abstract; para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed).

Regarding claim 55, Denso discloses the method as recited in claim 41, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), but fails to disclose the electrical sensor device comprises a global positioning device. Goodyear discloses wherein the object is a vehicle tire and teh electrical sensor device comprises a global positioning device (para [0039] - In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed), and wherein the step of monitoring a location of the tire is determined from information provided by the global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a global positioning device, and monitoring a location of the tire is determined from information provided to reduce cost and complexity as disclosed in Goodyear (see Goodyear, para [0006]).

Claims 18, 19, 29, 39, 40, 51, 56, and 57 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2016/0332493 A1 to Semiconductor Energy Laboratory Co., Ltd. (hereinafter SEL).

Regarding claim 18, Denso discloses the sensing system as recited in claim 11. Denso does not disclose wherein the electrical sensor device comprises a gyroscope. However, SEL, drawn to semiconductor device, discloses, wherein the electrical sensor device comprises a gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0107]- Examples of an object having a sealed space include a tire). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a gyroscope to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

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Box V.2 (Citations and Explanations)

Regarding claim 19, Denso in view of SEL discloses the sensing system as recited in claim 18, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and information is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). SEL discloses information from the gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0082]- the semiconductor device 400 includes three sensors, the sensor elements 412 to 414. For example, the sensor elements 412 to 414 can each include a sensor selected from a pressure sensor, a temperature sensor, a strain sensor, an acceleration sensor, and the like. One sensor element can have a plurality of functions).

Regarding claim 29, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose comprising an external transmitter for sending information wirelessly to the electronic sensor device. However, SEL discloses an external transmitter for sending information wirelessly to the electronic sensor device (para [0078]- the semiconductor device 400 preferably includes an antenna 401 and sensor elements 412 to 414; para [0083]- The antenna 401 is capable of converting a wireless signal into an electric signal or converting an electric signal into a wireless signal to receive and transmit a signal from/to an external terminal such as an interrogator). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso an external transmitter for sending information wirelessly to the electronic sensor device to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 39, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose wherein the electrical sensor device comprises a gyroscope. However, SEL discloses wherein the electrical sensor device comprises a gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0107]- Examples of an object having a sealed space include a tire). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a gyroscope to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 40, Denso in view of SEL discloses the sensing system as recited in claim 39, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and information is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). SEL discloses information from the gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0082]- the semiconductor device 400 includes three sensors, the sensor elements 412 to 414. For example, the sensor elements 412 to 414 can each include a sensor selected from a pressure sensor, a temperature sensor, a strain sensor, an acceleration sensor, and the like. One sensor element can have a plurality of functions).

Regarding claim 51, Denso discloses the method as recited in claim 41, wherein during the step of monitoring, the sensor monitors operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna information related to the monitored operating parameter to the receiver (para [0031]- The acceleration sensor 22aa corresponds to a vibration detection element for detecting the vibration applied to the corresponding tire 71a to 71d; para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0041]- Each of the vibration transmission members 22e serves to transmit the vibration applied to the corresponding tire 71a to 71d to the sensor chip 22a; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit). Denso does not disclose wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device. However, SEL discloses wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device (para [0078]- the semiconductor device 400 preferably includes an antenna 401 and sensor elements 412 to 414; para [0083]- The antenna 401 is capable of converting a wireless signal into an electric signal or converting an electric signal into a wireless signal to receive and transmit a signal from/to an external terminal such as an interrogator; para [0111]- The interrogator includes an antenna and a circuit portion. The circuit portion preferably includes a radio wave interface and a control system. The interrogator may further include an operation portion. For example, the operation portion may include an input button, a touch panel, and the like). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso receive information transmitted from an external device to change one or more feature of the electrical sensor device to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

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Regarding claim 56, Denso discloses the method as recited in claim 41. Denso does not disclose wherein the electrical sensor device comprises a gyroscope. However, SEL discloses wherein the electrical sensor device comprises a gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0107]- Examples of an object having a sealed space include a tire).
It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a gyroscope to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 57, Denso in view of SEL discloses the sensing system as recited in claim 56. Denso discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and information is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). SEL discloses information from the gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0082]- the semiconductor device 400 includes three sensors, the sensor elements 412 to 414. For example, the sensor elements 412 to 414 can each include a sensor selected from a pressure sensor, a temperature sensor, a strain sensor, an acceleration sensor, and the like. One sensor element can have a plurality of functions).

Claims 24, 27, and 44-49 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2019/0160895 A1 to Hankook Tire Co., Ltd. (hereinafter Hankook).

Regarding claim 24, Denso discloses the sensor assembly as recited in claim 20, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein the retaining member is attached to an inside surface of the vehicle tire or an element attached with the tire that rotates with the tire (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0027]). Denso does not disclose vulcanized rubber tire. However, Hankook, drawn to container structure for sensors, discloses, a vulcanized rubber tire (para [0107]- a method of manufacturing a tire-integrated container structure according to an embodiment can perform a step of preparing a vulcanized tire (S110)).
It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a vulcanized rubber tire to prevent breakdown of a sensor due to high temperature as disclosed in Hankook (see Hankook, para [0010]).

Regarding claim 27, Denso in view of Hankook discloses the sensor assembly as recited in claim 24, Denso further discloses wherein the retaining member is attached to the inside surface of the vehicle tire by an adhesive layer (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like). Hankook discloses after the vehicle tire has been vulcanized (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130)).

Regarding claim 44, Denso discloses the method as recited in claim 41. Denso does not disclose wherein the object is a made from vulcanized rubber, and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object after the object has been formed. However, Hankook discloses wherein the object is a made from vulcanized rubber (para [0107]- a method of manufacturing a tire-integrated container structure according to an embodiment can perform a step of preparing a vulcanized tire (S110)), and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object after the object has been formed (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130)). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the object is a made from vulcanized rubber to prevent breakdown of a sensor due to high temperature as disclosed in Hankook (see Hankook, para [0010]).

Regarding claim 45, Denso in view of Hankook discloses the method as recited in claim 44, Denso further discloses wherein the retaining member is attached to a surface of the object by use of an adhesive layer (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Regarding claim 46, Denso in view of Hankook discloses the method as recited in claim 45, Denso further discloses wherein the retaining member is attached to the object after the step of attaching the housing to the retaining member (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0050]- The tire-mounted sensor 2 configured as described above is provided by, for example, pushing out the hollow portion of the rubber bracket 21 by elastic deformation and disposing the sensor device 22 in a space surrounded by the rubber bracket 21. Then, in this state, the adhesive 23 is applied to the back surface of the bottom portion 21a of the rubber bracket 21, and the tire-mounted sensor 2 is attached to the inner wall surface of the corresponding tire 71a to 71d).

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Regarding claim 47, Denso in view of Hankook discloses the method as recited in claim 45, Denso further discloses wherein the retaining member is attached to the object (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0027]). While neither Denso nor Hankook specifically discloses by applying hand pressure onto the retaining member once placed into contact with the surface of the object to cause the adhesive layer to form an attachment therebetween, it would have been obvious to one of ordinary skill in the art based on optimization that applying hand pressure onto the retaining member once placed into contact with the surface of the object (para [0050]- The tire-mounted sensor 2 configured as described above is provided by, for example, pushing out the hollow portion of the rubber bracket 21 by elastic deformation and disposing the sensor device 22 in a space surrounded by the rubber bracket 21. Then, in this state, the adhesive 23 is applied to the back surface of the bottom portion 21a of the rubber bracket 21, and the tire-mounted sensor 2 is attached to the inner wall surface of the corresponding tire 71a to 71d) would cause the adhesive layer to form an attachment therebetween.

Regarding claim 48, Denso in view of Hankook discloses the method as recited in claim 44, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein the retaining member is attached to a surface that is inside of the vehicle tire (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Regarding claim 49, Denso in view of Hankook discloses the method as recited in claim 44. Hankook further discloses wherein the retaining member is mechanically attached to an element that is connected to and that rotates with the object (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130), the non-vulcanized rubber can be injected and compressed by any one of a C-type press, a robot arm, or an injection machine 300).

Claims 25 and 26 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of Hankook and further in view of SEL.

Regarding claim 25, Denso in view of Hankook discloses the sensor assembly as recited in claim 24, Denso discloses the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22). Neither Denso nor Hankook discloses wherein the retaining member is attached to a wheel that the tire is mounted on. However, SEL discloses wherein the semiconductor device is attached to a wheel that the tire is mounted on (see Fig. 5A, elements 301 and 302; para [0133]- The semiconductor device 302 may also be mounted on the wheel 301 as illustrated in FIG. 5A). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the retaining member is attached to a wheel that the tire is mounted on to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 26, Denso in view of Hankook discloses the sensor assembly as recited in claim 24, Denso discloses the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22).Neither Denso nor Hankook discloses wherein the retaining member is attached to a valve stem of a wheel that the tire is mounted on. However, SEL discloses wherein a pressure sensor is attached to a valve stem of a wheel that the tire is mounted on (para [0121]- A pressure sensor can be mounted on, for example, a valve cap of the tire. The pressure sensor is preferably mounted inside the tire).
It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the retaining member is attached to a valve stem of a wheel that the tire is mounted on to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Claims 14, 15, 30, 36, and 54 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not disclose or fairly suggest the subject matter claimed.

The prior art for claims 4, 15, 30, 36, and 54 is exemplified by Denso.

Regarding claim 14:
Denso discloses the sensing system as recited in claim 13, wherein one or more of the tire diameter, tire tread depth, and tire radial load is determined from data (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). Denso does not disclose data including a specific rotational speed of the tire at a given vehicle velocity.
None of the prior art discloses data including a specific rotational speed of the tire at a given vehicle velocity. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 14, therefore claim 14 meets the criteria set out in PCT Article 33(2)-(3).

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Regarding claim 15:
Denso discloses the sensing system as recited in claim 12, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and a radial load experienced by the tire is determined from data comprising an interval of radial deformation (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected). Denso does not disclose using a correction coefficient.
None of the prior art discloses using a correction coefficient. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 15, therefore claim 15 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 30:
Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein the housing includes a wall structure having a top cover end of the wall structure and a base section (para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa...Also, the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber), wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d, for example, on a back surface of a tread; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22). Denso does not disclose top cover at a first axial end of the wall, and a base section at an opposed second axial of the wall.
None of the prior art discloses top cover at a first axial end of the wall, and a base section at an opposed second axial of the wall. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 30, therefore claim 30 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 36:
Denso discloses the sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and the system is configured to determine one or more of a tire diameter, a tire tread depth, and a fire radial load from data (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected). Denso does not disclose data including a specific rotational speed of the tire at a given vehicle velocity.
None of the prior art discloses data including a specific rotational speed of the tire at a given vehicle velocity. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 36, therefore claim 36 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 54:
Denso discloses the method as recited in claim 52, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, and a tire radial load is determined from information (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected). Denso does not disclose information relating to a specific rotational speed of the tire at a given vehicle velocity.
None of the prior art discloses information relating to a specific rotational speed of the tire at a given vehicle velocity. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 54, therefore claim 54 meets the criteria set out in PCT Article 33(2)-(3).

Claims 1- 57 have industrial applicability as defined by PCT Article 33(4) because the invention can be made or used in the industry.

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Office Action Summary	Application No. 17/084,483	Applicant(s) Ferry, Keith George	
	Examiner JERMAINE L JENKINS	Art Unit 2855	AIA (FITF) Status Yes

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A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☐ Responsive to communication(s) filed on _____.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

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

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

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

Disposition of Claims*

5) ☑ Claim(s) 1-57 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-29 and 31-57 is/are rejected.

8) ☑ Claim(s) 30 is/are objected to.

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

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

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

11)☑ The drawing(s) filed on 08 January 2021 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

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

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

Priority under 35 U.S.C. § 119

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

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

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

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

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

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

Attachment(s)

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

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

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

4) ☐ Other: _____.

Revvo's Exhibit 1002
Revvo v. Cerebrum
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DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

2. The Preliminary Amendment filed on 05/02/2022 has been acknowledged.

Claim Rejections - 35 USC § 112

3. The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-40 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

5. In regards to line 8 of claim 1, the phrase “an object” is unclear. Is there an additional “object” wherein the sensor assembly is being attached, or is the “object” the same as recited in line 1 of claim 1? The limitation in line 8 of claim 1 will be read as “the object” upon further examination.

6. Claim 28 recites the limitation "the vehicle tire" in line 17. There is insufficient antecedent basis for this limitation in the claim. The limitation in line 17 of claim 28 will be read as “a vehicle tire” upon further examination.

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file

provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

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

8. Claims 1-57 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-31, 35-41, 44-48 & 52-54 of copending Application No. 16,671,105. Although the claims at issue are not identical, they are not patentably distinct from each other because Application No. 17/084,483 teaches a sensor assembly configured for attachment with an object that is rotated in use, the sensor assembly comprising: a housing comprising an outer surface and an internal cavity that is enclosed within the housing; an electrical sensor device that is disposed within the internal cavity attached therein to prevent movement of the device within the internal cavity, wherein the electrical sensor device is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with an object and the object is rotated in use; and a retaining member that is configured to accommodate attachment of the housing

therewith, wherein the retaining member has an outside surface configured for attachment to rotate with the object when the object is rotated in use and claim 1 of copending Application No. 16,671,105 teaches a sensor assembly configured for attachment with a vulcanized rubber article, the sensor assembly comprising: a housing comprising an outer surface and an internal cavity that is enclosed within the housing; an electrical sensor device that is disposed within the internal cavity attached therein to prevent movement of the device within the internal cavity, wherein the electrical sensor device is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with a vulcanized rubber article; and a retaining member that is configured to accommodate attachment of the housing therewith, wherein the retaining member has an outside surface configured for attachment with the vulcanized rubber article.

Claim 2 of Application 15/977,674 and claim 2 of copending Application No. 16,671,105 teaches wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member.

Claim 3 of Application 15/977,674 and claim 3 of copending Application No. 16,671,105 teaches wherein the housing comprises a top cover, a wall structure, and a base section that define the internal cavity, and wherein the top cover, wall structure and base section may be formed from the same or different materials, and wherein one or more of the top cover, wall section, and base section may separate or integral with one another.

Claim 4 of Application 15/977,674 and claim 4 of copending Application No. 16,671,105 teaches wherein one of the top cover or base section is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity.

Claim 5 of Application 15/977,674 and claim 5 of copending Application No. 16,671,105 teaches wherein the electrical sensor device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical sensor device to retain its position therein, and wherein there is open space above and below the electrical sensor device within the internal cavity.

Claim 6 of Application 15/977,674 and claim 6 of copending Application No. 16,671,105 teaches wherein the electrical sensor device is encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical sensor device within the housing.

Claim 7 of Application 15/977,674 and claim 7 of copending Application No. 16,671,105 teaches wherein the housing and retaining member are configured having a complementary shape to facilitate attachment of the housing with the retaining member.

Claim 8 of Application 15/977,674 and claim 8 of copending Application No. 16,671,105 teaches wherein the housing comprises a wall structure that surrounds the internal cavity, and wherein the retaining member comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith.

Claim 9 of Application 15/977,674 and claim 9 of copending Application No. 16,671,105 teaches wherein the retaining member is formed from an elastomeric

material that mitigates transmission of shock forces from the object to the housing when the retaining member is attached to the object and the housing is attached to the retaining member.

Claim 10 of Application 15/977,674 and claim 10 of copending Application No. 16,671,105 teaches wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device.

Claim 11 of Application 15/977,674 and claim 11 of copending Application No. 16,671,105 teaches wherein the sensing system comprises a receiver that is external from the object and that is configured to receive data from the electrical sensor device by wireless communication.

Claim 12 of Application 15/977,674 and claim 12 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises an accelerometer sensor connected therewith and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

Claim 13 of Application 15/977,674 and claim 13 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire, and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire radial load, vehicle camber and/or toe alignment is determined from the accelerometer sensor data measuring in a radial direction of the vehicle tire.

Claim 14 of Application 15/977,674 and claim 14 of copending Application No. 16,671,105 teaches wherein one or more of the tire diameter, tire tread depth, and tire

radial load is determined from data including a specific rotational speed of the tire at a given vehicle velocity.

Claim 15 of Application 15/977,674 and claim 15 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire and a radial load experienced by the tire is determined from data comprising an interval of radial deformation and using a correction coefficient.

Claim 16 of Application 15/977,674 and claim 16 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises a global positioning device.

Claim 17 of Application 15/977,674 and claim 17 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire and a location of the vehicle tire is determined from information provided by the global positioning device.

Claim 18 of Application 15/977,674 and claim 18 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises a gyroscope.

Claim 19 of Application 15/977,674 and claim 19 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth.

Claim 20 of Application 15/977,674 and claim 20 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises: a printed circuit board comprising electrical circuitry; a portable power source for providing power to the electrical sensor device; at least one sensor element; and and an antenna for receiving and/or transmitting information from the electrical sensor device.

Claim 21 of Application 15/977,674 and claim 21 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises one or both of a storage element and a processor.

Claim 22 of Application 15/977,674 and claim 22 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises one or both of an accelerometer sensor and a global positioning device.

Claim 23 of Application 15/977,674 and claim 22 of copending Application No. 16,671,105 teaches wherein the sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object.

Claim 24 of Application 15/977,674 and claim 23 of copending Application No. 16,671,105 teaches wherein the object is a vulcanized rubber vehicle tire, and wherein the retaining member is attached to an inside surface of the vehicle tire or an element attached with the tire that rotates with the tire.

Claim 27 of Application 15/977,674 and claim 24 of copending Application No. 16,671,105 teaches wherein the retaining member is attached to the inside surface of the vehicle tire by an adhesive layer after the vehicle tire has been vulcanized.

Claim 28 of Application 15/977,674 teaches a sensor assembly and sensing system for use with an object that rotates in use comprising: a housing comprising an outer structure that defines an open internal cavity therein, an electrical sensor device disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device, wherein the electrical sensor device is configured to monitor and transmit and/or

receive information regarding surrounding conditions, orientation and/or location, wherein the electrical sensor device comprises: a portable power source; a sensor; and an antenna for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor; a retaining member having an outside surface configured for attaching with a surface of the object or an element connected with the object to rotate with the object in use, wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the retaining member; and a receiver external from the vehicle tire that is configured to receive information from the electrical sensor device wirelessly and claim 23 of copending Application No. 16,671,105 teaches a sensor assembly and sensing system for use with a vulcanized vehicle tire comprising: a housing comprising an outer structure that defines an open internal cavity therein, an electrical sensor device disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device, wherein the electrical sensor device is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location, wherein the electrical sensor device comprises: a portable power source; a sensor; and an antenna for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor; a retaining member having an outside surface configured for attaching with a surface of the vulcanized vehicle tire, wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the

retaining member; and a receiver external from the vehicle tire that is configured to receive information from the electrical sensor device wirelessly.

Claim 29 of Application 15/977,674 and claim 26 of copending Application No. 16,671,105 teaches comprising an external transmitter for sending information wirelessly to the electronic sensor device.

Claim 30 of Application 15/977,674 and claim 27 of copending Application No. 16,671,105 teaches wherein the housing includes a wall structure having a top cover at a first axial end of the wall structure and a base section at an opposed second axial of the wall structure, wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith.

Claim 31 of Application 15/977,674 and claim 28 of copending Application No. 16,671,105 teaches wherein one of the top cover or the bottom section are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity.

Claim 32 of Application 15/977,674 and claim 29 of copending Application No. 16,671,105 teaches wherein open space exists above and below the electrical sensor device when disposed within the internal cavity.

Claim 33 of Application 15/977,674 and claim 30 of copending Application No. 16,671,105 teaches wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching the housing attached with the retaining member.

Claim 34 of Application 15/977,674 and claim 31 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises an accelerometer sensor and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

Claim 37 of Application 15/977,674 and claim 35 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises a global positioning device.

Claim 38 of Application 15/977,674 and claim 36 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire and the system is configured to determine a location of the vehicle tire from information provided by the global positioning device.

Claim 39 of Application 15/977,674 and claim 37 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises a gyroscope.

Claim 40 of Application 15/977,674 and claim 38 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

Claim 41 of Application 15/977,674 teaches a method for using a sensor assembly and sensing system with an object that rotates in use comprising the steps of: installing an electrical sensor device within an internal cavity of a housing, wherein the housing includes an outer structure that defines the internal cavity, and wherein the electrical sensor device comprises a sensor, a portable power source, an antenna, a printed circuit board, and related electrical circuitry; attaching the housing after the step

of installing to a retaining member, wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique, wherein the retaining member is connected with the object before or after formation of the object; and monitoring an operating parameter of the object through the use of the electrical sensing device, wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly and claim 39 of copending Application No. 16,671,105 teaches a method for using a pressure sensor assembly and sensing system with a vulcanized rubber article comprising the steps of: installing an electrical sensor device within an internal cavity of a housing, wherein the housing includes an outer structure that defines the internal cavity, and wherein the electrical sensor device comprises a sensor, a portable power source, an antenna, a printed circuit board, and related electrical circuitry; attaching the housing after the step of installing to a retaining member, wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique, wherein the retaining member is attached with the vulcanized rubber article before or after formation of the vulcanized rubber article; monitoring an operating parameter through the use of the electrical sensing device, wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly.

Claim 42 of Application 15/977,674 and claim 40 of copending Application No. 16,671,105 teaches wherein during the step of installing, the housing includes a wall structure having an opening through which the electrical sensor device is installed and,

after the step of installing, the opening is closed by attaching a top cover or bottom section to the opening.

Claim 43 of Application 15/977,674 and claim 41 of copending Application No. 16,671,105 teaches wherein during the step of installing, the electrical sensor device is attached in place within the internal cavity by contact between the electrical sensor device and one or more surface features in the internal cavity.

Claim 47 of Application 15/977,674 and claim 44 of copending Application No. 16,671,105 teaches wherein the retaining member is attached to the object by applying hand pressure onto the retaining member once placed into contact with the surface of the object to cause the adhesive layer to form an attachment therebetween.

Claim 48 of Application 15/977,674 and claim 45 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire, and wherein the retaining member is attached to a surface that is inside of the vehicle tire.

Claim 50 of Application 15/977,674 and claim 46 of copending Application No. 16,671,105 teaches wherein during the step of attaching, the housing is positioned relative to the retaining member according to a display feature that is positioned on the housing.

Claim 51 of Application 15/977,674 and claim 47 of copending Application No. 16,671,105 teaches wherein during the step of monitoring, the sensor monitors operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna information related to the monitored operating parameter to the receiver, and wherein the electrical device is configured to

receive information transmitted from an external device to change one or more feature of the electrical sensor device.

Claim 52 of Application 15/977,674 and claim 48 of copending Application No. 16,671,105 teaches wherein the sensor assembly electrical sensor device comprises an accelerometer sensor.

Claim 55 of Application 15/977,674 and claim 52 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire and the electrical sensor device comprises a global positioning device, and wherein the step of monitoring a location of the tire is determined from information provided by the global positioning device.

Claim 56 of Application 15/977,674 and claim 53 of copending Application No. 16,671,105 teaches wherein the electrical sensor device comprises a gyroscope.

Claim 57 of Application 15/977,674 and claim 54 of copending Application No. 16,671,105 teaches wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

This is a provisional nonstatutory double patenting rejection because the patentably indistinct claims have not in fact been patented.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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

10. Claims 1, 3, 4, 6-8, 11-15, 20-29, 31, 34-36, 41-49 & 51-54 are rejected under 35 U.S.C. 102(a)(1) as being anticipated by Saito (US 20190184773 A1).

As best understood in regards to claim 1, Saito teaches a sensor assembly (2, i.e. tire-mounted sensor) configured for attachment with an object (7, i.e. wheel) that is rotated in use, the sensor assembly (2) (Paragraph 0023) comprising: a housing (22f, i.e. accommodation structure) comprising an outer surface (22fa, i.e. housing) and an internal cavity that is enclosed within the housing (22f) (Paragraph 0041; Figure 3); an electrical sensor device (22a, i.e. sensor chip) that is disposed within the internal cavity attached therein to prevent movement of the device (22a) within the internal cavity, wherein the electrical sensor device (22a) is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location (wherein the electrical sensor device (22a) is formed by an acceleration sensor (22aa) and a microcomputer (22ab) in which the acceleration sensor (22a) outputs a detection signal corresponding to surrounding conditions, orientation and/or location) when the sensor assembly (2) is attached with the object (7) and the object (7) is rotated in use (Paragraphs 0030-0035); and a retaining member (21, i.e. rubber bracket) that is configured to accommodate attachment of the housing (22f) therewith, wherein the retaining member (21) has an outside surface (21a, i.e. bottom portion) configured for attachment to rotate with the object when the object is rotated in use (Paragraphs 0025-0027; Figure 3).

In regards to claim 3, Saito teaches wherein the housing (22f) comprises a top cover (22fab, i.e. second housing), a wall structure, and a base section (22faa, i.e. first housing) that define the internal cavity, and wherein the top cover (22fab), wall structure

and base section (22faa) may be formed from the same or different materials, and wherein one or more of the top cover (22fab), wall section, and base section (22fab) may separate or integral with one another (Paragraphs 0046-0048; Figure 3).

In regards to claim 4, Saito teaches wherein one of the top cover (22fab) or base section (22faa) is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device (22a) from the internal cavity (Paragraphs 0046-0048; Figure 3).

In regards to claim 6, Saito teaches wherein the electrical sensor device (22a) is encapsulated by the inner cavity of the housing (22f) during a process of making the housing (22f) that operates to retain the position of the electrical sensor device (22a) within the housing (22f) (Paragraphs 0036 & 0045; Figure 3).

In regards to claim 7, Saito teaches wherein the housing (22f) and retaining member (21) are configured having a complementary shape to facilitate attachment of the housing (22f) with the retaining member (21) (Paragraphs 0024 & 0028; Figure 4).

In regards to claim 8, Saito teaches wherein the housing (22f) comprises a wall structure that surrounds the internal cavity, and wherein the retaining member (21) comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith (Paragraph 0028; Figure 4).

In regards to claim 11, Saito teaches wherein the sensing system comprises a receiver that is external from the object (7) and that is configured to receive data from

the electrical sensor device (22a) by wireless communication (Paragraphs 0022 & 0035).

In regards to claim 12, Saito teaches wherein the electrical sensor device (22a) comprises an accelerometer sensor (22aa) (Paragraph 0030) connected therewith and is configured to send data from the accelerometer sensor (22aa) wirelessly to the external receiver (Paragraph 0035).

In regards to claim 13, Saito teaches wherein the object (7) is a vehicle tire (71a-71d), and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire radial load, vehicle camber and/or toe alignment is determined from the accelerometer sensor data measuring in a radial direction of the vehicle tire (Paragraphs 0031 & 0032).

In regards to claim 14, Saito teaches wherein one or more of the tire diameter, tire tread depth, and tire radial load is determined from data including a specific rotational speed of the tire (71a-71d) at a given vehicle velocity (Paragraph 0057).

In regards to claim 15, Saito teaches wherein the object (7) is a vehicle tire (71a-71d) and a radial load experienced by the tire (71a-71d) is determined from data comprising an interval of radial deformation and using a correction coefficient (Paragraph 0057).

In regards to claim 20, Saito teaches wherein the electrical sensor device (22a) comprises: a printed circuit board (22b) comprising electrical circuitry; a portable power source (22c, i.e. battery) for providing power to the electrical sensor device (22a); at least one sensor element (22aa, i.e. acceleration sensor); and an antenna (22d) for

receiving and/or transmitting information from the electrical sensor device (22a) (Paragraphs 0035, 0037 & 0040).

In regards to claim 21, Saito teaches wherein the electrical sensor device (22a) comprises one or both of a storage element and a processor (22ab, i.e. microcomputer) (Paragraph 0034).

In regards to claim 22, Saito teaches wherein the electrical sensor device (22a) comprises one or both of an accelerometer sensor (22aa) and a global positioning device (Paragraph 0030).

In regards to claim 23, Saito teaches wherein the sensor element (22aa) is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object (Paragraph 0031).

In regards to claim 24, Saito teaches wherein the object (7) is a vulcanized rubber vehicle tire (71a-71d), and wherein the retaining member (21) is attached to an inside surface of the vehicle tire (71a-71d) or an element attached with the tire (71a-71d) that rotates with the tire (71a-71d) (Paragraphs 0050 & 0057; Figure 4).

In regards to claim 25, Saito teaches wherein the retaining member (21) is attached to a wheel that the tire (71a-71d) is mounted on (Paragraphs 0050 & 0057; Figure 4).

In regards to claim 26, Saito teaches wherein the retaining member (21) is attached to a valve stem of a wheel that the tire (71a-71d) is mounted on (Paragraphs 0050 & 0057; Figure 4).

In regards to claim 27, Saito teaches wherein the retaining member (21) is attached to the inside surface of the vehicle tire (71a-71d) by an adhesive layer (23) after the vehicle tire (71a-71d) has been vulcanized (Paragraph 0050).

In regards to claim 28, Saito teaches a sensor assembly (2, i.e. tire-mounted sensor) and sensing system for use with an object (7, i.e. wheel) that rotates in use (Paragraph 0023) comprising: a housing (22f, i.e. accommodation structure) comprising an outer structure (22fa, i.e. housing) that defines an open internal cavity therein (Paragraph 0041; Figure 3), an electrical sensor device (22a, i.e. sensor chip) disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device (22a) (Paragraph 0030), wherein the electrical sensor device (22a) is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location (wherein the electrical sensor device (22a) is formed by an acceleration sensor (22aa) and a microcomputer (22ab) in which the acceleration sensor (22a) outputs a detection signal corresponding to surrounding conditions, orientation and/or location), wherein the electrical sensor device (22a) comprises: a portable power source (22c, i.e. battery) (Paragraph 0029); a sensor (22aa, i.e. acceleration sensor); and an antenna (22d) for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor (22a) (Paragraph

0035); a retaining member (21, i.e. rubber bracket) having an outside surface configured for attaching with a surface of the object (7) or an element connected with the object (7) to rotate with the object (7) in use (Paragraph 0024-0026), wherein the retaining member (21) is configured to accommodate placement a portion of the housing (22f) therein to provide an attachment between the housing (22f) and the retaining member (21) (Paragraph 0027-0028); and a receiver (22d) external from a vehicle tire (i.e. wheel) that is configured to receive information from the electrical sensor device wirelessly (Paragraph 0035).

In regards to claim 29, Saito teaches comprising an external transmitter (5, i.e. electronic control device) for sending information wirelessly to the electronic sensor device (22aa) (Paragraphs 0061 & 0062).

In regards to claim 31, Saito teaches wherein one of the top cover (22fab) or the bottom section (22faa) are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity (Paragraph 0046-0048; Figure 4).

In regards to claim 34, Saito teaches wherein the electrical sensor device (22a) comprises an accelerometer sensor (22aa) and is configured to send data from the accelerometer sensor (22aa) wirelessly to the external receiver (Paragraph 0035).

In regards to claim 35, Saito teaches wherein the object (7) is a vehicle tire and the system is configured to determine one or more parameters consisting of a tire diameter, a tire tread depth, a tire radial load, and vehicle camber and/or toe alignment from the accelerometer sensor data (Paragraph 0031 & 0032).

In regards to claim 36, Saito teaches wherein the object (7) is a vehicle tire (71a-71d), and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, and a tire radial load is determined from information relating to a specific rotational speed of the tire at a given vehicle velocity (Paragraph 0057).

In regards to claim 41, Saito teaches a method for using a sensor assembly (2, i.e. tire-mounted sensor) and sensing system with an object (7, i.e. wheel) that rotates in use (Paragraph 0023) comprising the steps of: installing an electrical sensor device (22a) within an internal cavity of a housing (22f, i.e. accommodation structure), wherein the housing (22f, i.e. accommodation structure) includes an outer structure (22fa, i.e. housing) that defines the internal cavity (Paragraph 0041; Figure 3), and wherein the electrical sensor device (22a) comprises a sensor (22aa, i.e. acceleration sensor), a portable power source (22c, i.e. battery) (Paragraph 0029), an antenna (22d), a printed circuit board (22b), and related electrical circuitry (Paragraph 0029 & 0030); attaching the housing (22f) after the step of installing to a retaining member (21) (Paragraph 0027), wherein the retaining member (21) is configured to accommodate attachment with the housing (22f) by mechanical or bonding technique (Paragraph 0026), wherein the retaining member (21) is connected with the object (7) before or after formation of the object (7) (Paragraph 0027; Figure 4); and monitoring an operating parameter of the object (7) through the use of the electrical sensing device (22aa), wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device (22aa) to a receiver that is external from the sensor assembly (2) (Paragraph 0035).

In regards to claim 42, Saito teaches wherein during the step of installing, the housing (22f) includes a wall structure having an opening through which the electrical sensor device (22aa) is installed and, after the step of installing, the opening is closed by attaching a top cover (22fab) or bottom section (22faa) to the opening (Paragraph 0046-0048).

In regards to claim 43, Saito teaches wherein during the step of installing, the electrical sensor device (22aa) is attached in place within the internal cavity by contact between the electrical sensor device (22aa) and one or more surface features in the internal cavity (Paragraph 0048; Figure 3).

In regards to claim 44, Saito teaches wherein the object (7) is a made from vulcanized rubber, and before the step of attaching, the retaining member (21) is attached with the object (7) or an element that rotates with the object (7) after the object (7) has been formed (Paragraphs 0050 & 0057; Figure 4).

In regards to claim 45, Saito teaches wherein the retaining member (21) is attached to a surface of the object (7) by use of an adhesive layer (23) (Paragraph 0050).

In regards to claim 46, Saito teaches wherein the retaining member (21) is attached to the object (7) after the step of attaching the housing (22f) to the retaining member (21) (Paragraph 0050).

In regards to claim 47, Saito teaches wherein the retaining member (21) is attached to the object (7) by applying hand pressure onto the retaining member (21) once placed into contact with the surface of the object (7) to cause the adhesive layer (23) to form an attachment therebetween (Paragraphs 0050-0052).

In regards to claim 48, Saito teaches wherein the object (7) is a vehicle tire (71a-71d), and wherein the retaining member (21) is attached to a surface that is inside of the vehicle tire (71a-71d) (Paragraph 0050.

In regards to claim 49, Saito teaches wherein the retaining member (21) is mechanically attached to an element that is connected to and that rotates with the object (7) (Paragraphs 0050 & 0057).

In regards to claim 51, Saito teaches wherein during the step of monitoring, the sensor (22aa) monitors operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna information related to the monitored operating parameter to the receiver (3), and wherein the electrical device (5, i.e. ECU) is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device (22a) (Paragraphs 0031, 0032 & 0035).

In regards to claim 52, Saito teaches wherein the sensor assembly electrical sensor device (22aa) comprises an accelerometer sensor (Paragraph 0030).

In regards to claim 53, Saito teaches wherein the object (7) is a vehicle tire, and wherein during the step of monitoring, on or more of a tire outside diameter, a tire tread depth, a tire radial load, and a vehicle camber and/or toe alignment parameter is determined from information sent wirelessly from the sensor assembly (2) (Paragraphs 0023 & 0035).

In regards to claim 54, Saito teaches wherein the object (7) is a vehicle tire (71a-71d), and wherein during the step of monitoring, one or more of a tire outside diameter,

a tire tread depth, and a tire radial load is determined from information relating to a specific rotational speed of the tire at a given vehicle velocity (Paragraph 0057).

Claim Rejections - 35 USC § 103

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

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 2, 5, 9, 32, 33 & 50 are rejected under 35 U.S.C. 103 as being unpatentable over Saito (US 20190184773 A1) in view of Brusarosco et al (US 20180186200 A1).

In regards to claims 2 & 50, Saito teaches the claimed invention except for wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member.

Brusarosco et al teaches a sensor assembly (10, i.e. monitoring device) comprising a housing outer surface includes one or more display features or indicia (49, i.e. graphical symbols) that are viewable to a user when the housing is attached with the retaining member (30, i.e. connecting member) (Paragraph 0172; Figure 4a). It would have been obvious to one having skill in the art before the effective filing date of the invention being made to provide a display feature on the outer surface of the housing as taught by Brusarosco et al onto the sensor assembly of Saito for the purpose of

displaying indicia that are viewable to the user to increase reliability (Paragraph 0011; Brusarosco et al).

In regards to claims 5 & 32, Saito teaches the claimed invention except for wherein the electrical sensor device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical sensor device to retain its position therein, and wherein there is open space above and below the electrical sensor device within the internal cavity.

Brusarosco et al teaches a sensor assembly (10, i.e. monitoring device) comprising wherein an open space above and below the electrical sensor device within the internal cavity (Paragraphs 0127 & 0128: Figure 2d). It would have been obvious to one having skill in the art before the effective filing date of the invention being made to provide to an open space above and below as taught by Brusarosco et al onto the sensor assembly of Saito for the purpose of increasing the reliability of the device (Paragraph 0011; Brusarosco et al).

In regards to claims 9 & 33, Saito teaches the claimed invention except for wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces from the object to the housing when the retaining member is attached to the object and the housing is attached to the retaining member.

Brusarosco et al teaches a sensor assembly (10, i.e. monitoring device) comprising a retaining member (30) being formed from an elastomeric material that mitigates transmission of shock forces from the object to the housing when the retaining member (30) is attached to the object and the housing is attached to the retaining member (30) (Paragraph 0125). It would have been obvious to one having skill in the

art before the effective filing date of the invention being made to form the retaining member of a known material such as elastomeric material as taught by Brusarosco et al into the sensor assembly of Saito for the purpose of increasing the lifetime of the device. Also, the selection of a known material, such as an elastomeric, based upon its suitability for the intended use is a design consideration within the skill of the art. In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960) See MPEP 2144.07.

13. Claim 10 is rejected under 35 U.S.C. 103 as being unpatentable over Saito (US 20190184773 A1) in view of Laird et al (US 20110025487 A1).

In regards to claim 10, Saito teaches the claimed invention except for wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device.

Laird et al teaches a tire pressure sensor comprising a housing for encasing electrical sensor device (Paragraph 0004) including a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device (Paragraph 0004). It would have been obvious to one having skill in the art before the effective filing date of the invention being made to provide a filter as taught by Laird et al into the sensor assembly of Saito for the purpose of preventing damage to the sensor electronic components and circuitry in the housing (Paragraph 0004; Laird et al).

14. Claims 16-18, 37-39 & 55-57 are rejected under 35 U.S.C. 103 as being unpatentable over Saito (US 20190184773 A1) in view of Lin et al (US 20190187027 A1).

In regards to claims 16, 37 & 55, Saito teaches the claimed invention except for wherein the electrical sensor device comprises a global positioning device.

Lin et al teaches a tire sensor system comprising wherein the electrical sensor device further comprises a global positioning device (Paragraph 0039). It would have been obvious to one having skill in the art before the effective filing date of the invention being made to provide a global positioning device as taught by Lin et al into the sensor assembly of Saito for the purpose of providing location tracking of the tire (Paragraph 0039; Lin et al).

In regards to claims 17 & 38, Saito teaches the claimed invention except for wherein the object is a vehicle tire and a location of the vehicle tire is determined from information provided by the global positioning device.

Lin et al teaches a tire sensor system comprising wherein the electrical sensor device further comprises a global positioning device (Paragraph 0039). It would have been obvious to one having skill in the art before the effective filing date of the invention being made to provide a global positioning device as taught by Lin et al into the sensor assembly of Saito for the purpose of providing location tracking of the tire (Paragraph 0039; Lin et al).

In regards to claims 18, 39 & 56, Saito teaches the claimed invention except for wherein the electrical sensor device comprises a gyroscope.

Lin et al teaches a tire sensor system comprising wherein the electrical sensor device further comprises a gyroscope (Paragraph 0045). It would have been obvious to one having skill in the art before the effective filing date of the invention being made to provide a gyroscope as taught by Lin et al into the sensor assembly of Saito for the purpose of providing a moving object with a high degree of safety.

In regards to claims 19 & 57, Saito teaches the claimed invention except for wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth.

Lin et al teaches a tire sensor system comprising wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth (Paragraph 0045). It would have been obvious to one having skill in the art before the effective filing date of the invention being made to provide a gyroscope as taught by Lin et al into the sensor assembly of Saito for the purpose of providing a moving object with a high degree of safety.

Allowable Subject Matter

15. Claim 30 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: In the Examiner's opinion in regards to claim 30, Saito teaches a sensor

assembly (2, i.e. tire-mounted sensor) and sensing system for use with an object (7, i.e. wheel) that rotates in use (Paragraph 0023) comprising: a housing (22f, i.e. accommodation structure) comprising an outer structure (22fa, i.e. housing) that defines an open internal cavity therein (Paragraph 0041; Figure 3), an electrical sensor device (22a, i.e. sensor chip) disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device (22a) (Paragraph 0030).

However Saito does not teach the structural limitations of the sensor assembly further comprising the housing including a wall structure having a top cover at a first axial end of the wall structure and a base section at an opposed second axial of the wall structure wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith in combination with the remaining limitations of independent claim 28 upon overcoming the rejection under 35 U.S.C. 102(a)(1).

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Phelan et al (US 6255940 B1) – The present invention is generally concerned with an apparatus for monitoring a condition of a tire, and more particularly with an apparatus for monitoring a condition of a pneumatic tire for diagnosing an impending failure thereof.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JERMAINE L JENKINS whose telephone number is (571)272-2179. The examiner can normally be reached M-F 7-3 EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Peter Macchiarolo can be reached on 571-272-2375. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J.L.J/
Examiner, Art Unit 2855

/PETER J MACCHIAROLO/
Supervisory Patent Examiner, Art Unit 2855

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20190184773	A1	2019-06-20	SAITO	
	2	20180186200	A1	2018-07-05	BRUSAROSCO et al.	
	3	20110025487	A1	2011-02-03	Laird et al.	
	4	20190187027	A1	2019-06-20	Lin et al.	
	5	20160332493	A1	2016-11-17	ATSUMI et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

	6	20190160895	A1	2019-05-30	SO et al.	

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	1	International Search Report dated February 2, 2021 for corresponding International Application No. PCT/US2020/058402 filed October 30, 2020; total 2 pages.	
	2	Written Opinion of the International Searching Authority dated February 2, 2021 for corresponding International Application No. PCT/US2020/058402 filed October 30, 2020; total 13 pages.	

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EXAMINER SIGNATURE

Examiner Signature	/JERMAINE L JENKINS/	Date Considered	11/08/2022

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 432

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2021-05-07
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 433

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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 record s.

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.

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Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 434

Notice of References Cited	Application/Control No. 17/084,483	Applicant(s)/Patent Under Reexamination Ferry, Keith George	
	Examiner JERMAINE L JENKINS	Art Unit 2855	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-6255940-B1	07-2001	Phelan; John Roux	B60C23/0493	73/146
	B					
	C					
	D					
	E					
	F					
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	I					
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FOREIGN PATENT DOCUMENTS

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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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Revvo v. Cerebrum
IPR2025-00632 - Page 435

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	Art Unit
	JERMAINE L JENKINS	2855

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	11/10/2022								
	1	✓								
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	23	✓								
	24	✓								
	25	✓								
	26	✓								
	27	✓								
	28	✓								
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	35	✓								
	36	✓								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								

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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	Art Unit
	JERMAINE L JENKINS	2855

CLAIM		DATE								
Final	Original	11/10/2022								
	43	✓								
	44	✓								
	45	✓								
	46	✓								
	47	✓								
	48	✓								
	49	✓								
	50	✓								
	51	✓								
	52	✓								
	53	✓								
	54	✓								
	55	✓								
	56	✓								
	57	✓								

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/084,483	Ferry, Keith George
	Examiner	Art Unit
	JERMAINE L JENKINS	2855

CPC - Searched*		
Symbol	Date	Examiner
SEE SEARCH HISTORY FOR CPC	11/08/2022	JJ

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Conducted PE2E SEARCH, TEXT SEARCH, INVENTOR NAME SEARCH, IP.COM, SIMILARITY SEARCH, GOOGLE PATENTS, Consulted with A. ALLEN on allowability, See SEARCH HISTORY	11/08/2022	JJ

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

/J.L.J/ Examiner, Art Unit 2855	

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Patents SENSOR ASSEMBLIES AND SYSTEMS

SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT; configured for us condition, and/or performance aspect of a rotating element;

About 135,829 results

Sort by · Relevance · Group by · None · Deduplicate by · Family · Results / page · 10

Sensor assemblies and systems for monitoring a dynamic object

WO EP US AU CA · US20210131916A1 · Keith George Ferry · Keith George Ferry
Priority 2019-10-31 · Filed 2020-10-29 · Published 2021-05-06
at least one **sensor** element; and and an antenna for receiving and/or transmitting infor electrical **sensor** device. 21 . The **sensor assembly** as recited in claim 20 , wherein the device comprises one or both of a storage element and a processor. 22 . The **sensor as**

Detection device of eddy current sensor

CN · CN212567263U · 王维友 · 福建宁德核电有限公司
Priority 2020-06-15 · Filed 2020-06-15 · Granted 2021-02-19 · Published 2021-02-19
Similar the acquisition and analysis equipment is respectively connected with the eddy current **sensc** indicator, acquires the first relative displacement signal and the second relative displacement signal, working state of the eddy current **sensor** based on the linear error of …

Wearable sports monitoring system and monitoring method

EP US CN JP · CN103809921B · 奥瑞尔·霍扎 · 阿迪达斯股份公司
Priority 2012-04-13 · Filed 2013-04-15 · Granted 2017-03-01 · Published 2017-03-01
Identify the take-off being carried out by described individuality ; Using connecting to described indiv **assembly**, based on start to sense the of jump One acceleration information determines the first verti described individuality ; It is characterized in that, vertical …

It is determined that the method for personal and moving object perform

EP US CN JP · CN104075731B · 奥瑞尔·霍扎 · 阿迪达斯股份公司
Priority 2013-03-12 · Filed 2014-03-12 · Granted 2018-03-20 · Published 2018-03-20
Processor 110, power supply 112, memory 114, acceleration transducer 116, the magnetic field **sens** embodiment 118 and transceiver 122 can have similar to the above-mentioned like on Fig. 4 the 26S and Function of those. The user interface 120 of **sensor assembly** 102 …

Sport ball athletic activity monitoring methods

EP US CN JP · CN103372299B · 奥瑞尔·霍扎 · 阿迪达斯股份公司
Priority 2012-04-13 · Filed 2013-04-15 · Granted 2017-04-12 · Published 2017-04-12
6. method according to claim 4, wherein the **sensor assembly** includes acceleration transducer and n Wherein described first magnetic field data is sensed by the magnetic field **sensor**, and Wherein desc information and second acceleration information are …

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Sport ball motion monitoring method and **system**

EP US CN • CN105080111B • 奥瑞尔·戴扎 • 阿迪达斯股份公司

Priority 2014-05-14 • Filed 2015-05-14 • Granted 2018-11-06 • Published 2018-11-06

In one embodiment, acceleration transducer 118 and magnetic field **sensor** 120 can be contained in t Individual accelerometer-magnetometer die of the model LSM303DLHC of STMicw Electronics (STM manufacture In block.In other embodiments, **sensor assembly** 102 can …

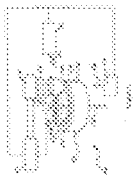
Vehicle component control methods and **systems**

US • US9593521B2 • David S. Breed • American Vehicular Sciences Llc

Priority 1995-06-07 • Filed 2015-04-14 • Granted 2017-03-14 • Published 2017-03-14

Control **system** for controlling at least one part of a vehicle includes a plurality of **sensor systems** mo locations on the vehicle, each **sensor system** providing a measurement related to a state thereof **syst** related to a state of the mounting location. A processor …

Monitoring and control **system** for blood processing



WO EP US CN JP AT AU CA DE ES • EP2207024B1 • Lee F. Carter • Terumo BCT, Inc.

Priority 2003-07-02 • Filed 2004-07-01 • Granted 2016-05-11 • Published 2016-05-11

A method for controlling a density centrifuge blood processing **system** for separating fl method comprising the steps of: performing a first measurement of an operating condi processing device corresponding to a first time; performing a second measurement of

To change the multilevel threshold of the operation of power-up surgical .

WO EP US CN JP BR PL • CN107979988A • F·E·谢尔顿四世 • 伊西康有限责任公司

Priority 2015-03-06 • Filed 2016-03-03 • Published 2018-05-01

In certain aspects, safe processor 2004 and/or primary processor 2006, which are connected to, is cc measurement The first **sensor** 2040a of first property of section's apparatus and the second biograph to measure the second quality of surgical instruments …

The assessment relevant with the time is carried out to **sensing** data to …

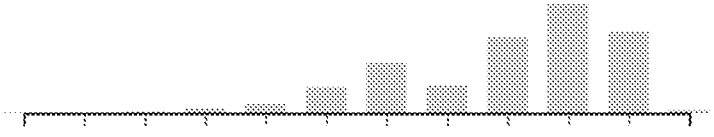
WO EP US CN JP BR • CN107567310A • F·E·谢尔顿四世 • 伊西康有限责任公司

Priority 2015-03-06 • Filed 2016-03-01 • Published 2018-01-09

The invention discloses a kind of cutting of Motorized surgical and suture instruments.The apparatus at least one **sensor**, at least one processor and the memory operatively associated with the processo least one parameter associated with the apparatus.The

Next › » About 135,829 results

Top 1000 results by filing date



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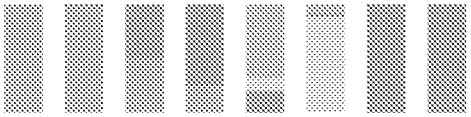

Relative count of top 5 values

Assignees Inventors

Automotive Technologies International, Inc.

Intelligent Technologies International, Inc.

伊西康有限责任公司

Nvidia Corporation

深圳市大疆创新科技有限公司

Expand

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	3	"17084483"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/07 10:27 AM
L2	38	(Artificial Intelligence) More like doc: US-20210131916-A1 Text: (AU-2020375038-A1 OR EP-4051515-A1 OR WO-2021087391-A1 OR CA-3156583-A1 OR US-20210129601-A1 OR CN-115210085-A OR US-20190184773-A1 OR US-11065921-B2 OR DE-112017004489-T5 OR CN-109641492-B OR JP-6617666-B2 OR WO-2018047781-A1 OR JP-2018039377-A OR CN-109641492-A OR EP-3492289-B1 OR JP-6676134-B2 OR JP-2019099146-A OR GB-2602012-A OR US-20190160895-A1 OR RU-2762050-C1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/07 10:27 AM
L3	33	(Artificial Intelligence) Similar to: 17/084,483 with 0 CPC Selections and 0 Text Selections Text: (CA-3156583-A1 OR WO-2021087391-A1 OR EP-4051515-A1 OR AU-2020375038-A1 OR US-20210131916-A1 OR US-20210129601-A1 OR FR-3063041-A1 OR ES-2322056-T3 OR MX-2019003548-A OR EP-3582980-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/11/08 06:58 AM

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		FR-3063041-B1 OR MX-PA05007477-A OR CA-2513553-A1 OR BR-112019005469-A2 OR RU-2020129959-A OR AU-2004212496-B2 OR ES-2361804-T3 OR EP-1592569-B1 OR JP-6798781-B2 OR WO-2018065846-A1 OR EP-3523144-A1 OR BR-PI0407371-A OR FR-3028451-A1 OR EP-3523144-B1 OR AU-2004212496-A1 OR EP-3020577-A1 OR BR-112020016901-A2 OR JP-2016097964-A OR EP-3582980-A1 OR WO-2018150141-A1 OR US-20210039451-A1 OR US-20190329609-A1 OR AU-2015258159-B2 OR AU-2015258159-A1 OR US-20160229237-A1 OR JP-2021518301-A OR EP-3543042-B1 OR RU-2019109045-A OR WO-2019179707-A1 OR AU-2019238814-A1 OR CA-3093737-A1 OR EP-3543042-A1 OR RU-2742062-C2 OR EP-1714806-A3 OR BR-PI0407371-B1 OR CA-2513553-C OR CN-110290947-A OR EP-3020577-B1 OR US-20200055354-A1 OR US-11065924-B2).did.					
L4	35	(Artificial Intelligence) Similar to: 17/084,483 with 0 CPC Selections and 9 Text Selections Text: (DE-2713451-A1 OR US-7242284-B2 OR FR-2492742-B1 OR GB-2399416-B OR DE-102005035183-B4 OR EP-0455636-B1 OR GB-2416846-B OR US-20070080795-A1 OR JP-S5073682-A OR US-11052712-B2 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO))	OR	ON	ON	2022/11/08 08:01 AM

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		US-20060224344-A1 OR EP-3981618-A1 OR JP-S6071306-A OR EP-3907090-A4 OR FR-2952021-B1 OR FR-2572029-A1 OR JP-2004237951-A OR FR-3019287-B1 OR US-20020190853-A1 OR DE-69210632-T2 OR WO-2021240765-A1 OR GB-0613061-D0 OR GB-2161432-B OR US-7441452-B2 OR KR-101581908-B1 OR US-10429260-B2 OR JP-4169457-B2 OR CN-110103646-B OR US-20170259631-A1 OR US-4337652-A OR US-2723700-A OR BE-819130-A OR NL-8003613-A OR US-20060117545-A1 OR KR-200346713-Y1 OR EP-3745530-A1 OR AU-447293-B2 OR GB-2591751-A OR EP-4023466-A1 OR US-20080196810-A1 OR EP-1580040-A1 OR JP-4289561-B2 OR US-20210016526-A1 OR FR-2470474-B1 OR CN-114072293-A OR DE-3021531-A1 OR WO-2022082228-A1 OR FR-2874196-B1 OR US-11420488-B1 OR CN-110641233-A).did.					
L5	14	((("FERRY") near3 ("Keith"))).INV.	(US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT)	OR	ON	ON	2022/11/08 08:06 AM
L6	6	("20110025487" OR "20160332493" OR "20180186200" OR "20190160895" OR "20190184773" OR "20190187027").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/08 08:36 AM
L7	29	("10119876" OR "10712238" OR "20020029626" OR "20030221766" OR "20130167999" OR "20170232806" OR "4862486" OR "5181975" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/11/08 08:37 AM

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		"5500065" OR "5562787" OR "5573610" OR "5573611" OR "5731754" OR "5971046" OR "6030478" OR "6208244" OR "6217683" OR "6255940" OR "6257289" OR "6309494" OR "6688353" OR "6788192" OR "7770444" OR "7900665" OR "8248225" OR "8657975" OR "8776590" OR "8874386" OR "9950575").pn.					
L8	21588954	(bearing rolling rotary rotary rotate rotation rotating rotated rotatably pivot pivoted pivoting spin spinning spinnability spinnable spun span) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 08:52 AM
L9	22036639	(container containing contain contained bag tank canister sack storage vessel vase capsule carton encapsulate	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/11/08 09:03 AM

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		encapsulated encapsulating housing housed enclosure enclosed enclosing chamber reservoir well compartment) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8).clm.	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L10	3357265	(detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing) WITH (tire wheel object).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 09:18 AM
L11	4	L8 & L9 & L10 & L5	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2022/11/08 09:26 AM

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			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L12	30318370	(replaceable changeable swappable switchable exchangeable interchangeable interconvertible transposable portable replace replacing replaced change changing changed changability swap swapped swapping switch switched switching switchability exchange exhanging exchanged exchangability interchange interchanged interchanging interchangability interconvert interconverting interconverted interconvertibility transposing transpose transposed transposability portability replaceability swappability) WITH (battery power source energy generator generating generation voltage wattage current)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM
L13	17079322	((detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM

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		inspection inspecting inspected test tested testing) WITH (tire wheel object))					
L14	59702573	((container containing contain contained bag tank canister sack storage vessel vase capsule carton encapsulate encapsulated encapsulating housing housed enclosure enclosed enclosing chamber reservoir well compartment) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM
L15	45731130	(bearing rolling rotary rotary rotate rotation rotating rotated rotatably pivot pivoted pivoting spin spinning spinnability spinnable spun span) WITH (fix fixing fixed fixation affix affixed affixing affixation attach attached attaching attachment$5 connect connected connection connecting connector mount mounted mounting mountable mountably join joined joinable joinably fasten fastening	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:34 AM

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		fastened fastenable fastenably hook hooked hooking clasp clasped clasping grapple grappling grappled link linked linking hold holder holding catch catching clamp clamped clamping clip clipped clipping grip gripper gripped gripping retain$8)					
L16	996496	L12 & L13 & L14 & L15	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 10:41 AM
L17	40706896	(communicat$8 intel$8 info$8 meassag$8 data) WITH (detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:06 AM
L18	4870920	(communicat$8 intel$8 info$8 meassag$8 data) WITH (detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:07 AM

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		sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing) WITH (electric electrically electricity magnet magnetic magnetically magnetized magnetism magnetize magnetizing electromagnetic electro$2magnetic)					
L19	195947	L16 & L18	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:07 AM
L20	5538	L19 AND ((G01M13/045 OR G01M13/028 OR G01M13/00 OR G01M17/007 OR G01M13/04 OR G01M17/02 OR G01M99/00 OR G01M7/08 OR G01M13/021 OR G01M99/005 OR G01M15/14 OR G01M17/013 OR G01M10/00 OR G01M15/02 OR G01M15/00 OR G01M17/08 OR G01M3/26 OR G01M5/0033 OR G01M5/0066 OR G01M5/0091 OR G01M99/008 OR G01M13/02 OR G01M17/00 OR G01M5/0008 OR G01M5/0025 OR G01M13/025 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:10 AM

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		G01M3/005 OR G01M3/02 OR G01M3/40 OR G01M7/02 OR G01M1/22 OR G01M15/05 OR G01M17/06 OR G01M7/00 OR G01M3/04 OR B60C23/0408 OR B60C23/041 OR B60C23/0411 OR B60C23/04 OR B60C23/0416 OR B60C23/0493 OR B60C19/00 OR B60C23/0433 OR B60C23/0488 OR B60C23/0413 OR B60C23/00 OR B60C23/0494 OR B60C23/0496 OR B60C11/24 OR B60C23/0444 OR B60C5/005 OR B60C9/00 OR B60C23/0401 OR B60C23/043 OR B60C23/02 OR B60C23/0406 OR B60C23/00354 OR B60C23/0462 OR B60C23/135 OR B60C23/126 OR B60C11/246 OR B60C23/064 OR B60C23/0447 OR B60C23/0483 OR B60C23/0479 OR B60C23/0488 OR B60C23/20 OR B60C23/00363 OR b60c23/0422 OR B60C23/007 OR B60C2019/004 OR B60C23/0425 OR B60C2200/12 OR B60C23/001 OR B60C23/0442 OR B60C23/0486 OR B60C23/123 OR B60C23/009 OR B60C23/004 OR B60C23/0455 OR B60C23/00336 OR B60C23/00318 OR B60C23/0474 OR B60C23/061 OR					

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Revvo v. Cerebrum
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		B60C23/0437 OR B60C23/0449 OR B60C11/243 OR B60C23/0471 OR B60C23/006 OR B60C23/0498 OR B60C23/06 OR B60C23/00372 OR G01C21/20 OR G01C21/00 OR G01C21/206 OR G01C21/26 OR G01C21/165 OR G01C17/38 OR G01C21/16 OR G01C21/36 OR G01C21/3407 OR G01C15/002 OR G01C21/12 OR G01C21/362 OR G01C15/00 OR G01C22/00 OR G01C22/006 OR G01C21/005 OR G01C21/3453 OR G01C5/00 OR G01C21/3664 OR G01C21/3697 OR G01C9/00 OR G01C21/32 OR G01C25/005 OR G01C19/00 OR G01C23/00 OR G01C21/3691 OR G01C17/28 OR G01C21/1654 OR G01C21/3632 OR G01C11/02 OR G01C17/30 OR G01C9/06 OR G01C21/1656 OR G01C21/30 OR G01C3/08 OR G01C21/3469 OR G01C21/265 OR G01C21/166 OR G01C21/28 OR G01C11/00 OR G01C9/02 OR G01C21/3415 OR G01C21/34 OR G01C21/3484 OR G01C21/367 OR G01C21/3688 OR G01C15/06 OR G01C21/188 OR G01C22/002 OR G01C25/00 OR				

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		G01C21/3461 OR G01C13/00 OR G01C21/3667 OR G01C21/203 OR G01C21/3492 OR G01C1/00 OR G01C21/3602 OR G01C21/3617 OR G01C19/42 OR G01C21/08 OR G01C21/3629 OR G01C21/3841 OR G01C21/365 OR G01C21/3673 OR G01C17/00 OR G01C21/1652 OR G01C21/18 OR G01C21/183 OR G01C19/38 OR G01C19/5783 OR G01S19/01).cpc.)					
L21	4575	L20 & @ad<="20191031"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:11 AM
L22	0	L2 & L21	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:12 AM
L23	0	L3 & L21	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 11:12 AM
L24	3	L4 & L21	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY,	OR	ON	ON	2022/11/08 11:12 AM

			CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L25	39613525	(container containing contain contained bag tank canister sack storage vessel vase capsule carton encapsulate encapsulated encapsulating housing housed reservoir) WITH (gap aperture break breach cut crack void hole orifice puncture cavity port trench pocket opening through$2hole recess chamber volume well slit)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:35 PM
L26	5325714	(gap aperture break breach cut crack void hole orifice puncture cavity port trench pocket opening through$2hole recess chamber volume well slit) WITH (detect detector detecting detection detected measure measuring measurement measured determine determining determined determination sense sensing sensitive sensed sensory sensor gauge gage cell module transducer calculate calculated calculation calculating calculator monitor monitored monitoring indicating indicator indication indicate inspect inspection inspecting inspected test tested testing) WITH (electric electrically electricity magnet magnetic magnetically magnetized magnetism	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:36 PM

Revvo's Exhibit 1002
Revvo v. Cerebrum
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		magnetize magnetizing electromagnetic electro$2magnetic)					
L27	86244	L19 & L25 & L26	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:37 PM
L28	1813	(L27 AND ((G01M13/045 OR G01M13/028 OR G01M13/00 OR G01M17/007 OR G01M13/04 OR G01M17/02 OR G01M99/00 OR G01M7/08 OR G01M13/021 OR G01M99/005 OR G01M15/14 OR G01M17/013 OR G01M10/00 OR G01M15/02 OR G01M15/00 OR G01M17/08 OR G01M3/26 OR G01M5/0033 OR G01M5/0066 OR G01M5/0091 OR G01M99/008 OR G01M13/02 OR G01M17/00 OR G01M5/0008 OR G01M5/0025 OR G01M13/025 OR G01M3/005 OR G01M3/02 OR G01M3/40 OR G01M7/02 OR G01M1/22 OR G01M15/05 OR G01M17/06 OR G01M7/00 OR G01M3/04 OR B60C23/0408 OR B60C23/041 OR B60C23/0411 OR B60C23/04 OR B60C23/0416 OR B60C23/0493 OR B60C19/00 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:37 PM

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Revvo v. Cerebrum
IPR2025-00632 - Page 455

		B60C23/0433 OR B60C23/0488 OR B60C23/0413 OR B60C23/00 OR B60C23/0494 OR B60C23/0496 OR B60C11/24 OR B60C23/0444 OR B60C5/005 OR B60C9/00 OR B60C23/0401 OR B60C23/043 OR B60C23/02 OR B60C23/0406 OR B60C23/00354 OR B60C23/0462 OR B60C23/135 OR B60C23/126 OR B60C11/246 OR B60C23/064 OR B60C23/0447 OR B60C23/0483 OR B60C23/0479 OR B60C23/0488 OR B60C23/20 OR B60C23/00363 OR b60c23/0422 OR B60C23/007 OR B60C2019/004 OR B60C23/0425 OR B60C2200/12 OR B60C23/001 OR B60C23/0442 OR B60C23/0486 OR B60C23/123 OR B60C23/009 OR B60C23/004 OR B60C23/0455 OR B60C23/00336 OR B60C23/00318 OR B60C23/0474 OR B60C23/061 OR B60C23/0437 OR B60C23/0449 OR B60C11/243 OR B60C23/0471 OR B60C23/006 OR B60C23/0498 OR B60C23/06 OR B60C23/00372 OR G01C21/20 OR G01C21/00 OR G01C21/206 OR G01C21/26 OR G01C21/165 OR G01C17/38 OR G01C21/16 OR G01C21/36 OR				

		G01C21/3407 OR G01C15/002 OR G01C21/12 OR G01C21/362 OR G01C15/00 OR G01C22/00 OR G01C22/006 OR G01C21/005 OR G01C21/3453 OR G01C5/00 OR G01C21/3664 OR G01C21/3697 OR G01C9/00 OR G01C21/32 OR G01C25/005 OR G01C19/00 OR G01C23/00 OR G01C21/3691 OR G01C17/28 OR G01C21/1654 OR G01C21/3632 OR G01C11/02 OR G01C17/30 OR G01C9/06 OR G01C21/1656 OR G01C21/30 OR G01C3/08 OR G01C21/3469 OR G01C21/265 OR G01C21/166 OR G01C21/28 OR G01C11/00 OR G01C9/02 OR G01C21/3415 OR G01C21/34 OR G01C21/3484 OR G01C21/367 OR G01C21/3688 OR G01C15/06 OR G01C21/188 OR G01C22/002 OR G01C25/00 OR G01C21/3461 OR G01C13/00 OR G01C21/3667 OR G01C21/203 OR G01C21/3492 OR G01C1/00 OR G01C21/3602 OR G01C21/3617 OR G01C19/42 OR G01C21/08 OR G01C21/3629 OR G01C21/3841 OR G01C21/365 OR G01C21/3673 OR G01C17/00 OR G01C21/1652 OR					

		G01C21/18 OR G01C21/183 OR G01C19/38 OR G01C19/5783 OR G01S19/01).cpc.))					
L29	1459	(L28 & @ad<="20191031")	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:37 PM
L30	0	L6 & L29	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:40 PM
L31	1	L7 & L29	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/08 01:40 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

PE2E SEARCH - Search History (Similarity Search)

Ref #	Application Number	Text Selections	CPC Selections
L3	17/084,483	No selections	No selections
L4	17/084,483	(Specification) sensor assembly (Specification) housing (Specification) cavity (Specification) electrical sensor device	No selections

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		(Specification) retaining member (Specification) retainer (Specification) wall structure (Specification) tire (Specification) rotational direction	

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	8776590	B2	2014-07-15	Kempf et al.	
	2	7900665	B2	2011-03-08	Shimura	
	3	8657975	B2	2014-02-25	Bell	
	4	6309494	B1	2001-10-30	Koch et al.	
	5	6255940	B1	2001-07-03	Phelan et al.	
	6	10712238	B2	2020-07-14	Ledoux et al.	
	7	10119876	B2	2018-11-06	Marques et al.	
	8	9950575	B2	2018-04-24	Marques et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

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Attorney Docket Number	67838.01000

	9	7770444	B2	2010-08-10	Bertrand	
	10	8248225	B2	2012-08-21	Buck et al.	
	11	6030478	A	2000-02-29	Koch et al.	
	12	6257289	B1	2001-07-10	Tomita et al.	
	13	6788192	B2	2004-09-07	Shimura	
	14	5573611	A	1996-11-12	Koch et al.	
	15	5573610	A	1996-11-12	Koch et al.	
	16	5562787	A	1996-10-08	Koch et al.	
	17	5971046	A	1999-10-26	Koch et al.	
	18	6217683	B1	2001-04-17	Balzer et al.	
	19	5731754	A	1998-03-24	Lee, Jr. et al.	

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Revvo v. Cerebrum
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

	20	5500065	A	1996-03-19	Koch et al.	
	21	5181975	A	1993-01-26	Pollack et al.	
	22	4862486	A	1989-08-29	Wing et al.	
	23	6688353	B1	2004-02-10	Koch	
	24	6208244	B1	2001-03-27	Wilson et al.	
	25	8874386	B2	2014-10-28	Brusarosco et al.	

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U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20170232806	A1	2017-08-17	Sakamoto et al.	
	2	20020029626	A1	2002-03-14	Koch et al.	
	3	20130167999	A1	2013-07-04	Nakatani et al.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2861
	Examiner Name	Not yet assigned
	Attorney Docket Number	67838.01000

	4	20030221766	A1	2003-12-04	Strache et al.	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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EXAMINER SIGNATURE

Examiner Signature	/JERMAINE L JENKINS/	Date Considered	11/08/2022

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 463

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2021-08-04
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Revvo v. Cerebrum
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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public 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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L.J/

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17084483 - IP

Report Run Date: 2022-11-08
Results included: 100
Results Priority Date Range: 1994-05-09 to 2019-10-31
Results Publication Date Range: 1996-01-03 to 2022-10-18

Main Concept Document: US20210131916 (Sensor assemblies and systems for monitoring a dynamic object)
Collections (167): US Patents, US Designs, US Applications, EPO Patents, EPO Applications, China Patents, China Applications, Japan Patents, Japan Applications, Korea Patents, Korea Applications, WIPO Applications,...

Publication contains information from a representative family member.

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Search Criteria

Main Concept Document: US20210131916 (Sensor assemblies and systems for monitoring a dynamic object)

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Collections (167): US Patents, US Designs, US Applications, EPO Patents, EPO Applications, China Patents, China Applications, Japan Patents, Japan Applications, Korea Patents, Korea Applications, WIPO Applications, Argentina Patents, Argentina Applications, Brazil Patents, Brazil Applications, Canada Patents, Canada Applications, Chile Patents, Chile Applications, Colombia Applications, Costa Rica Applications, Cuba Patents, Cuba Applications, Dominican Republic Applications, Ecuador Patents, Ecuador Applications, El Salvador Applications, Guatemala Applications, Honduras Applications, Mexico Patents, Mexico Applications, Nicaragua Patents, Panama Applications, Peru Applications, Trinidad & Tobago Patents, Uruguay Applications, Austria Patents, Austria Applications, Belarus Patents, Belgium Patents, Belgium Applications, Bosnia & Herzegovina Patents, Bosnia & Herzegovina Applications, Bulgaria Patents, Bulgaria Applications, Croatia Patents, Croatia Applications, Czech Republic Patents, Czech Republic Applications, Czechoslovakia Patents, Czechoslovakia Applications, Denmark Patents, Denmark Applications, Estonia Patents, Estonia Applications, EUIPO Patents, Finland Patents, Finland Applications, France Patents, France Applications, Germany Patents, Germany Applications, Great Britain Patents, Great Britain Applications, Greece Patents, Greece Applications, Hungary Patents, Hungary Applications, Iceland Patents, Iceland Applications, Ireland Patents, Ireland Applications, Italy Patents, Italy Applications, Latvia Patents, Latvia Applications, Lithuania Patents, Lithuania Applications, Luxembourg Patents, Malta Patents, Monaco Patents, Montenegro Patents, Montenegro Applications, Netherlands Patents, Netherlands Applications, Norway Patents, Norway Applications, Poland Patents, Poland Applications, Portugal Patents, Portugal Applications, Republic of Moldova Patents, Republic of Moldova Applications, Romania Patents, Romania Applications, San Marino Patents, San Marino Applications, Serbia Patents, Serbia Applications, Slovakia Patents, Slovakia Applications, Slovenia Patents, Spain Patents, Spain Applications, Sweden Patents, Sweden Applications, Switzerland Patents, Switzerland Applications, Ukraine Patents, Yugoslavia/Serbia and Montenegro Patents, Yugoslavia/Serbia and Montenegro Applications, Armenia Patents, Australia Patents, Australia Applications, Cyprus Patents, Gulf Cooperation Council Patents, Hong Kong Patents, India Patents, India Applications, Indonesia Patents, Indonesia Applications, Israel Applications, Jordan Patents, Jordan Applications, Kyrgyzstan Patents, Macao Applications, Malaysia Patents, Mongolia Patents, New Zealand Patents, Philippines Patents, Philippines Applications, Saudi Arabia Patents, Saudi Arabia Applications, Singapore Patents, Singapore Applications, Taiwan Patents, Taiwan Applications, Tajikistan Patents, Tajikistan Applications, Thailand Patents, Thailand Applications, Uzbekistan Patents, Vietnam Patents, Algeria Patents, ARIPO Patents, ARIPO Applications, Egypt Patents, Kenya Patents, Malawi Patents, Morocco Patents, Morocco Applications, OAPI Patents, South Africa Patents, Tunisia Applications, Zambia Patents, Zimbabwe Patents, EAPO Patents, EAPO Applications, Georgia Patents, Georgia Applications, Kazakhstan Patents, Kazakhstan Applications, Russia Patents, Russia Applications, Turkey Patents, Turkey Applications

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Sensor assemblies and systems for monitoring a dynamic object

Image not currently available

Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

Sensor assemblies and systems for monitoring a dynamic object

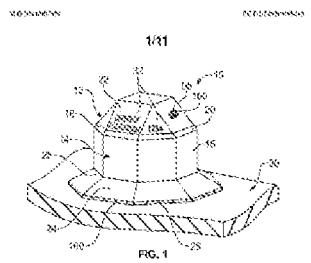

FIG. 1

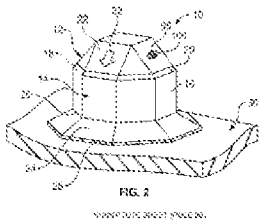
FIG. 2

Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

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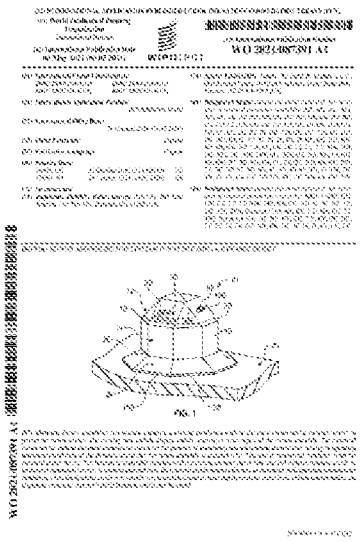
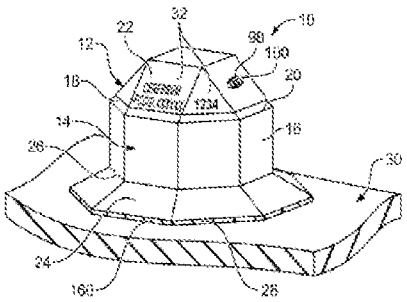
Sensor assemblies and systems for monitoring a dynamic object



Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

Sensor Assemblies and Systems for Monitoring Dynamic Objects



Abstract:
Sensor assemblies and systems include a housing configured with an electrical sensor device held therein to protect the sensor device. The housing may include display indicia relating to certain aspects of the sensor assembly. The electrical sensor device includes electrical components useful for the purpose of monitoring and transmitting desired data related to operating parameters/states of a dynamic article to which the sensor assembly is attached. Data is transmitted wirelessly from the electrical sensor device. The housing is removably attached to the dynamic article or element connected thereto and a retaining member to which it is also attached. A receiver that is external to the dynamic article receives the data so that when the dynamic article is a vehicle tire, behavior such as outer diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment deviations, and tire/vehicle position Determine parameters and/or states, which may be stored.

Current Assignees: FERRY KEITH GEORGE

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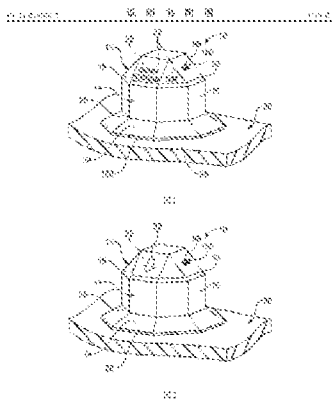
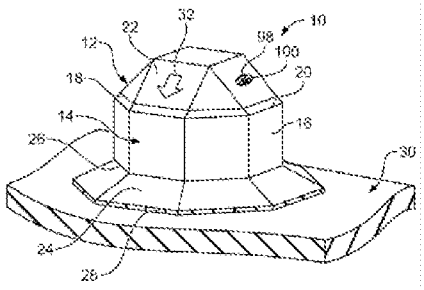
Sensor assembly and system for monitoring dynamic objects



Abstract:
Sensor assemblies and systems include a housing configured to retain an electrical sensor device therein to protect the sensor device. The housing may include display indicia associated with some aspects of the sensor assembly. The electrical sensor device includes electrical components that can be used to monitor and transmit desired data related to an operating parameter/condition of a dynamic article to which the sensor assembly is attached. The data is wirelessly transmitted from the electrical sensor device. The housing is removably attached to a retaining member that is also attached to the dynamic article or an element connected to the dynamic article. A receiver external to the dynamic article receives data to determine such operating parameters and/or conditions that may be stored: when the dynamic article is a vehicle tire, such operating parameters and/or conditions as outer diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment changes, and...

Current Assignees: JI SIQIAOZHIFEILI

Sensor assemblies and systems for monitoring a dynamic object



Abstract:
Sensor assemblies and systems comprise a housing configured to accommodate an electrical sensor device therein, mechanically retain the same, and provide a protective surrounding thereto. The housing may include display indicia relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with, e.g., a vehicle tire. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article. A receiver external from the dynamic article receives the data for the purpose of determine such operating parameter/or conditions, when the dynamic article is a vehicle tire, as tire tread depth, tire pressure, vehicle camber and toe alignment variations, and tire/vehicle location, which...

Current Assignees: FERRY KEITH GEORGE

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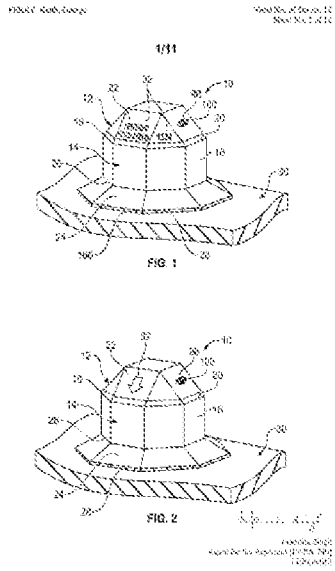
Sensor assemblies and systems for monitoring a dynamic object



Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored.

Current Assignees: FERRY KEITH GEORGE

Sensor assemblies and systems for monitoring a dynamic object

Image not currently available

Abstract:
Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia, relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a. vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may he stored. Sensor...

Current Assignees: FERRY KEITH GEORGE

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Vehicle wireless sensing and communication system

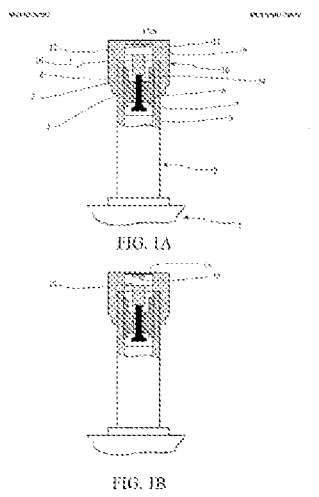


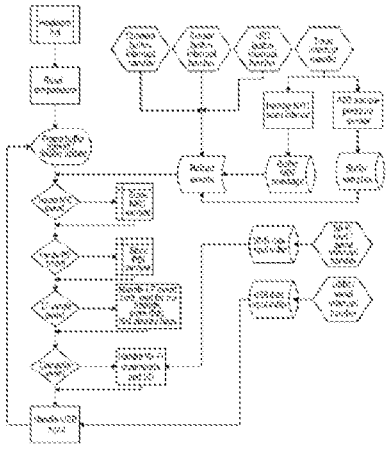
FIG. 1A

FIG. 1B

Abstract:
Valve cap (10) for monitoring pressure and/or temperature of a tire (1) having a valve stem (2) including a valve assembly (5) having a valve pin (6). A body (9) of the valve cap (10) mates with the valve stem (2) and defines a chamber (12) upon such mating. A valve pin depressor (14) is arranged in the body (9) and depresses the valve pin (6) upon mating of the body (9) with the valve stem (2) to open the valve assembly (5) and enable flow communication between an interior of the tire (1) and the chamber (12). At least one SAW sensor (11) is arranged in the chamber (12) for receiving a signal and returning a signal modified by virtue of the temperature and/or pressure of the tire (1).

Current Assignees: AUTOMOTIVE TECH INTL INC

Method for communicating data between an NFC-enabled device on a vehicle and a driver indentification device



Abstract:
A method for communicating data between a vehicle and a mobile computing device includes locating at least one NFC-enabled device on the vehicle. Vehicle user data is wirelessly transferred between the NFC-enabled device and the mobile computing device. Using the vehicle user data, the NFC-enabled device on the vehicle and the mobile computing device are paired.

Current Assignees: ITIRE LLC

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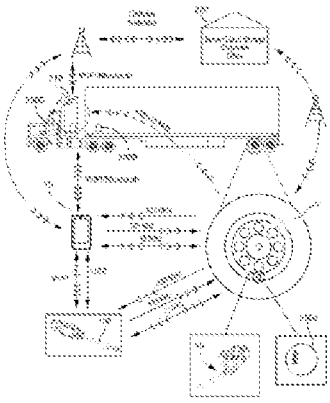
US20160343178 | **Publication Date: 2016-11-24 | Priority Date: 2015-03-10**

Method for communicating data between an nfc-enabled device on a vehicle and a driver identification device

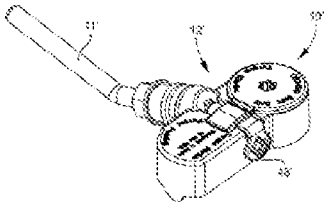


Abstract:
A method for communicating data between a vehicle and a mobile computing device includes locating at least one NFC-enabled device on the vehicle. Vehicle user data is wirelessly transferred between the NFC-enabled device and the mobile computing device. Using the vehicle user data, the NFC-enabled device on the vehicle and the mobile computing device are paired.

Current Assignees: ITIRE LLC

US20160339748 | **Publication Date: 2016-11-24 | Priority Date: 2015-03-10**

Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

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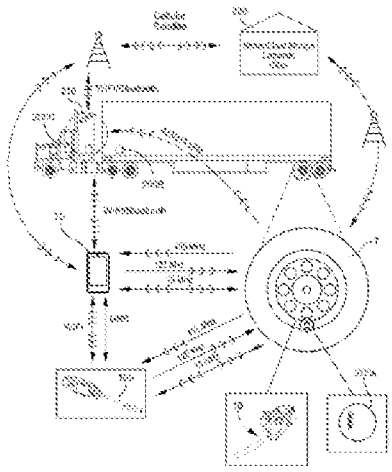
US9682598 | **Publication Date: 2017-06-20 | Priority Date: 2015-03-10**

Smart tag assembly for mounting on an object to be tracked

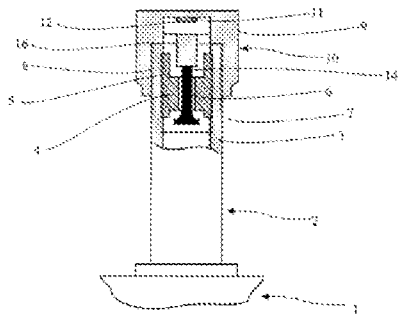


Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

US6758089 | **Publication Date: 2004-07-06 | Priority Date: 2001-07-09**

Wireless sensing and communication system of roadways



Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

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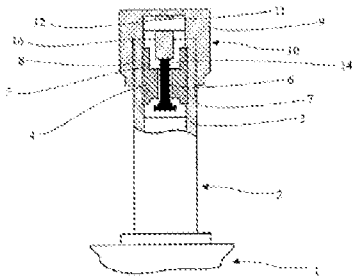
US20030005789 | **Publication Date: 2003-01-09** | **Priority Date: 2001-07-09**

Wireless sensing and communication system of roadways

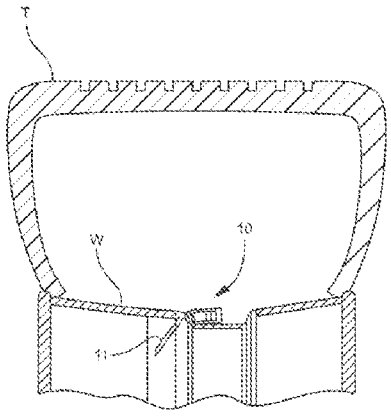


Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

US20170200448 | **Publication Date: 2017-07-20** | **Priority Date: 2014-10-06**

Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

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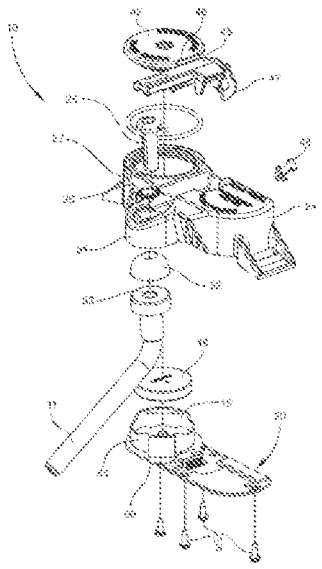
US10204297 | **Publication Date: 2019-02-12** | **Priority Date: 2014-10-06**

Smart tag assembly for mounting on an object to be tracked

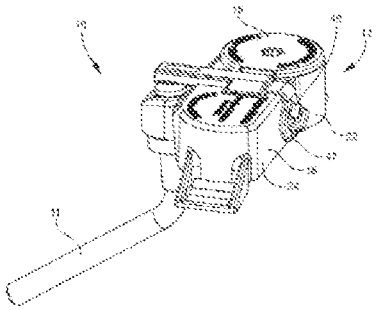


Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate, and has a generally concave outside surface adapted for residing against a generally convex surface of the object to be tracked.

Current Assignees: ITIRE LLC

US20180072114 | **Publication Date: 2018-03-15** | **Priority Date: 2014-03-10**

Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate.

Current Assignees: ITIRE LLC

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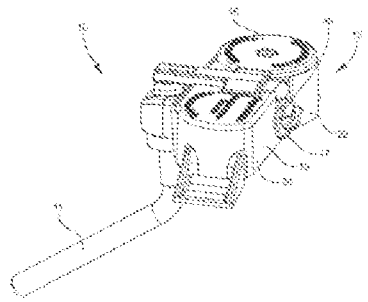
US20160375733 | **Publication Date: 2016-12-29** | **Priority Date: 2014-03-10**

Smart tag assembly for mounting on an object to be tracked

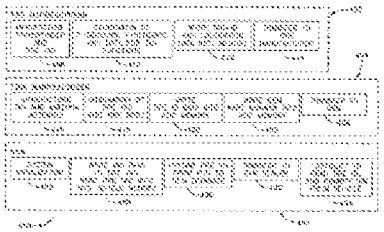


Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate.

Current Assignees: ITIRE LLC

US7104438 | **Publication Date: 2006-09-12** | **Priority Date: 2003-10-22**

Method of integrating tire identification into a vehicle information system



Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage for storing tire identification data; connecting the tire stored data to a vehicle electronic control unit (ECU) having ECU data storage; reading tire identification data from the stored tire data into the ECU stored data; and uploading the tire identification data from the ECU stored data to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU stored data and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an end-of-line diagnostic test on the vehicle.

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
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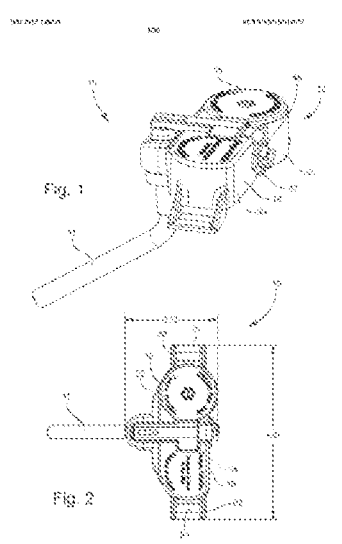
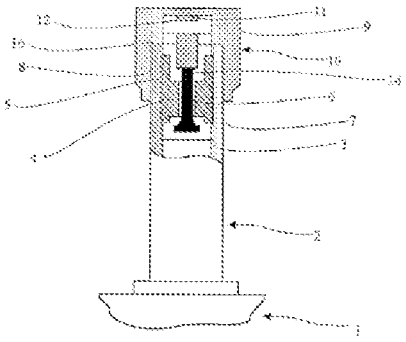
Smart tag assembly for mounting on an object to be tracked



Abstract:
A smart tag assembly is designed for mounting on an object to be tracked. The smart tag assembly comprises a multiple layer RFID laminate adapted for electronically storing and processing data, and wireless communicating data when interrogated by an RFID reader. The laminate comprises an RFID inlay including a microchip and antenna formed with a substrate, and laminated between an outside label cover and backing. A low-profile tag carrier defines a recessed pocket designed for receiving and holding the RFID laminate.

Current Assignees: ITIRE LLC

Vehicle wireless sensing and communication system



Abstract:
Wireless sensing and communication system including sensors located on the vehicle or in the vicinity of the vehicle and which provide information which is transmitted to one or more interrogators in the vehicle using wireless radio frequency transmission technology. Power to operate the sensor may be supplied by the interrogator. The sensors include tire pressure, temperature and acceleration monitoring sensors, weight or load measuring sensors, switches, temperature, acceleration, angular position, angular rate, angular acceleration, proximity, rollover, occupant presence, humidity, presence of fluids or gases, strain, road condition and friction, chemical sensors and other similar sensors providing information to a vehicle system, vehicle operator or external site. The sensors provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
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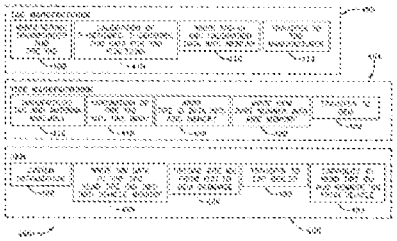
US20050087593 | **Publication Date: 2005-04-28** | **Priority Date: 2003-10-22**

Method of integrating tire identification into a vehicle information system

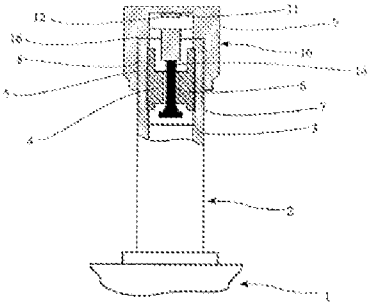


Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage means for storing tire identification data; connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means; reading tire identification data from the tire data storage means into the ECU data storage means; and uploading the tire identification data from the ECU data storage means to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU data storage means and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US6662642 | **Publication Date: 2003-12-16** | **Priority Date: 2000-09-08**

Vehicle wireless sensing and communication system



Abstract:
Wireless sensing and communication system including sensors located on the vehicle or in the vicinity of the vehicle and which provide information which is transmitted to one or more interrogators in the vehicle using wireless radio frequency transmission technology. Power to operate the sensor may be supplied by the interrogator. The sensors include tire pressure, temperature and acceleration monitoring sensors, weight or load measuring sensors, switches, temperature, acceleration, angular position, angular rate, angular acceleration, proximity, rollover, occupant presence, humidity, presence of fluids or gases, strain, road condition and friction, chemical sensors and other similar sensors providing information to a vehicle system, vehicle operator or external site. The sensors provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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WO2009070065A1 | **Publication Date: 2009-06-04** | **Priority Date: 2007-11-30**

Wheel-monitoring apparatus

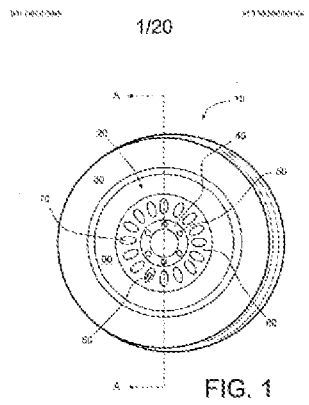


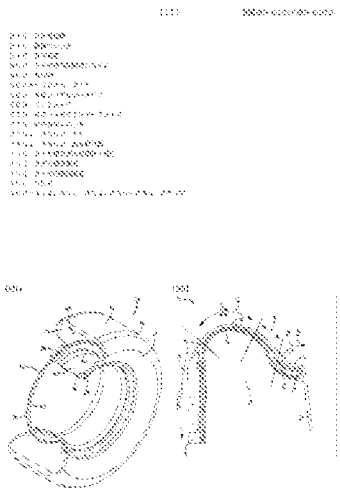
FIG. 1

Abstract:
There is provided a wheel-monitoring apparatus (600, 680, 690, 2200) for monitoring operation of a wheel (10, 2500, 3000) of a vehicle (900). The apparatus (600, 680, 690, 2200) includes a sensor module (400) operatively mounted to revolve with the wheel (10, 2500, 3000). The module (400) is coupled in communication with a processing arrangement (710, ECU 950) of the vehicle (900). The module (400) senses at least one physical parameter of the wheel (10, 2500, 3000) and generates a corresponding sensor signal for the processing arrangement (950). The processing arrangement (710, ECU 950) processes the sensor signal to compute information indicative of operation of the wheel (10, 2500, 3000). The apparatus (600, 680, 690, 2200) includes a sensor (118) for sensing an angular orientation (ϑ) of the wheel (600, 680, 690, 2200). The processing arrangement (710, ECU 950) is operable to process the sensor signal in respect of the angular orientation (ϑ, ω). Moreover, the module...

Current Assignees: VOLVO LASTVAGNAR AB

JP2005182192A | **Publication Date: 2005-06-23** | **Priority Date: 2003-10-22**

Unifying method of tire discrimination information to vehicle information system



Abstract:
PROBLEM TO BE SOLVED: To provide a method for integrating tire data into a vehicle information system. A method for integrating tire identification data into a vehicle information system includes attaching a tire having tire data storage means for storing tire identification data to a vehicle chassis of a production line; Connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means, and reading tire identification data from the tire data storage means into the ECU data storage means And uploading the tire identification data from the ECU data storage means to the OEM database. [Selection] Figure 15

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 481

CA2482242A1 | Publication Date: 2005-04-22 | Priority Date: 2003-10-22

Method of integrating tire identification into a vehicle information system

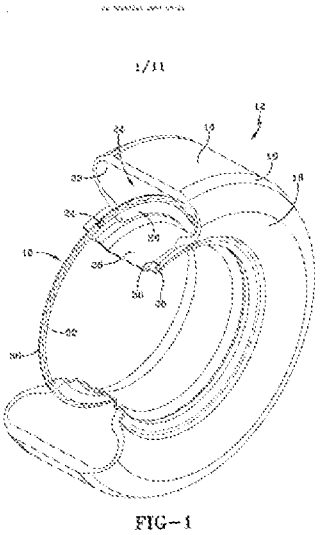


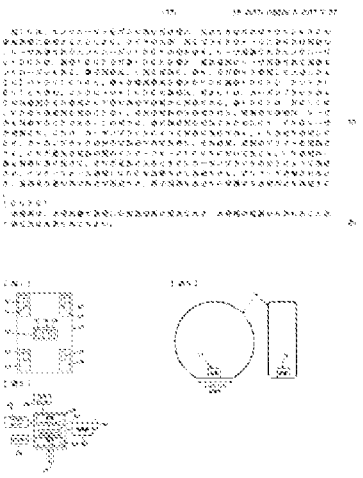
FIG-1

Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage means for storing tire identification data; connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means; reading tire identification data from the tire data storage means into the ECU data storage means; and uploading the tire identification data from the ECU data storage means to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU data storage means and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an...

Current Assignees: GOODYEAR TIRE & RUBBER CO

JP2017128328A | Publication Date: 2017-07-27 | Priority Date: 2015-12-22

Advanced tire monitoring system



Abstract:
An advanced tire monitoring system is provided. A tire pressure monitoring system includes a tire pressure monitoring device that is attached to an inner surface of a tire and includes a pressure sensor that monitors a pressure of fluid in the tire. The system has an RFID tag placed on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from the fluid pressure monitoring, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device. [Selection] Figure 6

Current Assignees: SCHRADER ELTNC LTD

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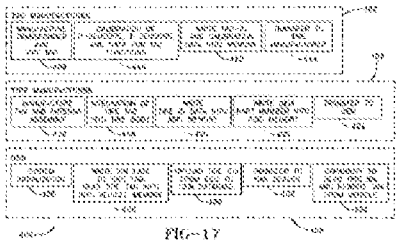
EP1528467A1 | **Publication Date: 2005-04-27** | **Priority Date: 2003-10-22**

Method of integrating tire identification data into a vehicle informating system

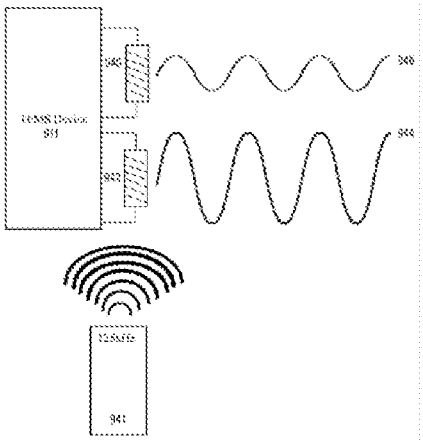


Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage means for storing tire identification data; connecting the tire data storage means to a vehicle electronic control unit (ECU) having ECU data storage means; reading tire identification data from the tire data storage means into the ECU data storage means; and uploading the tire identification data from the ECU data storage means to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU data storage means and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an...

Current Assignees: GOODYEAR TIRE & RUBBER CO

US11090991 | **Publication Date: 2021-08-24** | **Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

Revvo's Exhibit 1002
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BRPI0722237A2 | **Publication Date: 2014-06-03** | **Priority Date: 2007-11-30**

Wheel monitoring module

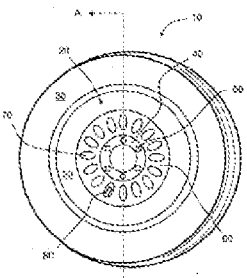


FIG. 1

Abstract:
A module is operable to monitor at least a pressure within a tire of a wheel, the module being operatively mounted to said wheel, the module including: (a) a pressure sensor for measuring the pressure (P) and generating a corresponding pressure signal; and b1) an associated data memory including a data field containing data relevant to the functional status of the tyre.

Current Assignees: VOLVO LASTVAGNAR AB

NZ330237A | **Publication Date: 1998-06-26** | **Priority Date: 1994-06-03**

Tire condition sensor/transmitter adhered to inner surface of tire

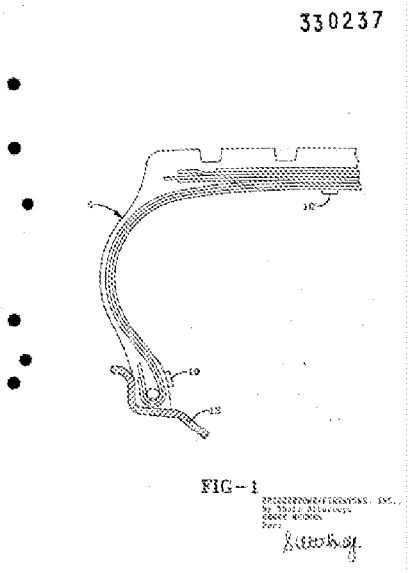


FIG-1

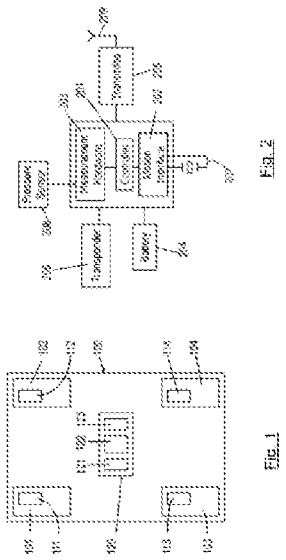
Abstract:

Current Assignees: BRIDGESTONE AMERICAS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 484

US20170174014 | **Publication Date: 2017-06-22** | **Priority Date: 2015-12-22**

Advanced Tire Monitoring System

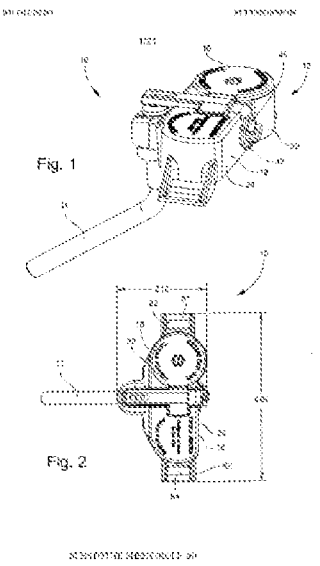


Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

WO2013152294A1 | **Publication Date: 2013-10-10** | **Priority Date: 2012-04-06**

Tire data collection and communication device, multi-purpose handheld data collection and communication tool, and method for communicating tire data between a vehicle tire and a remote computing device



Abstract:
A direct tire data collection and communication device is adapted for use in a pneumatic vehicle tire. The device incorporates a tire-mounted electronics module comprising a microcontroller, and at least one tire property sensor in electronic communication with the microcontroller and capable of measuring at least one operational property of the vehicle tire. The threshold operational property value defines a positive tire safety condition and a negative tire safety condition. The electronics module calculates accumulated travel data of the vehicle tire while in the negative tire safety condition. A transmitter transmits the travel data to an electronic remote terminal.

Current Assignees: ITIRE LLC

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Revvo v. Cerebrum
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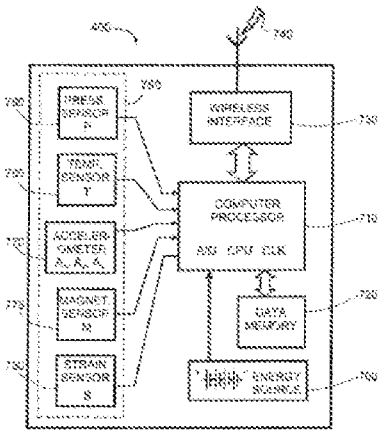
US10035387 | **Publication Date: 2018-07-31** | **Priority Date: 2007-11-30**

Wheel-monitoring module

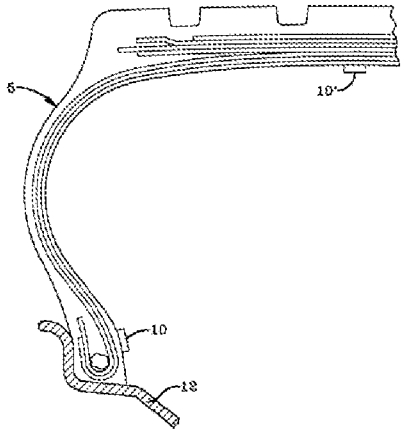


Abstract:
A module is operable to monitor at least a pressure within a tire of a wheel, the module being operatively mounted to said wheel, the module including (a) a pressure sensor for measuring the pressure (P) and generating a corresponding pressure signal; and b1) an associated data memory including a data field containing data relevant to the functional status of the tire.

Current Assignees: VOLVO TRUCKS CORP, VOLVO TECH AB

EP0689950B1 | **Publication Date: 1999-04-28** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein



FIG−1

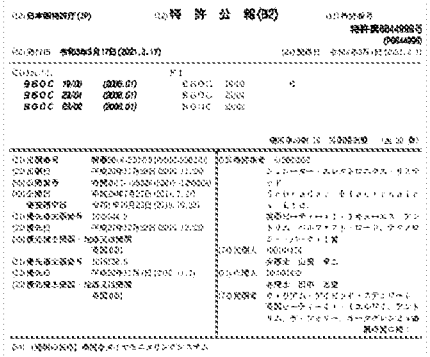
Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 486

JP6844996B2 | **Publication Date: 2021-03-17** | **Priority Date: 2015-12-22**

Advanced tire monitoring system

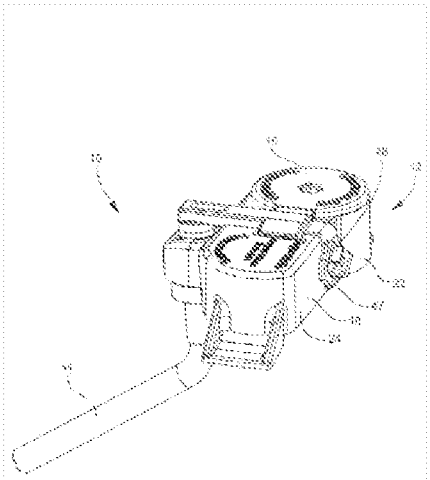


Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

US20210252921 | **Publication Date: 2021-08-19** | **Priority Date: 2012-04-06**

Tire data collection and communication device, multi-purpose handheld data collection and communication tool, and method for communicating tire data between a vehicle tire and a remote computing device



Abstract:
A direct tire data collection and communication device is adapted for use in a pneumatic vehicle tire. The device incorporates a tire-mounted electronics module comprising a microcontroller, and at least one tire property sensor in electronic communication with the microcontroller and capable of measuring at least one operational property of the vehicle tire. The threshold operational property value defines a positive tire safety condition and a negative tire safety condition. The electronics module calculates accumulated travel data of the vehicle tire while in the negative tire safety condition. A transmitter transmits the travel data to an electronic remote terminal.

Current Assignees: ITIRE LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
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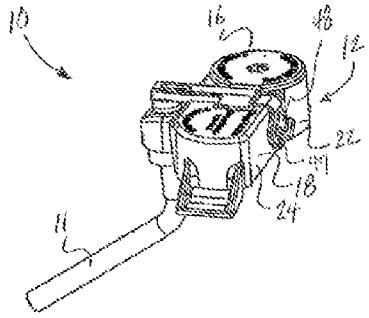
US20150029016 | **Publication Date: 2015-01-29 | Priority Date: 2012-04-06**

Tire data collection and communication device, multi-purpose handheld data collection and communication tool, and method for communicating tire data between a vehicle tire and a remote computing device

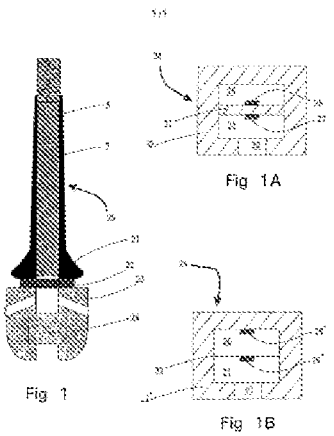


Abstract:
A direct tire data collection and communication device is adapted for use in a pneumatic vehicle tire. The device incorporates a tire-mounted electronics module comprising a microcontroller, and at least one tire property sensor in electronic communication with the microcontroller and capable of measuring at least one operational property of the vehicle tire. The threshold operational property value defines a positive tire safety condition and a negative tire safety condition. The electronics module calculates accumulated travel data of the vehicle tire while in the negative tire safety condition. A transmitter transmits the travel data to an electronic remote terminal.

Current Assignees: ITIRE LLC

GB2406171A | **Publication Date: 2005-03-23 | Priority Date: 2000-09-08**

Tyre valve with SAW sensors to measure pressure and temperature



Abstract:
A valve stem assembly for a tyre has an elongate metallic (eg brass) valve stem 7, a rubber body 23 attached to the end of the stem 7 within the interior space of the tyre and a sensor capsule 24 within the rubber body 23 which includes a SAW absolute pressure sensor 27,29' in a chamber 25 in flow communication with the inside of the tyre and also a SAW temperature sensor 28,28' in another chamber 26 isolated from the inside of the tyre by a flexible or rigid membrane 31,33.

Current Assignees: AUTOMOTIVE TECH INTL INC

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IPR2025-00632 - Page 488

GB2406170A | Publication Date: 2005-03-23 | Priority Date: 2000-09-08

Tyre monitor which measures acceleration of tyre tread

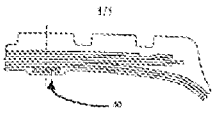


Fig 1

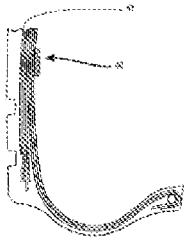


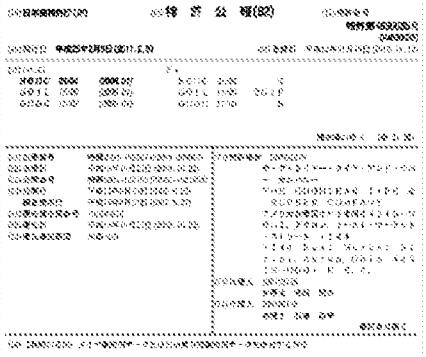
Fig 1A

Abstract:
A tyre monitor 40 is either cemented to the inner surface of the tyre opposite the tread, or is inserted into the tyre during manufacture. The monitor includes pressure and/or temperature sensors. The monitor also includes an accelerometer to measure the tangential and/or radial acceleration of the tyre tread adjacent the monitor. The sensors may be SAW devices. Pressure, temperature and acceleration data is transmitted from the monitor via an antenna. The measured acceleration signals can be used to detect tyre wear, delamination, embedded nails and debris attached to the tyre. The length of the tyre footprint can be calculated from the length of time that the tread opposite the monitor is in contact with the road. This can provide an indication of tyre overloading.

Current Assignees: AUTOMOTIVE TECH INTL INC

JP4630035B2 | Publication Date: 2011-02-09 | Priority Date: 2003-10-22

Method for integrating tire identification data and OEM vehicle identification data



Abstract:
A method for integrating tire identification data into a vehicle information system comprises the steps: mounting a tire to a production line vehicle chassis, the tire having tire data storage for storing tire identification data; connecting the tire stored data to a vehicle electronic control unit (ECU) having ECU data storage; reading tire identification data from the stored tire data into the ECU stored data; and uploading the tire identification data from the ECU stored data to an OEM database. The method may optionally include incorporating a tire pressure monitoring system into the tire; and including tire pressure monitoring system identification data in the tire identification data. The vehicle identification data may be incorporated into the ECU stored data and uploaded with the tire identification information to an OEM database at a preferred point in the vehicle assembly line sequence that coincides with the execution of an end-of-line diagnostic test on the vehicle.

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 489

NZ330238A | **Publication Date: 1998-07-28** | **Priority Date: 1994-06-03**

Fixing pressure sensor transmitter to inner surface of tire

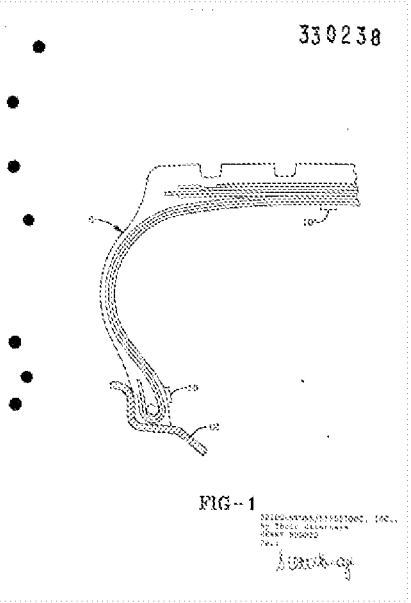


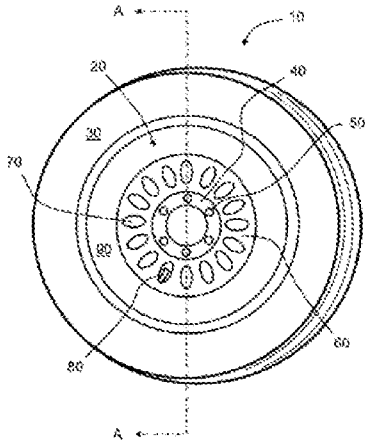
FIG - 1

Abstract:

Current Assignees: BRIDGESTONE AMERICAS INC

US20100250048 | **Publication Date: 2010-10-07** | **Priority Date: 2007-11-30**

Wheel-monitoring module



Abstract:
A module is operable to monitor at least a pressure within a tire of a wheel, the module being operatively mounted to said wheel, the module including: (a) a pressure sensor for measuring the pressure (P) and generating a corresponding pressure signal; and b1) an associated data memory including a data field containing data relevant to the functional status of the tyre.

Current Assignees: VOLVO TRUCKS CORP, VOLVO TECH AB

Revvo's Exhibit 1002
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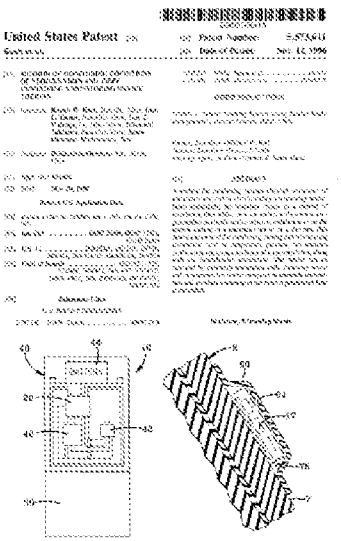
US5573611 | **Publication Date: 1996-11-12** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein

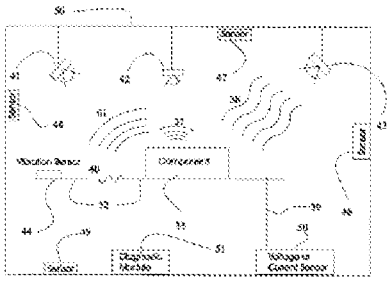


Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

US7089099 | **Publication Date: 2006-08-08** | **Priority Date: 2004-07-30**

Sensor assemblies



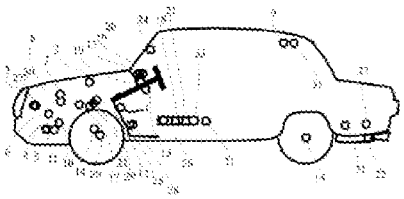
Abstract:
Sensor assembly capable of obtaining and providing a measurement of a physical quantity, e.g., measurement of temperature and/or pressure of a vehicular tire, includes an antenna capable of receiving a radio frequency signal, a radio frequency identification (RFID) device coupled to the antenna, a sensor coupled to the RFID device arranged to generate a measurement of the physical quantity or quantities, and a switch coupled to the RFID device and arranged to connect or disconnect the sensor from a circuit with the antenna dependent on whether the antenna receives a particular signal associated with the RFID device. When the antenna receives the particular signal associated with the RFID device, the RFID device causes the switch to close and connect the sensor in the circuit with the antenna to enable the measurement generated by the sensor to be directed to and transmitted by the antenna.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 491

US7379800 | **Publication Date: 2008-05-27** | **Priority Date: 2000-09-08**

Tire pressure monitoring using hall effect sensors

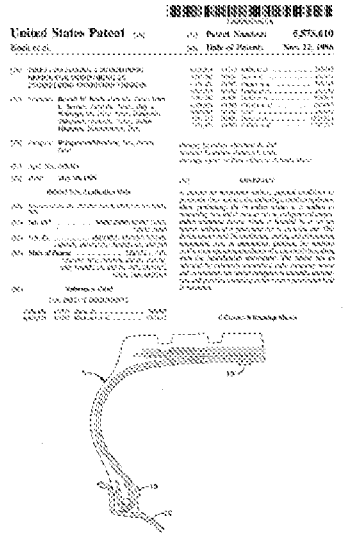


Abstract:
Wheel assembly with a tire pressure monitoring system includes a wheel rim, a tire mounted thereon, a housing having an interior in flow communication with the tire interior such that the same pressure prevails in the tire and in the housing interior, a magnet arranged in the housing and movable in an axial direction of the tire, a Hall effect sensor arranged on a non-rotating part of the vehicle in a position in which it is in a magnetic field generated by the magnet during rotation of the tire relative to the non-rotating part, and a spring arranged to move the magnet in dependence on pressure in the housing interior. The spring is arranged outside of the magnet. The Hall effect sensor senses magnetic field density of the magnet as the magnet rotates which is convertible into an indication of the pressure in the housing and thus the tire pressure.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US5573610 | **Publication Date: 1996-11-12** | **Priority Date: 1994-06-03**

Tires containing a monitoring device for monitoring an engineering condition therein



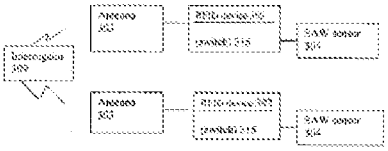
Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 492

US20060025897 | **Publication Date: 2006-02-02** | **Priority Date: 2004-07-30**

Sensor assemblies

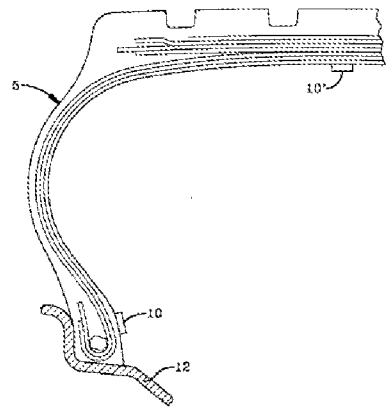


Abstract:
Sensor assembly capable of obtaining and providing a measurement of a physical quantity, e.g., measurement of temperature and/or pressure of a vehicular tire, includes an antenna capable of receiving a radio frequency signal, a radio frequency identification (RFID) device coupled to the antenna, a sensor coupled to the RFID device arranged to generate a measurement of the physical quantity or quantities, and a switch coupled to the RFID device and arranged to connect or disconnect the sensor from a circuit with the antenna dependent on whether the antenna receives a particular signal associated with the RFID device. When the antenna receives the particular signal associated with the RFID device, the RFID device causes the switch to close and connect the sensor in the circuit with the antenna to enable the measurement generated by the sensor to be directed to and transmitted by the antenna.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

EP0689950A2 | **Publication Date: 1996-01-03** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires and tires containing a monitoring device therein



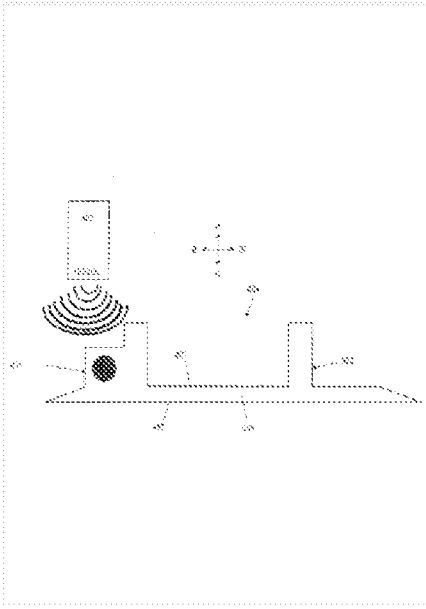
FIG−1

Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded. -

Current Assignees: BRIDGESTONE AMERICAS INC

DE102016225640A1 | **Publication Date: 2017-06-22** | **Priority Date: 2015-12-22**

Improved tire monitoring system

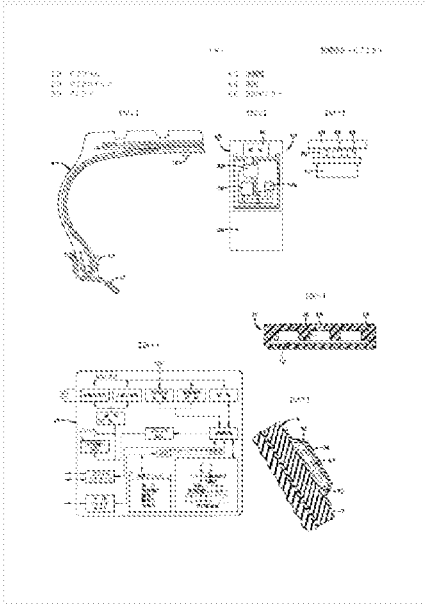


Abstract:
A tire pressure monitoring system includes a tire pressure monitoring device for mounting on an inner surface of a tire, and a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag disposed on the tire separate from the tire monitor. In response to the detection of a tire pressure event from the monitoring of the fluid pressure, the tire pressure monitoring device causes the RFID to send data received from the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

JPH0867117A | **Publication Date: 1996-03-12** | **Priority Date: 1994-06-03**

Method for monitoring state of tire for vehicle and monitor device built-in tire



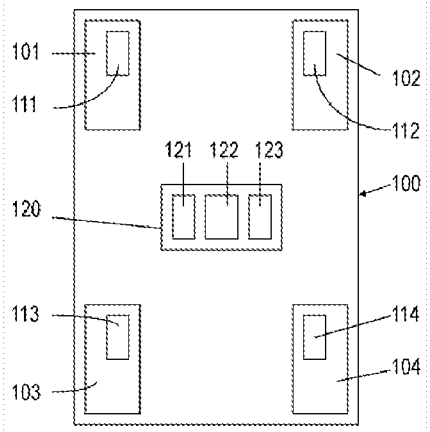
Abstract:
(57) [Summary] [Purpose] To monitor various physical conditions of tires. The configuration uses an active, self-driving programmable electronic device mounted inside the tire or on the tire rim. This device is designed for the temperature of pneumatic tires, Information such as pressure, mileage, and / or other driving conditions is monitored, stored, and used to telemeter along with tire identification information. The device can be activated by an externally transmitted radio frequency, in response the device compares or transmits information and gives a warning if a preselected limit is exceeded. -

Current Assignees: BRIDGESTONE CORP

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 494

KR20170074804A | **Publication Date: 2017-06-30** | **Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system comprising a pressure sensor for monitoring fluid pressure in a tire and a tire pressure monitoring device for mounting on an inner surface of the tire. The system has an RFID tag located on a tire separate from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of the fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

GB2405931A | **Publication Date: 2005-03-16** | **Priority Date: 2000-09-08**

Tyre pressure and/or temperature sensor

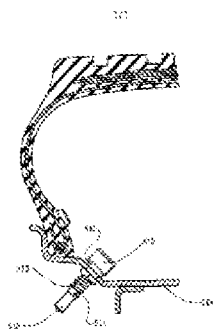


Fig 1

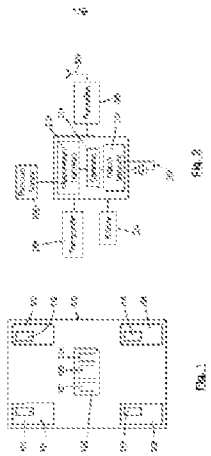
Abstract:
A tyre pressure and/or temperature monitor 510 is arranged inside the tyre at one end of an elongate body which extends through a wheel rim 513. An antenna 515 is arranged outside the tyre at the other end of the elongate body. The antenna 515 is coupled to the monitor 510 by an inductive wire 512 which matches the output of the monitor to the antenna. Insulating material 511 surrounds the elongate body to prevent electrical contact with the wheel rim. The sensor may be a SAW (surface acoustic wave) sensor.

Current Assignees: AUTOMOTIVE TECH INTL INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 495

GB2545693A | **Publication Date: 2017-06-28** | **Priority Date: 2015-12-22**

Advanced tire monitoring system

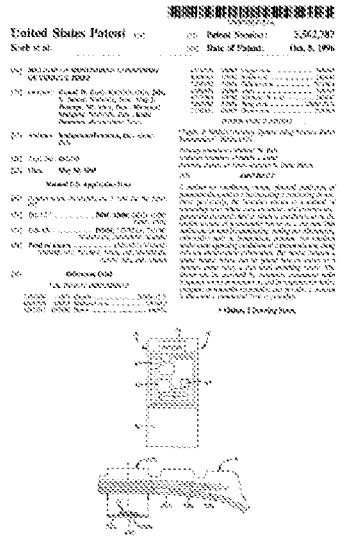


Abstract:
A tire pressure monitoring system (111, Fig.1) comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor 208 for monitoring the fluid pressure in the tire(101-104). The system has a data storage device, RFID tag 401, located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device. This permits the communication of data such as manufacturer, recommended tyre pressure, date of manufacture, mileage covered, etc. between the pressure sensor and the RFID tag. Pressure change detection may be event of new tyre being fitted to rim, i.e. from atmospheric to in use pressure, or the opposite for removal of old tyre. Also claimed is a tyre monitoring device for the inside of a tire comprising spaced...

Current Assignees: SCHRADER ELTNC LTD

US5562787 | **Publication Date: 1996-10-08** | **Priority Date: 1994-06-03**

Method of monitoring conditions of vehicle tires



Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device includes a power source which can be placed into an active or a dormant mode using a data band switching circuit. The device can be activated by externally transmitted radio frequency waves or microwaves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

Revvo's Exhibit 1002
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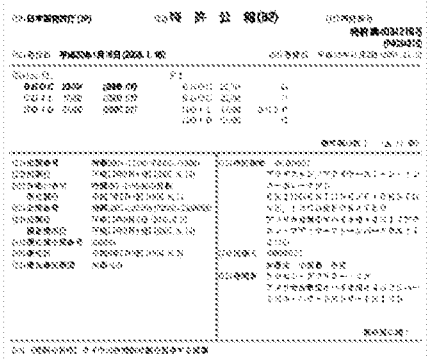
JP4034316B2 | Publication Date: 2008-01-16 | Priority Date: 1994-06-03

Equipment for monitoring the technical state of tires

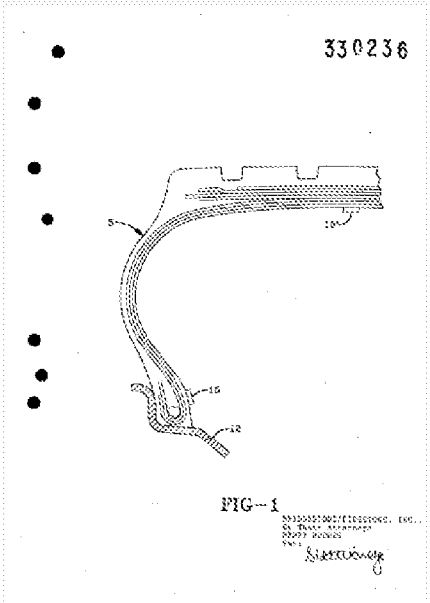


Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

NZ330236A | Publication Date: 1998-06-26 | Priority Date: 1994-06-03

Tire includes monitoring transducer transmitting tire data by data band switching



FIG—1

Abstract:

Current Assignees: BRIDGESTONE AMERICAS INC

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Revvo v. Cerebrum
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Method and apparatus for identifying wheel module positions of a vehicle, system and vehicle including said apparatus, and method of operating the system

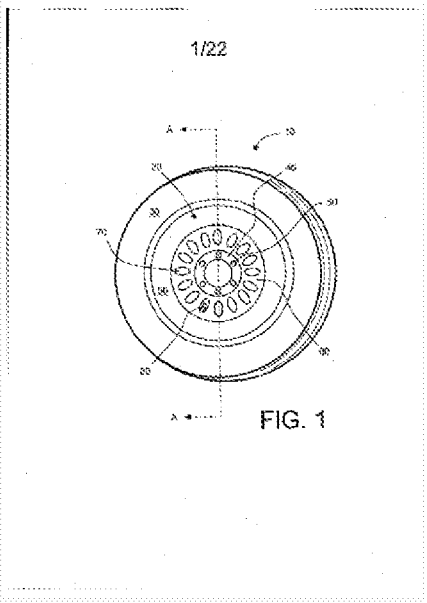
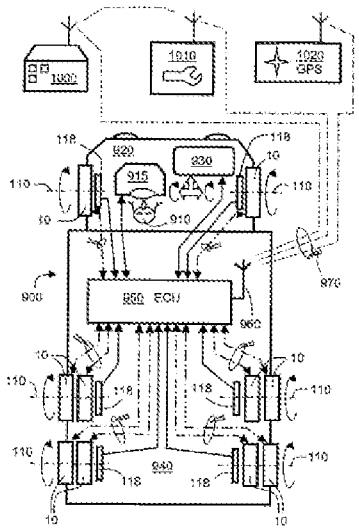


FIG. 1

Abstract:
METHOD AND APPARATUS FOR IDENTIFYING THE POSITIONS OF WHEEL MODULES OF A VEHICLE, SYSTEM AND VEHICLE INCLUDING THIS APPLIANCE, AND METHOD OF OPERATING THE SYSTEM The present invention relates to a method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring the operation of at least one wheel (10) of the vehicle (900), the apparatus (600, 680, 690, 2200) including a or more sensor modules (400) operatively mounted to revolutionize with at least one wheel (10), the one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of the vehicle (900). The method includes the steps of: (a) communicating with one or more modules (400) of the device (600, 680, 690, 2200) to receive their identification codes (ID) in a processing arrangement (950) of the device (600, 680, 690, 2200); (b) direct the vehicle (900) around a curved trajectory as sensed by a...

Current Assignees: VOLVO LASTVAGNAR AB

Method of identifying positions of wheel modules



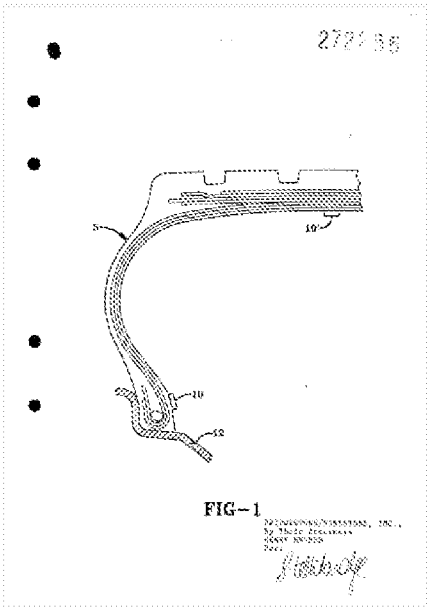
Abstract:
There is provided a method of identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle, the one or more modules operatively mounted to revolve with the at least one wheel, the one or more modules being operatively coupled in communication with a processing arrangement of the vehicle, the one or more modules being operable to sense at least one physical parameter of the wheel and to generate at least one corresponding sensor signal for the processing arrangement, the processing arrangement being operable to process the at least one sensor signal to compute information indicative of operation of the at least one wheel. The method includes steps of: (a) driving the vehicle for a period of time whilst recording a number of rotations executed for each of at least one wheel of the vehicle by employing a rotation sensing arrangement associated with the at least one wheel; (b) during the period of time,...

Current Assignees: VOLVO TRUCKS CORP

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 498

NZ272255A | **Publication Date: 1998-06-26** | **Priority Date: 1994-06-03**

Signalling device, embedded in tyre to monitor engineering condition of tire



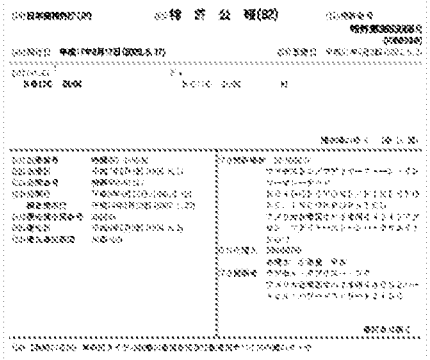
FIG–1

Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

JP3683008B2 | **Publication Date: 2005-08-17** | **Priority Date: 1994-06-03**

Vehicle tire condition monitoring method and tire with built-in monitoring device



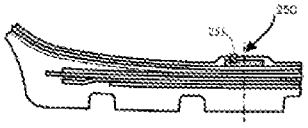
Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 499

US7549327 | **Publication Date: 2009-06-23 | Priority Date: 2001-02-16**

Tire-mounted energy generator and monitor

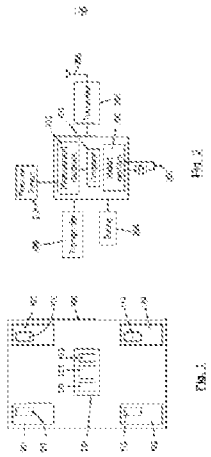


Abstract:
Tire monitoring arrangement including at least one tire condition sensor arranged on the tire to measure a condition of the tire and an energy generating mechanism or device arranged on the tread of the tire for generating electricity upon rotation of the tire. The energy generating mechanism is connected in a circuit with each tire condition sensor and powers the circuit and thus provides energy for the tire condition sensor(s). The tire condition sensor(s) and energy generating mechanism may be part of a tire monitor assembly which is affixed to an interior surface of the tire opposite the tread or inserted into the tire opposite the tread. Various tire condition sensors may be used including accelerometers, tire pressure sensors and tire temperature sensors. Various energy generating mechanisms may be used including a piezoelectric device, a polyvinylidene fluoride (PVDF) piezoelectric polymer, and a flexible material whose flexure causes energy generation.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

GB2545968A | **Publication Date: 2017-07-05 | Priority Date: 2015-12-22**

Advanced tire monitoring system



Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device. Further features may include detecting fluid increase/decrease, a transponder coil, memory/data storage, power induction, and the monitor is enclosed having a base and lid fixed together by laser welds. A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from...

Current Assignees: SCHRADER ELTNC LTD

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 500

EP3505336B1 | **Publication Date: 2021-09-01** | **Priority Date: 2018-12-18**

Article with electronic component inclusion and method of manufacturing

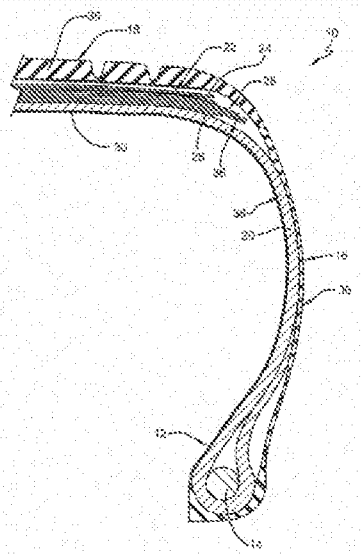


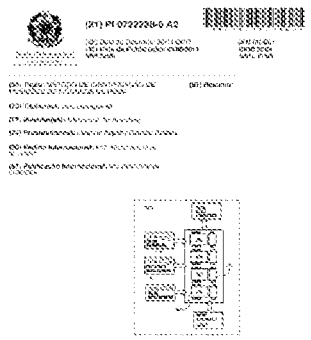
FIG. 1

Abstract:
An article that experiences repeated deformation includes an electronic component as an inclusion. The article includes at least one structural element, in which the structural element includes a material. At least one electronic component is incorporated into the material as an inclusion. The electronic component includes an integrated circuit and may also include at least one sensor and an antenna. The size of the electronic inclusion is no greater than the largest inclusion typically occurring within the material. The article may be an article formed of rubber, such as a tire.

Current Assignees: GOODYEAR TIRE & RUBBER CO

BRPI0722238A2 | **Publication Date: 2014-06-03** | **Priority Date: 2007-11-30**

Wheel modules position identification method



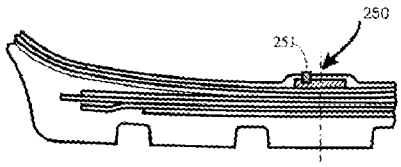
Abstract:
A method for identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle includes steps of (a) communicating with one or more modules of the apparatus for receiving their identification codes at a processing arrangement of the apparatus, the one or more modules being mounted on at least one wheel of the vehicle; (b) driving the vehicle around a curved trajectory as sensed by the steering sensing arrangement and recording a direction of steering of the vehicle together with a temporal record of the physical parameter measured by the one or more modules together with their corresponding identification codes, the physical parameter pertaining to one or more tires of the at least one wheel; and (c) applying an analysis to the steering direction and the temporal record in respect of time to identify where the one or more modules are located on the at least one wheel of the vehicle, the analysis utilizing...

Current Assignees: VOLVO LASTVAGNAR AB

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 501

US20060243043 | **Publication Date: 2006-11-02** | **Priority Date: 2001-02-16**

Tire-Mounted Energy Generator and Monitor

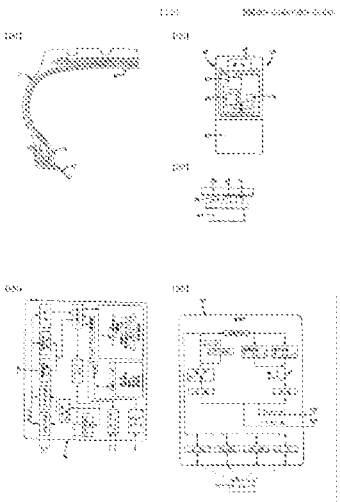


Abstract:
Information management and monitoring system and method for monitoring components on an apparatus during its operation includes a monitoring system including sensors for monitoring the components operation thereof, and a processing module arranged on the apparatus and to receive and process data about the monitored components from the sensors. The module derives information from the data about the monitored components to determine whether any component is operating in a non-optimal manner and/or to forecast failure of any component prior to such failure. The system also includes at least one remote entity interested in the operation or failure of any component. A wireless communication system is arranged on the apparatus and coupled to the module for enabling wireless communications of derived information from the module to each entity during operation of the apparatus, including information about the presence and identity of any non-optimally operating component or component forecast...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

JP2005233968A | **Publication Date: 2005-09-02** | **Priority Date: 1994-06-03**

System for monitoring technical conditions of tire



Abstract:
PROBLEM TO BE SOLVED: To monitor various physical states of a tire. An active, self-driven programmable electronic device is used that is mounted inside a tire or on a tire rim. This device is used to monitor, store and further telemetry information such as pneumatic tire temperature, pressure, mileage and / or other driving conditions along with tire identification information. This device can be activated by externally transmitted high frequencies, and in response, the device compares or transmits information and gives a warning if a preselected limit is exceeded. [Selection] Figure 1

Current Assignees: BRIDGESTONE AMERICAS INC

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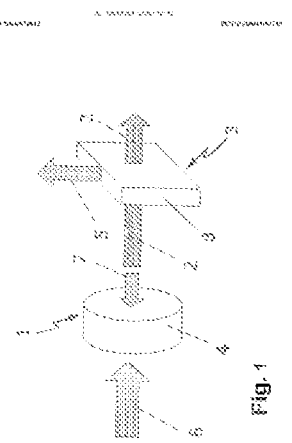
CA2515769A1 | **Publication Date: 2004-09-02** | **Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same



Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

EP3505336A1 | **Publication Date: 2019-07-03** | **Priority Date: 2017-12-20**

Article with electronic component inclusion and method of manufacturing

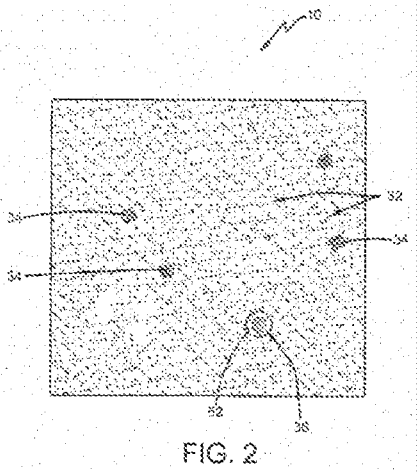


FIG. 2

Abstract:
An article such as a tire (10) with an electronic component inclusion is disclosed. The article (10) comprises at least one structural element, the structural element including a material (32) and at least one electronic component (36) being incorporated into the material (32) as an inclusion, the electronic component (36) including an integrated circuit (38). -

Current Assignees: GOODYEAR TIRE & RUBBER CO

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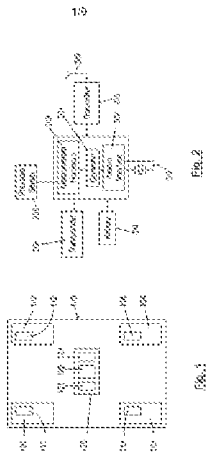
Revvo v. Cerebrum
IPR2025-00632 - Page 503

GB2545868B | **Publication Date: 2019-06-26** | **Priority Date: 2015-12-22**

Advanced tire monitoring system

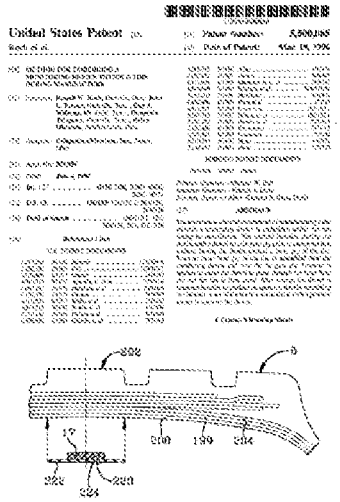


Abstract:
A tire pressure monitoring system comprising a tire pressure monitoring device for mounting on an internal surface of a tire and including a pressure sensor for monitoring the fluid pressure in the tire. The system has an RFID tag located on the tire separately from the tire pressure monitoring device. In response to detecting a tire pressure event from monitoring the fluid pressure of said fluid, the tire pressure monitoring device causes the RFID to transmit data, which is received by the tire pressure monitoring device.

Current Assignees: SCHRADER ELTNC LTD

US5500065 | **Publication Date: 1996-03-19** | **Priority Date: 1994-06-03**

Method for embedding a monitoring device within a tire during manufacture



Abstract:
The invention is directed to a method of manufacturing a tire wherein a monitoring device is embedded within the tire during its manufacture. The method includes placing the device with a dowel on a tie gum ply prior to curing the tire, without having the device contact a body ply of the tire. Then an inner liner ply of the tire is assembled over the monitoring device and over the tie gum ply. Pressure is applied to cause the dowel to press through the inner liner ply and the tire is then cured. After curing, the dowel is removed in order to produce an aperture, thereby permitting the internal space of the tire to communicate with a pressure sensor located on the device.

Current Assignees: BRIDGESTONE AMERICAS TIRE OPERATIONS LLC

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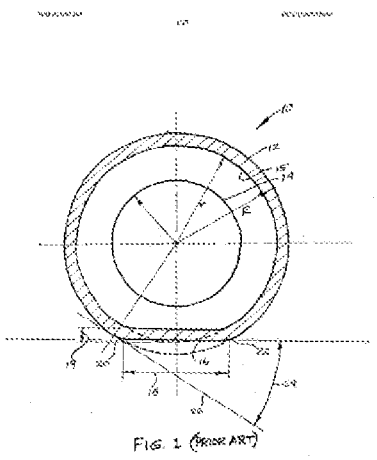
WO2002092364A2 | **Publication Date: 2002-11-21** | **Priority Date: 2001-05-15**

Vehicle and vehicle tire monitoring system, apparatus and method

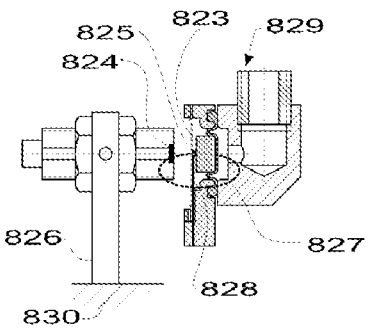


Abstract:
Vehicle and vehicle tire monitoring system, apparatus and method determine the load-induced deflection or deformation of a vehicle tire and based thereon, deflection-related information, such as tire load, molar air content, total vehicle mass and distribution of vehicle mass, may be provided. The fire deflection region or contact region (40) of the loaded tire is detected by sensing the acceleration of the rotating tire by means od an accelerometer (50) mounted on the tire, preferably on an inner surface such as the tread lining (15) thereof. As the tire rotates and the accelerometer is off of the contact region, a high centrifugal acceleration is sensed. Conversely, when the accelerometer is on the contact region and not rotating, a low acceleration is sensed. The deflection points delimiting the contact region are determined at the points where the sensed acceleration transitions between the high and low values.

Current Assignees: WILSON KITCHENER C

US20060212193 | **Publication Date: 2006-09-21** | **Priority Date: 2000-09-08**

Tire Pressure Monitoring Using Hall Effect Sensors



Abstract:
Wheel assembly with a tire pressure monitoring system includes a wheel rim, a tire mounted thereon, a housing having an interior in flow communication with the tire interior such that the same pressure prevails in the tire and in the housing interior, a magnet arranged in the housing and movable in an axial direction of the tire, a Hall effect sensor arranged on a non-rotating part of the vehicle in a position in which it is in a magnetic field generated by the magnet during rotation of the tire relative to the non-rotating part, and a spring arranged to move the magnet in dependence on pressure in the housing interior. The spring is arranged outside of the magnet. The Hall effect sensor senses magnetic field density of the magnet as the magnet rotates which is convertible into an indication of the pressure in the housing and thus the tire pressure.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
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EP1390218A2 | **Publication Date: 2004-02-25** | **Priority Date: 2001-05-15**

Vehicle and vehicle tire monitoring system, apparatus and method

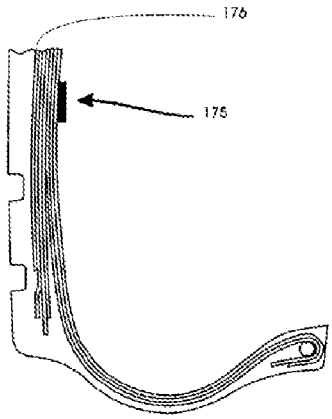
Image not currently available

Abstract:
Vehicle and vehicle tire monitoring system, apparatus and method determine the load-induced deflection or deformation of a vehicle tire and based thereon, deflection-related information, such as tire load, molar air content, total vehicle mass and distribution of vehicle mass, may be provided. The fire deflection region or contact region (40) of the loaded tire is detected by sensing the acceleration of the rotating tire by means od an accelerometer (50) mounted on the tire, preferably on an inner surface such as the tread lining (15) thereof. As the tire rotates and the accelerometer is off of the contact region, a high centrifugal acceleration is sensed. Conversely, when the accelerometer is on the contact region and not rotating, a low acceleration is sensed. The deflection points delimiting the contact region are determined at the points where the sensed acceleration transitions between the high and low values.

Current Assignees: WILSON KITCHENER C

US6988026 | **Publication Date: 2006-01-17** | **Priority Date: 1995-06-07**

Wireless and powerless sensor and interrogator



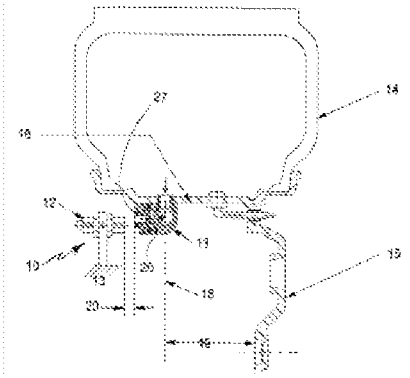
Abstract:
Arrangement and method for monitoring a tire mounted to the vehicle in which a thermal radiation detecting device detects the temperature of the tire at different circumferential locations along the circumference of the tire. The detected temperatures of the tire are analyzed to determine, for example, whether a difference in thermal radiation is present between the circumferential locations of the tire, and if so, an action is effected in response to the analysis. The thermal radiation detecting devices are preferably supplied with power wirelessly, e.g., through an inductive system, a capacitive system or a radio frequency energy transfer system.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 506

US7032443 | **Publication Date: 2006-04-25 | Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same

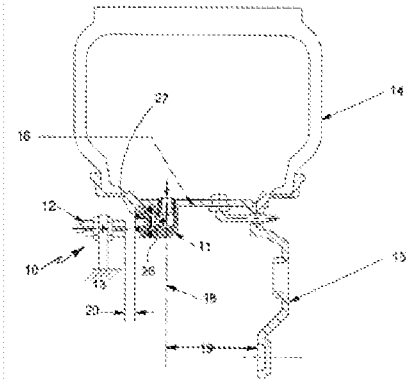


Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

US20060006994 | **Publication Date: 2006-01-12 | Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same



Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: MOSER GEORGE G

Revvo's Exhibit 1002
Revvo v. Cerebrum
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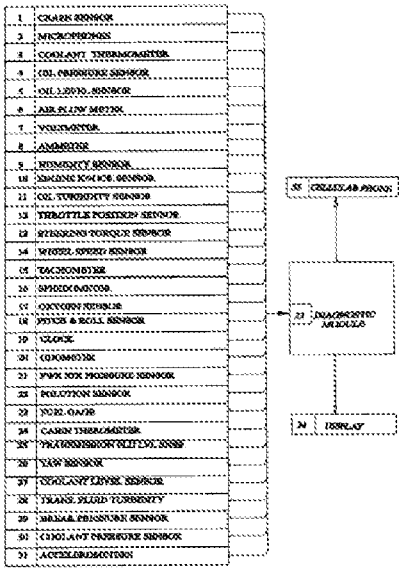
US20090043441 | **Publication Date: 2009-02-12** | **Priority Date: 1995-06-07**

Information Management and Monitoring System and Method

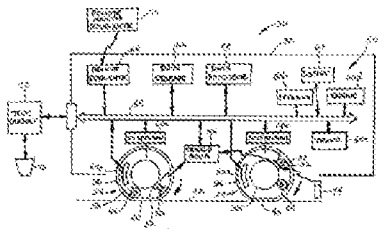


Abstract:
Information management and monitoring system and method for monitoring components on an apparatus during its operation includes a monitoring system including sensors for monitoring the components operation thereof, and a processing module arranged on the apparatus and to receive and process data about the monitored components from the sensors. The module derives information from the data about the monitored components to determine whether any component is operating in a non-optimal manner and/or to forecast failure of any component prior to such failure. The system also includes at least one remote entity interested in the operation or failure of any component. A wireless communication system is arranged on the apparatus and coupled to the module for enabling wireless communications of derived information from the module to each entity during operation of the apparatus, including information about the presence and identity of any non-optimally operating component or component forecast...

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20030058118 | **Publication Date: 2003-03-27** | **Priority Date: 2001-05-15**

Vehicle and vehicle tire monitoring system, apparatus and method



Abstract:
Vehicle and vehicle tire monitoring system, apparatus and method determine the load-induced deflection or deformation of a vehicle tire and based thereon, deflection-related information, such as tire load, molar air content, total vehicle mass and distribution of vehicle mass, may be provided. The tire deflection region or contact region of the loaded tire is detected by sensing the acceleration of the rotating tire by means of an accelerometer mounted on the tire, preferably on an inner surface such as the tread lining thereof. As the tire rotates and the accelerometer is off of the contact region, a high centrifugal acceleration is sensed. Conversely, when the accelerometer is on the contact region and not rotating, a low acceleration is sensed. The deflection points delimiting the contact region are determined at the points where the sensed acceleration transitions between the high and low values.

Current Assignees: WILSON KITCHENER C

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Tire pressure monitoring system and method of using same

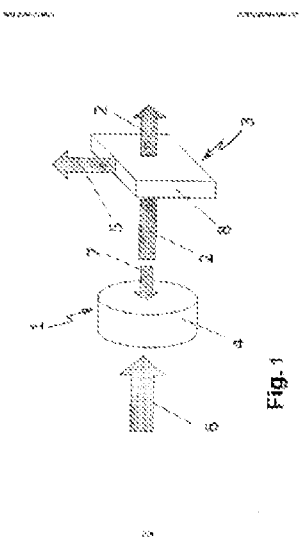


Fig. 1

Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

Tire monitoring apparatus

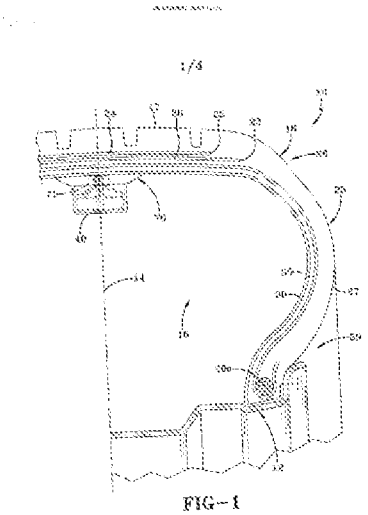


FIG-1

Abstract:
Apparatus for mounting an electronic tag within a tire includes a patch having a first side for mounted location against an inner liner of the tire, a second opposite side, and a socket member extending into the second side. A housing is provided having an internal tag receiving chamber defined by sidewalls and an elongate assembly bolt extends through the housing passageway and into the patch socket member to attach the housing to the patch. A remote end of the assembly bolt protrudes through the patch and carries a temperature sensor that engages the tire inner liner and transmits temperature data to electronic data transmission means within the housing. A lower portion of the housing sidewall is adapted to angle inward toward the lower housing end and a pressure measuring device is mounted within the angled sidewall portion. The housing comprises a cup and a top member, the top member covering the cap and including a dependent skirt portion engaging the patch second surface along a...

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 509

EP1599350A2 | **Publication Date: 2005-11-30** | **Priority Date: 2003-02-15**

Tire pressure monitoring system and method of using same

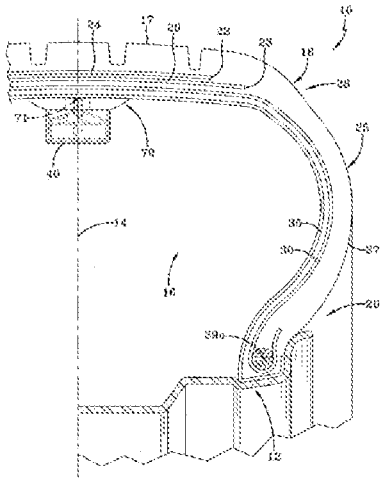
Image not currently available

Abstract:
A tire pressure monitoring system (10) including a magnetic actuator (11) having an air pressure transducer therein for generating a signal proportional to the interior tire air pressure. The actuator (11) operates parallel to the axle to alleviate speed sensitivity. Magnetic actuator (11) communicates with a stationary field sensor (12) permanently mounted on the vehicle at a close proximity to the magnetic actuator (11). The magnetic actuator (11) rotates about the access with the wheel (15), and for every revolution of the wheel (15), comes in to close proximity to the sensor (12) at least once, and communicates information about the internal tire pressure to the driver.

Current Assignees: ADVANCED DIGITAL COMPONENTS INC

US20040118198 | **Publication Date: 2004-06-24** | **Priority Date: 2002-12-20**

Tire monitoring apparatus



Abstract:
Apparatus for mounting an electronic tag within a tire includes a patch having a first side for mounted location against an inner liner of the tire, a second opposite side, and a socket member extending into the second side. A housing is provided having an internal tag receiving chamber defined by sidewalls and an elongate assembly bolt extends through the housing passageway and into the patch socket member to attach the housing to the patch. A remote end of the assembly bolt protrudes through the patch and carries a temperature sensor that engages the tire inner liner and transmits temperature data to electronic data transmission means within the housing. A lower portion of the housing sidewall is adapted to angle inward toward the lower housing end and a pressure measuring device is mounted within the angled sidewall portion. The housing comprises a cup and a top member, the top member covering the cap and including a dependent skirt portion engaging the patch second surface along a...

Current Assignees: GOODYEAR TIRE & RUBBER CO

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Revvo v. Cerebrum
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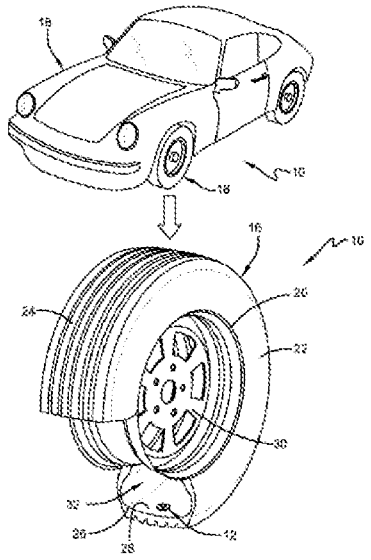
US20190187027 | **Publication Date: 2019-06-20 | Priority Date: 2017-12-20**

Integrated tire sensor and reader system

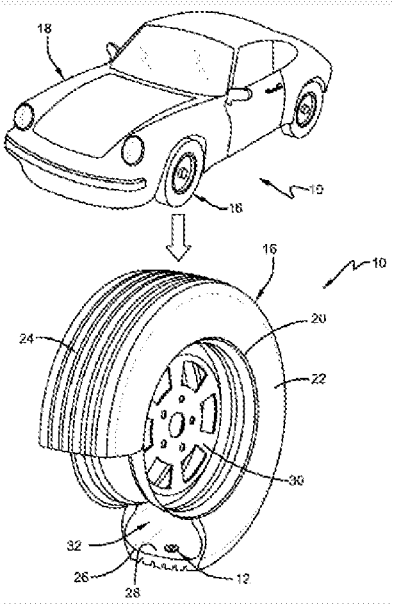


Abstract:
An integrated tire sensor and reader system includes at least one sensor unit mounted a tire or a wheel. A reader is disposed remotely from the sensor unit. The sensor unit includes at least one sensor for measuring a parameter of the tire or wheel and an antenna for communicating with the reader. The sensor unit is configured to receive a radio frequency power signal from the reader and to transmit data to the receiver. The reader includes an antenna for transmitting the radio frequency power signal to the sensor unit to actuate the one sensor unit. Upon actuation of the sensor unit, the sensor measures the parameter of the tire or wheel, and data from the sensor is transmitted from the sensor unit to the reader.

Current Assignees: GOODYEAR TIRE & RUBBER CO

US10935466 | **Publication Date: 2021-03-02 | Priority Date: 2017-12-20**

Integrated tire sensor and reader system



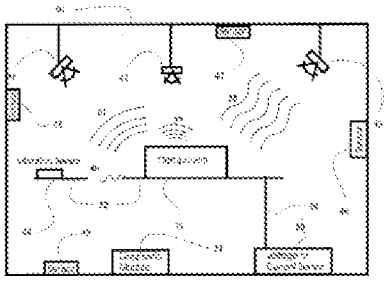
Abstract:
An integrated tire sensor and reader system includes at least one sensor unit mounted a tire or a wheel. A reader is disposed remotely from the sensor unit. The sensor unit includes at least one sensor for measuring a parameter of the tire or wheel and an antenna for communicating with the reader. The sensor unit is configured to receive a radio frequency power signal from the reader and to transmit data to the reader. The reader includes an antenna for transmitting the radio frequency power signal to the sensor unit to actuate the one sensor unit. Upon actuation of the sensor unit, the sensor measures the parameter of the tire or wheel, and data from the sensor is transmitted from the sensor unit to the reader.

Current Assignees: GOODYEAR TIRE & RUBBER CO

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 511

US20040130442 | **Publication Date: 2004-07-08** | **Priority Date: 1995-06-07**

Wireless and powerless sensor and interrogator

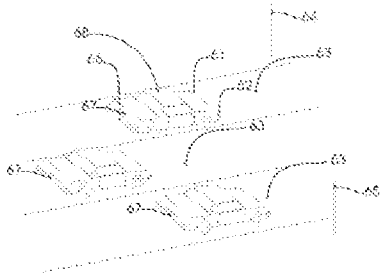


Abstract:
Arrangement and method for monitoring a tire mounted to the vehicle in which a thermal radiation detecting device detects the temperature of the tire at different circumferential locations along the circumference of the tire. The detected temperatures of the tire are analyzed to determine, for example, whether a difference in thermal radiation is present between the circumferential locations of the tire, and if so, an action is effected in response to the analysis. The thermal radiation detecting devices are preferably supplied with power wirelessly, e.g., through an inductive system, a capacitive system or a radio frequency energy transfer system.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US9014953 | **Publication Date: 2015-04-21** | **Priority Date: 2000-09-08**

Wireless sensing and communication system for traffic lanes



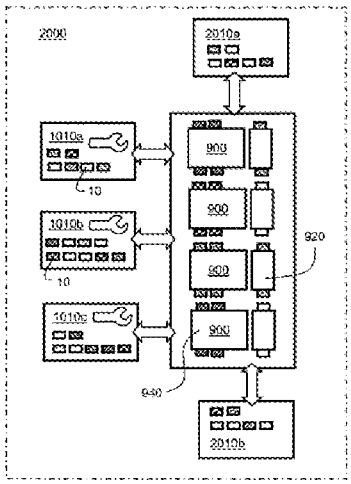
Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 512

US20100256874 | **Publication Date: 2010-10-07** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

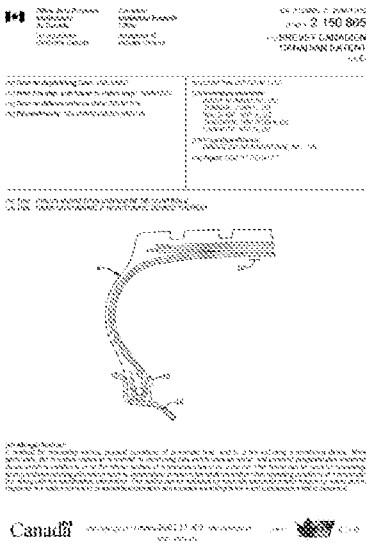


Abstract:
A method for identifying locations of one or more modules of an apparatus implemented in a vehicle for monitoring operation of at least one wheel of the vehicle includes steps of (a) communicating with one or more modules of the apparatus for receiving their identification codes at a processing arrangement of the apparatus, the one or more modules being mounted on at least one wheel of the vehicle; (b) driving the vehicle around a curved trajectory as sensed by the steering sensing arrangement and recording a direction of steering of the vehicle together with a temporal record of the physical parameter measured by the one or more modules together with their corresponding identification codes, the physical parameter pertaining to one or more tires of the at least one wheel; and (c) applying an analysis to the steering direction and the temporal record in respect of time to identify where the one or more modules are located on the at least one wheel of the vehicle, the analysis utilizing...

Current Assignees: VOLVO TRUCKS CORP

CA2150865C | **Publication Date: 2004-11-16** | **Priority Date: 1994-06-03**

Tires containing a monitoring device therein



Abstract:
A method for monitoring various physical conditions of pneumatic tires, and to a tire including a monitoring device. More particularly, the invention relates to a method of monitoring tires which uses an active, self-powered programmable electronic device which is installed in or on the interior surface of a pneumatic tire or on a tire rim. This device can be used for monitoring, storing and telemetering information such as temperature, pressure, tire rotations and/or other operating conditions of a pneumatic tire, along with tire identification information. The device can be activated by externally transmitted radio frequency waves and in response, the device compares or transmits information and provides a warning in the event a preselected limit is exceeded.

Current Assignees: BRIDGESTONE AMERICAS INC

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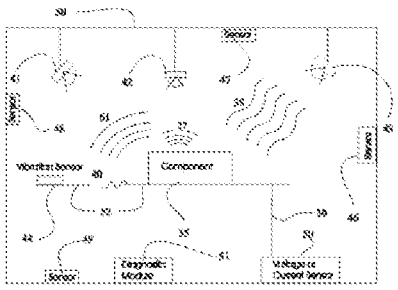
US7630802 | **Publication Date: 2009-12-08 | Priority Date: 1995-06-07**

Information management and monitoring system and method

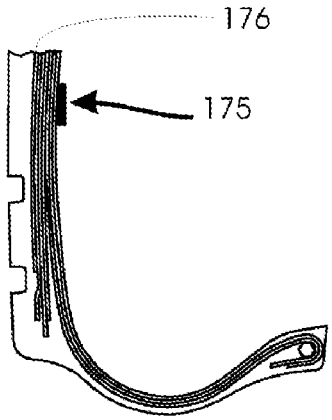


Abstract:
Information management and monitoring system and method for monitoring components on a vehicle during its operation includes a monitoring system including sensors for monitoring the components operation thereof, and a processing module arranged on the vehicle and to receive and process data about the monitored components from the sensors. The module derives information from the data about the monitored components to determine whether any component is operating in a non-optimal manner and/or to forecast failure of any component. A wireless communication system is arranged on the vehicle and coupled to the module for enabling wireless communications of derived information from the module to a remote entity interested in the operation or failure of any component during operation of the vehicle. The communication includes information about the presence and identity of any non-optimally operating component or component forecast to fail.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US20070156320 | **Publication Date: 2007-07-05 | Priority Date: 2000-09-08**

Vehicular Tire Monitoring Based on Sensed Acceleration



Abstract:
Vehicle with tire monitoring capabilities includes at least one wheel, each including a rim, a tire mounted on the rim, a sensor system for sensing angular, radial, tangential and/or lateral acceleration of the tire and providing acceleration signals based thereon, and an antenna arranged on the rim or tire and coupled to the sensor system for communicating data about the sensed acceleration. A processor receives acceleration signals provided by the sensor system and determines the existence of an anomaly in the tire based thereon. When arranged on the wheel, the processor provides a signal indicative or representative of the determination of the existence of the anomaly via the antenna to a receiving antenna which conveys it to a reactive system. The reactive system may provide a visual and/or audible warning to the driver of the vehicle or to personnel at a vehicle or tire monitoring facility.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

Revvo's Exhibit 1002
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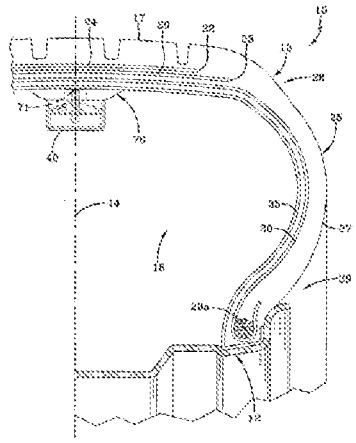
US6854324 | **Publication Date: 2005-02-15** | **Priority Date: 2002-12-20**

Tire monitoring apparatus



Abstract:
Apparatus for mounting an electronic tag within a tire includes a patch having a first side for mounted location against an inner liner of the tire, a second opposite side, and a socket member extending into the second side. A housing is provided having an internal tag receiving chamber defined by sidewalls and an elongate assembly bolt extends through the housing passageway and into the patch socket member to attach the housing to the patch. A remote end of the assembly bolt protrudes through the patch and carries a temperature sensor that engages the tire inner liner and transmits temperature data to electronic data transmission means within the housing. A lower portion of the housing sidewall is adapted to angle inward toward the lower housing end and a pressure measuring device is mounted within the angled sidewall portion. The housing comprises a cup and a top member, the top member covering the cap and including a dependent skirt portion engaging the patch second surface along a...

Current Assignees: GOODYEAR TIRE & RUBBER CO

CN101873943B | **Publication Date: 2013-01-09** | **Priority Date: 2007-11-30**

Wheel-monitoring module

Abstract:
There is provided a module (400) operable to monitor at least a pressure (P) within a tyre (30) of a wheel (10), said module (400) being operatively mounted to said wheel (10), said module (400) includes: (a) a pressure sensor (760) for measuring said pressure (P) and generating a corresponding pressure signal; and (b) an associated data memory including a data field containing data relevant to the functional status of the tyre. -

Current Assignees: VOLVO TRUCKS CORP

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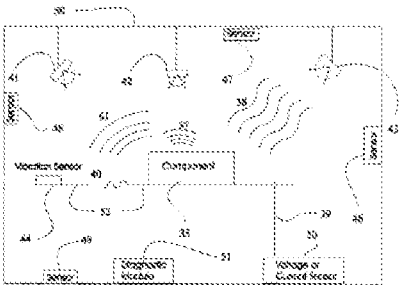
US7408453 | **Publication Date: 2008-08-05** | **Priority Date: 2001-02-16**

Wheel-mounted tire pumping and energy generating system and method

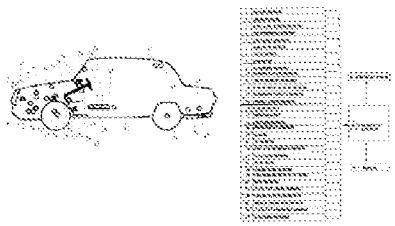


Abstract:
Wheel for a vehicle includes a wheel rim, a tire mounted on the wheel rim to define an inflatable interior compartment, a pump for pumping air into the compartment, and an energy generating system for generating energy upon rotation of the wheel to power the pump and cause the pump to pump air into the compartment. The energy generating system may include a first coil, a magnetized mass movable upon rotation of the wheel relative to and partly in a chamber surrounded by the first coil, and an energy storage or load device coupled to the first coil. Upon rotation of the wheel, the mass moves relative to the first coil imparting a charge to the first coil which is stored in the energy storage or load device and used to power the pump when needed.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

US7893826 | **Publication Date: 2010-04-06** | **Priority Date: 2000-09-08**

Vehicular tire monitoring based on sensed acceleration



Abstract:
Vehicle with tire monitoring capabilities includes at least one wheel, each including a rim, a tire mounted on the rim, a sensor system for sensing angular, radial, tangential and/or lateral acceleration of the tire and providing acceleration signals based thereon, and an antenna arranged on the rim or tire and coupled to the sensor system for communicating data about the sensed acceleration. A processor receives acceleration signals provided by the sensor system and determines the existence of an anomaly in the tire based thereon. When arranged on the wheel, the processor provides a signal indicative or representative of the determination of the existence of the anomaly via the antenna to a receiving antenna which conveys it to a reactive system. The reactive system may provide a visual and/or audible warning to the driver of the vehicle or to personnel at a vehicle or tire monitoring facility.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

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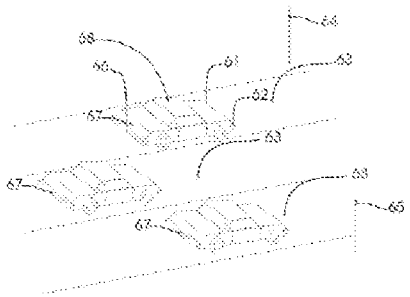
US20080119966 | **Publication Date: 2008-05-22** | **Priority Date: 2000-09-08**

Wireless Sensing and Communication System for Traffic Lanes

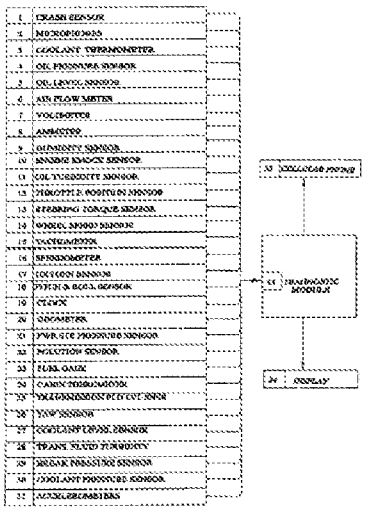


Abstract:
Wireless sensing and communication system including sensors located on the vehicle, in the roadway or in the vicinity of the vehicle or roadway and which provide information which is transmitted to one or more interrogators in the vehicle by a wireless radio frequency mechanism. Power to operate a particular sensor is supplied by the interrogator or the sensor is independently connected to either a battery, generator, vehicle power source or some source of power external to the vehicle. The sensors can provide information about the vehicle and its interior or exterior environment, about individual components, systems, vehicle occupants, subsystems, or about the roadway, ambient atmosphere, travel conditions and external objects. The sensors arranged on the roadway or ancillary structures would include pressure sensors, temperature sensors, moisture content or humidity sensors, and friction sensors.

Current Assignees: INTELLIGENT TECH INTL INC

US20050192727 | **Publication Date: 2005-09-01** | **Priority Date: 1994-05-09**

Sensor Assemblies



Abstract:
Sensor assembly capable of obtaining and providing a measurement of a physical quantity, e.g., measurement of temperature and/or pressure of a vehicular tire, includes an antenna capable of receiving a radio frequency signal, a radio frequency identification (RFID) device coupled to the antenna, a sensor coupled to the RFID device arranged to generate a measurement of the physical quantity or quantities, and a switch coupled to the RFID device and arranged to connect or disconnect the sensor from a circuit with the antenna dependent on whether the antenna receives a particular signal associated with the RFID device. When the antenna receives the particular signal associated with the RFID device, the RFID device causes the switch to close and connect the sensor in the circuit with the antenna to enable the measurement generated by the sensor to be directed to and transmitted by the antenna.

Current Assignees: AUTOMOTIVE TECH INTL INC

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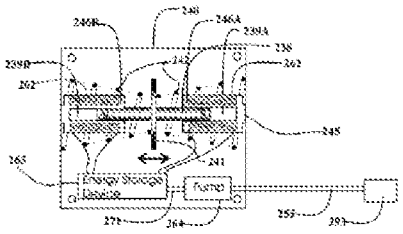
US20080156406 | **Publication Date: 2008-07-03** | **Priority Date: 2001-02-16**

Wheel-mounted tire pumping and energy generating system and method



Abstract:
Wheel for a vehicle includes a wheel rim, a tire mounted on the wheel rim to define an inflatable interior compartment, a pump for pumping air into the compartment, and an energy generating system for generating energy upon rotation of the wheel to power the pump and cause the pump to pump air into the compartment. The energy generating system may include a first coil, a magnetized mass movable upon rotation of the wheel relative to and partly in a chamber surrounded by the first coil, and an energy storage or load device coupled to the first coil. Upon rotation of the wheel, the mass moves relative to the first coil imparting a charge to the first coil which is stored in the energy storage or load device and used to power the pump when needed.

Current Assignees: AMERICAN VEHICULAR SCIENCES LLC

EP2219868A1 | **Publication Date: 2010-08-25** | **Priority Date: 2007-11-30**

Method of identifying positions of wheel modules

Image not currently available

Abstract:
A method of identifying locations of one or more modules (400) of an apparatus (600, 680, 690, 2200) implemented in a vehicle (900) for monitoring operation of at least one wheel (10) of the vehicle (900), said apparatus (600, 680, 690, 2200) including one or more sensor modules (400) operatively mounted to revolve with said at least one wheel (10), said one or more modules (400) being operatively coupled in communication with a processing arrangement (710, ECU 950) of said vehicle (900), said one or more modules (400) being operable to sense at least one physical parameter of said wheel (10) and to generate at least one corresponding sensor signal for said processing arrangement (950), said processing arrangement (710, ECU 950) being operable to process said at least one sensor signal to compute information indicative of operation of said at least one wheel (10),, characterized in that said method includes steps of (a) communicating with one or more modules (400) of said apparatus...

Current Assignees: VOLVO TRUCKS CORP

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Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of the Claims:

1. (Original) A sensor assembly configured for attachment with an object that is rotated in use, the sensor assembly comprising:

a housing comprising an outer surface and an internal cavity that is enclosed within the housing;

an electrical sensor device that is disposed within the internal cavity attached therein to prevent movement of the device within the internal cavity, wherein the electrical sensor device is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with an object and the object is rotated in use; and

a retaining member that is configured to accommodate attachment of the housing therewith, wherein the retaining member has an outside surface configured for attachment to rotate with the object when the object is rotated in use.

2. (Original) The sensor assembly as recited in claim 1, wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member.

3. (Original) The sensor assembly as recited in claim 1, wherein the housing comprises a top cover, a wall structure, and a base section that define the internal cavity, and wherein the top cover, wall structure and base section may be formed from the same or different materials, and wherein one or more of the top cover, wall section, and base section may separate or integral with one another.

4. (Original) The sensor assembly as recited in claim 1, wherein one of the top cover or base section is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity.

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5. (Original) The sensor assembly as recited in claim 1, wherein the electrical sensor device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical sensor device to retain its position therein, and wherein there is open space above and below the electrical sensor device within the internal cavity.

6. (Original) The sensor assembly as recited in claim 1, wherein the electrical sensor device is encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical sensor device within the housing.

7. (Original) The sensor assembly as recited in claim 1, wherein the housing and retaining member are configured having a complementary shape to facilitate attachment of the housing with the retaining member.

8. (Original) The sensor assembly as recited in claim 7, wherein the housing comprises a wall structure that surrounds the internal cavity, and wherein the retaining member comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith.

9. (Original) The sensor assembly as recited in claim 1, wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces from the object to the housing when the retaining member is attached to the object and the housing is attached to the retaining member.

10. (Original) The sensor assembly as recited in claim 1, wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device.

11. (Original) A sensing system comprising the sensor assembly as recited in claim 1, wherein the sensing system comprises a receiver that is external from the object and that is configured to receive data from the electrical sensor device by wireless communication.

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12. (Original) The sensing system as recited in claim 11, wherein the electrical sensor device comprises an accelerometer sensor connected therewith and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

13. (Currently Amended) The sensing system as recited in claim 12, wherein the object is a vehicle tire, and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire radial load, slip, road or soil conditions, strain, vehicle camber and/or toe alignment is determined from the accelerometer sensor data measuring in a radial direction of the vehicle tire.

14. (Original) The sensing system as recited in claim 13, wherein one or more of the tire diameter, tire tread depth, and tire radial load is determined from data including a specific rotational speed of the tire at a given vehicle velocity.

15. (Original) The sensing system as recited in claim 12, wherein the object is a vehicle tire and a radial load experienced by the tire is determined from data comprising an interval of radial deformation and using a correction coefficient.

16. (Currently Amended) The sensing system as recited in claim 11, wherein the electrical sensor device or receiver comprises a global positioning device.

17. (Currently Amended) The sensing system as recited in claim 16, wherein the object is a vehicle tire and a location of the vehicle tire is determined from information provided by one or both of the global positioning device and interaction with the electrical sensor device.

18. (Original) The sensing system as recited in claim 11, wherein the electrical sensor device comprises a gyroscope.

19. (Original) The sensing system as recited in claim 18, wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth.

20. (Currently Amended) The sensor assembly as recited in claim 1, wherein the electrical sensor device comprises:

a printed circuit board comprising electrical circuitry;

a portable power source for providing power to the electrical sensor device;

at least one sensor element; and

~~and~~

an antenna for receiving and/or transmitting information from the electrical sensor device.

21. (Original) The sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of a storage element and a processor.

22. (Original) The sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of an accelerometer sensor and a global positioning device.

23. (Original) The sensor assembly as recited in claim 20, wherein the sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object.

24. (Original) The sensor assembly as recited in claim 20, wherein the object is a vulcanized rubber vehicle tire, and wherein the retaining member is attached to an inside surface of the vehicle tire or an element attached with the tire that rotates with the tire.

25. (Original) The sensor assembly as recited in claim 24, wherein the retaining member is attached to a wheel that the tire is mounted on.

26. (Currently Amended) The sensor assembly as recited in claim 24, wherein the retaining member is attached to a valve stem <u>or valve cap</u> of a wheel that the tire is mounted on.

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27. (Original) The sensor assembly as recited in claim 24, wherein the retaining member is attached to the inside surface of the vehicle tire by an adhesive layer after the vehicle tire has been vulcanized.

28. (Original) A sensor assembly and sensing system for use with an object that rotates in use comprising:

a housing comprising an outer structure that defines an open internal cavity therein,

an electrical sensor device disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device, wherein the electrical sensor device is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location, wherein the electrical sensor device comprises:

a portable power source;

a sensor; and

an antenna for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor;

a retaining member having an outside surface configured for attaching with a surface of the object or an element connected with the object to rotate with the object in use, wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the retaining member; and

a receiver external from the vehicle tire that is configured to receive information from the electrical sensor device wirelessly.

29. (Original) The sensor assembly and sensing system as recited in claim 28, comprising an external transmitter for sending information wirelessly to the electronic sensor device.

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30. (Original) The sensor assembly and sensing system as recited in claim 28, wherein the housing includes a wall structure having a top cover at a first axial end of the wall structure and a base section at an opposed second axial of the wall structure, wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith.

31. (Original) The sensor assembly and sensing system as recited in claim 28, wherein one of the top cover or the bottom section are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity.

32. (Original) The sensor assembly and sensing system as recited in claim 28, wherein open space exists above and below the electrical sensor device when disposed within the internal cavity.

33. (Original) The sensor assembly and sensing system as recited in claim 28, wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching the housing attached with the retaining member.

34. (Original) The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises an accelerometer sensor and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

35. (Currently Amended) The sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire and the system is configured to determine one or more parameters consisting of a tire diameter, slip, strain, road conditions or soil conditions, a tire tread depth, a tire radial load, and vehicle camber and/or toe alignment from the accelerometer sensor data.

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36. (Currently Amended) The sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire and the system is configured to determine one or more of a tire diameter, a tire tread depth, slip, strain, road or soil conditions, and a tire radial load from data including a specific rotational speed of the tire at a given vehicle velocity.

37. (Currently Amended) The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device or receiver comprises a global positioning device.

38. (Original) The sensor assembly and sensing system as recited in claim 37, wherein the object is a vehicle tire and the system is configured to determine a location of the vehicle tire from information provided by the global positioning device.

39. (Original) The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises a gyroscope.

40. (Original) The sensing system as recited in claim 39, wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

41. (Original) A method for using a sensor assembly and sensing system with an object that rotates in use comprising the steps of:

installing an electrical sensor device within an internal cavity of a housing, wherein the housing includes an outer structure that defines the internal cavity, and wherein the electrical sensor device comprises a sensor, a portable power source, an antenna, a printed circuit board, and related electrical circuitry;

attaching the housing after the step of installing to a retaining member, wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique, wherein the retaining member is connected with the object before or after formation of the object; and

monitoring an operating parameter of the object through the use of the electrical sensing device, wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly.

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42. (Original) The method as recited in claim 41, wherein during the step of installing, the housing includes a wall structure having an opening through which the electrical sensor device is installed and, after the step of installing, the opening is closed by attaching a top cover or bottom section to the opening.

43. (Original) The method as recited in claim 41, wherein during the step of installing, the electrical sensor device is attached in place within the internal cavity by contact between the electrical sensor device and one or more surface features in the internal cavity.

44. (Currently Amended) The method as recited in claim 41, wherein the object is a made from vulcanized rubber, and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object before or after the object has been formed.

45. (Currently Amended) The method as recited in claim 44, wherein the retaining member is attached to a surface of the object by use of an adhesive layer or during the formation of the object.

46. (Original) The method as recited in claim 45, wherein the retaining member is attached to the object after the step of attaching the housing to the retaining member.

47. (Original) The method as recited in claim 45, wherein the retaining member is attached to the object by applying hand pressure onto the retaining member once placed into contact with the surface of the object to cause the adhesive layer to form an attachment therebetween.

48. (Original) The method as recited in claim 44, wherein the object is a vehicle tire, and wherein the retaining member is attached to a surface that is inside of the vehicle tire.

49. (Original) The method as recited in claim 44, wherein the retaining member is mechanically attached to an element that is connected to and that rotates with the object.

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50. (Original) The method as recited in claim 41, wherein during the step of attaching, the housing is positioned relative to the retaining member according to a display feature that is positioned on the housing.

51. (Original) The method as recited in claim 41, wherein during the step of monitoring, the sensor monitors operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna information related to the monitored operating parameter to the receiver, and wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device.

52. (Original) The method as recited in claim 41, wherein the sensor assembly electrical sensor device comprises an accelerometer sensor.

53. (Currently Amended) The method as recited in claim 52, wherein the object is a vehicle tire, and wherein during the step of monitoring, on or more of a tire outside diameter, a tire tread depth, slip, strain, road or soil conditions, a tire radial load, and a vehicle camber and/or toe alignment parameter is determined from information sent wirelessly from the sensor assembly.

54. (Currently Amended) The method as recited in claim 52, wherein the object is a vehicle tire, and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, slip, strain, road or soil conditions, and a tire radial load is determined from information relating to a specific rotational speed of the tire at a given vehicle velocity.

55. (Currently Amended) The method as recited in claim 41, wherein the object is a vehicle tire and the electrical sensor device or receiver comprises a global positioning device, and wherein the step of monitoring a location of the tire is determined from information provided by the global positioning device.

56. (Original) The method as recited in claim 41, wherein the electrical sensor device comprises a gyroscope.

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57. (Original) The sensing system as recited in claim 56 wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

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Electronic Acknowledgement Receipt

EFS ID:	45616373
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	67838.01000
Receipt Date:	02-MAY-2022
Filing Date:	29-OCT-2020
Time Stamp:	19:23:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		050222_PA_as_filed_67838_01000.pdf	136914 2d05883799805a194b7a833775c942226ed291e8	yes	12

	Multipart Description/PDF files in .zip description		
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	Preliminary Amendment	1	1
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

Prior to examination of this application, Applicant respectfully requests that the claims be amended as indicated herein. Support for the amendments may be found in the originally-filed specification, claims, and figures. No new matter has been introduced by the amendments.

The Commissioner is hereby authorized to charge any fees, which may be required, or credit any overpayment, to Deposit Account No. 19-2814.

Respectfully submitted,

Date: May 2, 2022

/ Grant T. Langton/

Grant T. Langton
Registration No. 39,739
Snell & Wilmer L.L.P.
One Arizona Center
400 East Van Buren Street
Suite 1900
Phoenix, AZ 85004-2202
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(213) 929-2525 (Fax)

CUSTOMER NUMBER

125632

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 532

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	17/084,483	Confirmation No.:	7585
Inventor(s):	Keith George Ferry	Group Art Unit:	2856
Filed:	October 29, 2020	Examiner:	Jenkins, Jermaine L.
Title:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	Docket No.	67838.01000

Mail Stop Amendments
Commissioner of Patents
P. O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Dear Commissioner:

Prior to examination of the above-identified U.S. application, Applicant respectfully requests that the following preliminary amendments be entered:

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 12 of this paper.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 533

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/084,483	Filing Date 10/29/2020	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $240 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	05/02/2022	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 57	Minus	** 57	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $240 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ANNIE C SINGLETON/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

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

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

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	8776590	B2	2014-07-15	Kempf et al.	
	2	7900665	B2	2011-03-08	Shimura	
	3	8657975	B2	2014-02-25	Bell	
	4	6309494	B1	2001-10-30	Koch et al.	
	5	6255940	B1	2001-07-03	Phelan et al.	
	6	10712238	B2	2020-07-14	Ledoux et al.	
	7	10119876	B2	2018-11-06	Marques et al.	
	8	9950575	B2	2018-04-24	Marques et al.	

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 535

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2861
	Examiner Name	Not yet assigned
	Attorney Docket Number	67838.01000

	9	7770444	B2	2010-08-10	Bertrand	
	10	8248225	B2	2012-08-21	Buck et al.	
	11	6030478	A	2000-02-29	Koch et al.	
	12	6257289	B1	2001-07-10	Tomita et al.	
	13	6788192	B2	2004-09-07	Shimura	
	14	5573611	A	1996-11-12	Koch et al.	
	15	5573610	A	1996-11-12	Koch et al.	
	16	5562787	A	1996-10-08	Koch et al.	
	17	5971046	A	1999-10-26	Koch et al.	
	18	6217683	B1	2001-04-17	Balzer et al.	
	19	5731754	A	1998-03-24	Lee, Jr. et al.	

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 536

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2861
	Examiner Name	Not yet assigned
	Attorney Docket Number	67838.01000

	20	5500065	A	1996-03-19	Koch et al.	
	21	5181975	A	1993-01-26	Pollack et al.	
	22	4862486	A	1989-08-29	Wing et al.	
	23	6688353	B1	2004-02-10	Koch	
	24	6208244	B1	2001-03-27	Wilson et al.	
	25	8874386	B2	2014-10-28	Brusarosco et al.	

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

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20170232806	A1	2017-08-17	Sakamoto et al.	
	2	20020029626	A1	2002-03-14	Koch et al.	
	3	20130167999	A1	2013-07-04	Nakatani et al.	

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 537

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2861
	Examiner Name	Not yet assigned
	Attorney Docket Number	67838.01000

	4	20030221766	A1	2003-12-04	Strache et al.	

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FOREIGN PATENT DOCUMENTS Remove

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

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

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Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2021-08-04
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 539

Privacy Act Statement

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

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

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

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.

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 540

Electronic Acknowledgement Receipt

EFS ID:	43430538
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	67838.01000
Receipt Date:	04-AUG-2021
Filing Date:	29-OCT-2020
Time Stamp:	22:10:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	080421_IDS_as_filed_67838_01000.pdf	1035253 f21d8b4d3e0d385975f1b9dd26968555f5c61deb	no	6

Warnings:

Information:	
Total Files Size (in bytes):	1035253

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17084483
Filing Date	2020-10-29
First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20190184773	A1	2019-06-20	SAITO	
	2	20180186200	A1	2018-07-05	BRUSAROSCO et al.	
	3	20110025487	A1	2011-02-03	Laird et al.	
	4	20190187027	A1	2019-06-20	Lin et al.	
	5	20160332493	A1	2016-11-17	ATSUMI et al.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17084483
	Filing Date	2020-10-29
	First Named Inventor	Keith George Ferry
	Art Unit	2861
	Examiner Name	Not yet assigned
	Attorney Docket Number	67838.01000

	6	20190160895	A1	2019-05-30	SO et al.	

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FOREIGN PATENT DOCUMENTS Remove

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

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	International Search Report dated February 2, 2021 for corresponding International Application No. PCT/US2020/058402 filed October 30, 2020; total 2 pages.	
	2	Written Opinion of the International Searching Authority dated February 2, 2021 for corresponding International Application No. PCT/US2020/058402 filed October 30, 2020; total 13 pages.	

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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First Named Inventor	Keith George Ferry
Art Unit	2861
Examiner Name	Not yet assigned
Attorney Docket Number	67838.01000

CERTIFICATION STATEMENT

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

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

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

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

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

Signature	/Grant T. Langton/	Date (YYYY-MM-DD)	2021-05-07
Name/Print	Grant T. Langton	Registration Number	39,739

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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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 record s.

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: GRANT T. LANGTON
SNELL & WILMER L.L.P.
400 EAST VAN BUREN STREET
ONE ARIZONA CENTER
SUITE 1900
PHOENIX, AZ 85004-2202

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	02 FEB 2021
Applicant's or agent's file reference 67838-00716	**FOR FURTHER ACTION** See paragraph 2 below

International application No	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 20/58402	30 October 2020 (30.10.2020)	31 October 2019 (31.10.2019)

International Patent Classification (IPC) or both national classification and IPC

IPC - B60C 23/00, 23/02, 23/04, 23/20 (2020.01)

CPC - B60C 23/00, 23/0408, 23/0433, 11/243, 11/246, 23/02, 23/04, 23/0493, 23/0452, 23/20; B60G 2204/113, 2400/52, 2800/984; G01M 17/02

Applicant FERRY, KEITH G

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	29 December 2020	Lee Young PCT Help Desk Telephone No. 571-272-4300

Form PCT/ISA/237 (cover sheet) (revised January 2019)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 20/58402

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(b)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

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Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	2, 5, 9, 10, 14-19, 24-27, 29, 30, 32, 33, 36-40, 44-51, 54-57	YES
	Claims	1, 3, 4, 6-8, 11-13, 20-23, 28, 31, 34, 35, 41-43, 52, 53	NO
Inventive step (IS)	Claims	14, 15, 30, 36, 54	YES
	Claims	1-13, 16-29, 31-35, 37-53, 55-57	NO
Industrial applicability (IA)	Claims	1-57	YES
	Claims	NONE	NO

2. Citations and explanations:
Claims 1, 3, 4, 6-8, 11-13, 20-23, 28, 31, 34, 35, 41-43, 52, and 53 lack novelty under PCT Article 33(2) as being anticipated by US 2019/0184773 A1 to DENSO CORPORATION (hereinafter Denso).

Regarding claim 1, Denso discloses a sensor assembly (2) configured for attachment with an object that is rotated in use (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22), the sensor assembly comprising:
a housing (22fa, 22fab) comprising an outer surface and an internal cavity that is enclosed within the housing (Fig. 3; para [0045]- The housing 22fa is formed of the hollow member that provides the accommodation chamber inside; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab);
an electrical sensor device (22a, 22b) that is disposed within the internal cavity attached therein to prevent movement of the device within the internal cavity (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown); para [0045]- and the housing 22fa is filled with the resin sealing portion 22fb to protect each component of the tire-mounted sensor 2), wherein the electrical sensor device (22) is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with an object and the object is rotated in use (para [0029]- the sensor device 22 includes a sensor chip 22a, a circuit board 22b on which peripheral elements (not shown) and the like are mounted; para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa and a microcomputer 22ab in a molding resin 22ac; para [0031]- The acceleration sensor 22aa corresponds to a vibration detection element for detecting the vibration applied to the corresponding tire 71a to 71d; para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0041]- Each of the vibration transmission members 22e serves to transmit the vibration applied to the corresponding tire 71a to 71d to the sensor chip 22a; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0061] temperature sensor); and a retaining member (21) that is configured to accommodate attachment of the housing therewith (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d, for example, on a back surface of a tread; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22), wherein the retaining member has an outside surface configured for attachment to rotate with the object when the object is rotated in use (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Regarding claim 3, Denso discloses the sensor assembly as recited in claim 1, wherein the housing comprises a top cover, a wall structure, and a base section (22faa) that define the internal cavity (para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber), and wherein the top cover, wall structure and base section may be formed from the same or different materials (para [0048]- The second housing 22fab is made of, for example, resin; para [0047]- The first housing 22faa is made of, for example, a circular resin or the like), and wherein one or more of the top cover, wall section, and base section may separate or integral with one another (para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber).

Regarding claim 4, Denso discloses the sensor assembly as recited in claim 1, wherein one of the top cover or base section is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity (Fig. 3; para [0047]-[0048]- in cooperation with the first housing 22faa... the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber).

Regarding claim 6, Denso discloses the sensor assembly as recited in claim 1, wherein the electrical sensor device is encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical sensor device within the housing (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa and a microcomputer 22ab in a molding resin 22ac; para [0036]- The molding resin 22ac covers the acceleration sensor 22aa and the microcomputer 22ab to protect those components; para [0045]-and the housing 22fa is filled with the resin sealing portion 22fb to protect each component of the tire-mounted sensor 2).
--see Supplemental Box

Form PCT/ISA/237 (Box No. V) (revised January 2019)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 28, as drafted, lacks antecedent basis for "the tire." For purposes of this written opinion "the tire" is taken to read "a tire" in accordance with proper antecedent basis.

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Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2 (Citations and Explanations)

Regarding claim 7, Denso discloses the sensor assembly as recited in claim 1, wherein the housing and retaining member are configured having a complementary shape to facilitate attachment of the housing with the retaining member (Fig. 3; para [0028]- the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22).

Regarding claim 8, Denso discloses the sensor assembly as recited in claim 7, wherein the housing comprises a wall structure that surrounds the internal cavity (Fig. 3; para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber), and wherein the retaining member comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith (Fig. 3; para [0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22).

Regarding claim 11, Denso discloses a sensing system comprising the sensor assembly as recited in claim 1, wherein the sensing system comprises a receiver that is external from the object and that is configured to receive data from the electrical sensor device by wireless communication (Abstract; para [0022]- The receiver 3 and the ECU 5 are fixed to a vehicle body 6 of the vehicle 1; para [0035]- Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit. In the present embodiment, the RF circuit is used as the transmission unit because a signal in an RF band is used).

Regarding claim 12, Denso discloses the sensing system as recited in claim 11, wherein the electrical sensor device comprises an accelerometer sensor connected therewith and is configured to send data from the accelerometer sensor wirelessly to the external receiver (Abstract; para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa; para [0022]- The receiver 3 and the ECU 5 are fixed to a vehicle body 6 of the vehicle 1; para [0035]- Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit. In the present embodiment, the RF circuit is used as the transmission unit because a signal in an RF band is used).

Regarding claim 13, Denso discloses the sensing system as recited in claim 12, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire radial load, vehicle camber and/or toe alignment is determined from the accelerometer sensor data measuring in a radial direction of the vehicle tire (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth of the tire).

Regarding claim 20, Denso discloses the sensor assembly as recited in claim 1, wherein the electrical sensor device (para [0024]- a sensor device 22) comprises: a printed circuit board (22b) comprising electrical circuitry (para [0029]-[0030], [0037]- The circuit board 22b is a board on which the sensor chip 22a, peripheral elements (not shown), and the like are mounted, and is configured by a printed circuit board or the like on which the circuit pattern is formed); a portable power source for providing power to the electrical sensor device (para [0029]- a battery 22c corresponding to a power supply); a least one sensor element (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa); and an antenna for receiving and/or transmitting information from the electrical sensor device (para [0035]- the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit).

Regarding claim 21, Denso discloses the sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of a storage element and a processor (para [0034]- The microcomputer 22ab is a well-known one including a CPU, a ROM, a RAM, an I/O, and the like).

Regarding claim 22, Denso discloses the sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of an accelerometer sensor and a global positioning device (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa).

Regarding claim 23, Denso discloses the sensor assembly as recited in claim 20, wherein the sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object (para [0031]- the acceleration sensor 22aa is disposed to detect an acceleration in accordance with the ground state of the corresponding tire 71a to 71d).

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Box V.2 (Citations and Explanations)

Regarding claim 28, Denso discloses a sensor assembly (2) and sensing system for rise with an object that rotates in use (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22) comprising: a housing (22fa, 22fab) comprising an outer structure that defines an open internal cavity therein (Fiig. 3; para [0045]- The housing 22fa is formed of the hollow member that provides the accommodation chamber inside; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab), an electrical sensor device disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown); para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber. In addition, the dimension of an opening of the second housing 22fab is reduced on the upper surface side), wherein the electrical sensor device is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location (para [0029]- the sensor device 22 includes a sensor chip 22a, a circuit board 22b on which peripheral elements (not shown) and the like are mounted; para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa and a microcomputer 22ab in a molding resin 22ac; para [0031]- The acceleration sensor 22aa corresponds to a vibration detection element for detecting the vibration applied to the corresponding tire 71a to 71d; para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0041]- Each of the vibration transmission members 22e serves to transmit the vibration applied to the corresponding tire 71a to 71d to the sensor chip 22a; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit), wherein the electrical sensor device comprises:
a portable power source (para [0029]- a battery 22c corresponding to a power supply);
a sensor (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa); and
an antenna (22d) for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor (para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit); a retaining member (21) having an outside surface configured for attaching with a surface of the object or an element connected with the object to rotate with the object in use (Fig. 3; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like), wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the retaining member (Fig. 3; para [0027]-[0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22); and a receiver external from the vehicle tire that is configured to receive information from the electrical sensor device wirelessly (para [0022]- The receiver 3 and the ECU 5 are fixed to a vehicle body 6 of the vehicle 1; para [0035]- Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit. In the present embodiment, the RF circuit is used as the transmission unit because a signal in an RF band is used).

Regarding claim 31, Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein one of the top cover (22fab) or the bottom section (22faa) are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity (para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab; para [0047]- The first housing 22faa is made of, for example, a circular resin or the like. The first housing 22faa is disposed adjacent to the rear surface of the tread of the corresponding tire 71a to 71d than the second housing 22fab, and is brought into contact with the bottom portion 21a of the rubber bracket 21; para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa).

Regarding claim 34, Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises an accelerometer sensor and is configured to send data from the accelerometer sensor wirelessly to the external receiver (para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit).

Regarding claim 35, Denso discloses the sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and the system is configured to determine one or more parameters consisting of a tire diameter, a tire tread depth, a tire radial load, and vehicle camber and/or toe alignment from the accelerometer sensor data (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth of the tire).

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Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2 (Citations and Explanations)

Regarding claim 41, Denso discloses a method for using a sensor assembly and sensing system with an object that rotates in use (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire; para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22) comprising the steps of: installing an electrical sensor device within an internal cavity of a housing (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown)), wherein the housing includes an outer structure that defines the internal cavity (Fig. 3; para [0045]- The housing 22fa is formed of the hollow member that provides the accommodation chamber inside; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab), and wherein the electrical sensor device comprises a sensor (22aa), a portable power source (22c), an antenna (22d), a printed circuit board (22b), and related electrical circuitry (para [0029]-[0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa; para [0029]- a battery 22c corresponding to a power supply; para [0035]- the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0037]- The circuit board 22b is a board on which the sensor chip 22a, peripheral elements (not shown), and the like are mounted, and is configured by a printed circuit board or the like on which the circuit pattern is formed); attaching the housing after the step of installing to a retaining member (Fig. 3; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like, and the holding portion 21b extends from the other surface of the bottom portion 21a opposite to the one surface to be adhered to the corresponding tire 71a to 71d), wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like), wherein the retaining member is connected with the object before or after formation of the object (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like); and monitoring an operating parameter of the object through the use of the electrical sensing device (para [0031]- the acceleration sensor 22aa is disposed to detect an acceleration in accordance with the ground state of the corresponding tire 71a to 71d; para [0091]), wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly (para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0091]).

Regarding claim 42, Denso discloses the method as recited in claim 41, wherein during the step of installing, the housing includes a wall structure having an opening through which the electrical sensor device is installed (Fig. 3; para [0046]- the housing 22fa is configured to include the first housing 22faa and the second housing 22fab; para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa...Also, the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber) and, after the step of installing, the opening is closed by attaching a top cover or bottom section to the opening (Fig. 3; para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa...Also, the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber).

Regarding claim 43, Denso discloses the method as recited in claim 41, wherein during the step of installing, the electrical sensor device is attached in place within the internal cavity by contact between the electrical sensor device and one or more surface features in the internal cavity (see Fig. 3, elements 22b and 22fab; para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface; para [0029]- a circuit board 22b on which peripheral elements (not shown) and the like are mounted).

Regarding claim 52, Denso discloses the method as recited in claim 41, wherein the sensor assembly electrical sensor device comprises an accelerometer sensor (para [0030]- The sensor chip 22a is formed by incorporating an acceleration sensor 22aa).

Regarding claim 53, Denso discloses the method as recited in claim 52, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein during the step of monitoring, on or more of a tire outside diameter, a tire tread depth, a tire radial load, and a vehicle camber and/or toe alignment parameter is determined from information sent wirelessly from the sensor assembly (para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit; para [0091] groove depth of the tire).

Claims 2, 5, 9, 32, 33, and 50 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2018/0186200 A1 to PIRELLI TYRE S.P. A. (hereinafter Pirelli).

Regarding claim 2, Denso discloses the sensor assembly as recited in claim 1, Denso does not disclose wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member. However, Pirelli, drawn to tire monitoring device, discloses, wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member (para [0172], para [0194]- graphical signs 67 are predisposed on the top of the hooping member 63, such graphical signs 67 allowing a correct orientation of the monitoring device 10 during the fastening operation). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso display features or indicia that are viewable to a user to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]). --see next page

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Regarding claim 5, Denso discloses the sensor assembly as recited in claim 1, wherein the electrical sensor device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical sensor device to retain its position therein (Fig. 3; para [0046]- the housing 22fa configures an accommodation chamber that accommodates the circuit board 22b on which the antenna 22d is mounted in addition to the sensor chip 22a and the peripheral elements (not shown); para [0048]- the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber. In addition, the dimension of an opening of the second housing 22fab is reduced on the upper surface side). Denso does not disclose wherein there is open space above and below the electrical sensor device within the internal cavity. However, Pirelli discloses wherein there is open space above and below the electrical sensor device within the internal cavity (Fig. 2d; para [0127]-[0128]- the housing cavity has size such to ensure the formation of at least one interspace between the outer surface of the electronic unit 20 (in particular the containment body 26 thereof) and the inner walls of said connecting member 30 defining said housing cavity). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso open space above and below the electrical sensor device within the internal cavity to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 9, Denso discloses the sensor assembly as recited in claim 1, wherein the retaining member is formed from an elastically deformable rubber (para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- The holding portion 21b is also made of an elastically deformable rubber or the like), when the retaining member is attached to the object and the housing is attached to the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22; para [0027]-[0028]- The holding portion 21b is formed of, for example, a cylindrical member having a hollow portion into which the sensor device 22 is fitted). Denso does not disclose an elastomeric material that mitigates transmission of shock forces from the object to the housing. However, Pirelli discloses an elastomeric material that mitigates transmission of shock forces from the object to the housing (para [0010]- describe monitoring devices equipped with particular members for connecting to the tyre, such connecting members provided with a cavity inside of which the electronic unit is housed; para [0011]- The Applicant found that the presence of two portions separated from each other allows distributing and dampening in a particularly effective manner the deformations caused by the stresses transmitted to the deformation member by the tyre during rolling (also at high and very high speed); para [0125]- Preferably the connecting member 30 is made of elastomeric material). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso an elastomeric material that mitigates transmission of shock forces from the object to the housing to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 32, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose wherein open space exists above and below the electrical sensor device when disposed within the internal cavity. However, Pirelli discloses wherein open space exists above and below the electrical sensor device when disposed within the internal cavity (para [0128]- the housing cavity has size such to ensure the formation of at least one interspace between the outer surface of the electronic unit 20 (in particular the containment body 26 thereof) and the inner walls of said connecting member 30 defining said housing cavity). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso open space above and below the electrical sensor device within the internal cavity to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 33, Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein the retaining member is formed from an elastically deformable rubber (para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- The holding portion 21b is also made of an elastically deformable rubber or the like), the housing attached with the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22; para [0028]- The holding portion 21b is formed of, for example, a cylindrical member having a hollow portion into which the sensor device 22 is fitted). Denso does not disclose an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching. However, Pirelli discloses an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching (para [0010]- describe monitoring devices equipped with particular members for connecting to the tyre, such connecting members provided with a cavity inside of which the electronic unit is housed; para [0011]- The Applicant found that the presence of two portions separated from each other allows distributing and dampening in a particularly effective manner the deformations caused by the stresses transmitted to the deformation member by the tyre during rolling (also at high and very high speed); para [0125]- Preferably the connecting member 30 is made of elastomeric material). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso an elastomeric material that mitigates transmission of shock forces from the object when attached to the object before reaching to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

Regarding claim 50, Denso discloses the method as recited in claim 41, wherein during the step of attaching (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d), the housing is positioned relative to the retaining member (para [0028]- the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22). Denso does not disclose according to a display feature that is positioned on the housing.
Pirelli discloses according to a display feature that is positioned on the housing (para [0172], [0194]- graphical signs 67 are predisposed on the top of the hooping member 63, such graphical signs 67 allowing a correct orientation of the monitoring device 10 during the fastening operation). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso according to a display feature that is positioned on the housing to increase the reliability and lifetime of the monitoring device as disclosed in Pirelli (see Pirelli, para [0011]).

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Claim 10 lacks an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2011/0025487 A1 to Laird et al. (hereinafter Laird).

Regarding claim 10, Denso discloses the sensor assembly as recited in claim 1. Denso does not disclose wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device. However, Laird, drawn to tire pressure sensor, discloses, wherein the housing includes an opening through the outside surface to the internal cavity (para [0004]- some tire pressure sensors have a housing for encasing the sensor electronic components and circuitry. An opening is provided in the housing), and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device (para [0004]- some tire pressure sensors have a housing for encasing the sensor electronic components and circuitry. An opening is provided in the housing, and a filter covers the opening. The filter permits only gases (e.g. the tire's pressurized air), and not liquids). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the housing includes an opening through the outside surface to the internal cavity, and a filter that is positioned to filter air passing into the internal cavity to prevent damage to the sensor electronic components and circuitry in the housing as disclosed in Laird (see Laird, para [0004]).

Claims 16, 17, 37, 38, and 55 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2019/0187027 A1 to The Goodyear Tire & Rubber Company (hereinafter Goodyear).

Regarding claim 16, Denso discloses the sensing system as recited in claim 11. Denso does not disclose wherein the electrical sensor device comprises a global positioning device. However, Goodyear, drawn to integrated tire sensor, discloses, wherein the electrical sensor device comprises a global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a global positioning device to reduce cost and complexity as disclosed in Goodyear (see Goodyear, para [0006]).

Regarding claim 17, Denso in view of Goodyear discloses the sensing system as recited in claim 16, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and Goodyear discloses a location of the vehicle tire is determined from information provided by the global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed).

Regarding claim 37, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose wherein the electrical sensor device comprises a global positioning device. However, Goodyear discloses wherein the electrical sensor device comprises a global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a global positioning device to reduce cost and complexity as disclosed in Goodyear (see Goodyear, para [0006]).

Regarding claim 38, Denso in view of Goodyear discloses the sensor assembly and sensing system as recited in claim 37. Goodyear furhter discloses the system is configured to determine a location of the vehicle tire from information provided by the global positioning device (Abstract; para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed).

Regarding claim 55, Denso discloses the method as recited in claim 41, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), but fails to disclose the electrical sensor device comprises a global positioning device. Goodyear discloses wherein the object is a vehicle tire and teh electrical sensor device comprises a global positioning device (para [0039] - In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed), and wherein the step of monitoring a location of the tire is determined from information provided by the global positioning device (para [0039]- In addition, global positioning system (GPS) capability may be included in the sensor unit 16 and/or the module 40 to provide location tracking of the tire 16 during transport and/or location tracking of the vehicle on which the tire is installed). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a global positioning device, and monitoring a location of the tire is determined from information provided to reduce cost and complexity as disclosed in Goodyear (see Goodyear, para [0006]).

Claims 18, 19, 29, 39, 40, 51, 56, and 57 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2016/0332493 A1 to Semiconductor Energy Laboratory Co., Ltd. (hereinafter SEL).

Regarding claim 18, Denso discloses the sensing system as recited in claim 11. Denso does not disclose wherein the electrical sensor device comprises a gyroscope. However, SEL, drawn to semiconductor device, discloses, wherein the electrical sensor device comprises a gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0107]- Examples of an object having a sealed space include a tire). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a gyroscope to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

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Regarding claim 19, Denso in view of SEL discloses the sensing system as recited in claim 18, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and information is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). SEL discloses information from the gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0082]- the semiconductor device 400 includes three sensors, the sensor elements 412 to 414. For example, the sensor elements 412 to 414 can each include a sensor selected from a pressure sensor, a temperature sensor, a strain sensor, an acceleration sensor, and the like. One sensor element can have a plurality of functions).

Regarding claim 29, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose comprising an external transmitter for sending information wirelessly to the electronic sensor device. However, SEL discloses an external transmitter for sending information wirelessly to the electronic sensor device (para [0078]- the semiconductor device 400 preferably includes an antenna 401 and sensor elements 412 to 414; para [0083]- The antenna 401 is capable of converting a wireless signal into an electric signal or converting an electric signal into a wireless signal to receive and transmit a signal from/to an external terminal such as an interrogator). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso an external transmitter for sending information wirelessly to the electronic sensor device to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 39, Denso discloses the sensor assembly and sensing system as recited in claim 28. Denso does not disclose wherein the electrical sensor device comprises a gyroscope. However, SEL discloses wherein the electrical sensor device comprises a gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0107]- Examples of an object having a sealed space include a tire). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a gyroscope to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 40, Denso in view of SEL discloses the sensing system as recited in claim 39, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and information is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). SEL discloses information from the gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0082]- the semiconductor device 400 includes three sensors, the sensor elements 412 to 414. For example, the sensor elements 412 to 414 can each include a sensor selected from a pressure sensor, a temperature sensor, a strain sensor, an acceleration sensor, and the like. One sensor element can have a plurality of functions).

Regarding claim 51, Denso discloses the method as recited in claim 41, wherein during the step of monitoring, the sensor monitors operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna information related to the monitored operating parameter to the receiver (para [0031]- The acceleration sensor 22aa corresponds to a vibration detection element for detecting the vibration applied to the corresponding tire 71a to 71d; para [0032]- as the acceleration sensor 22aa, a multi-axis sensor such as a two-axis sensor capable of detecting accelerations in two directions or a three-axis sensor capable of detecting accelerations in three directions can be used; para [0041]- Each of the vibration transmission members 22e serves to transmit the vibration applied to the corresponding tire 71a to 71d to the sensor chip 22a; para [0035]- The microcomputer 22ab receives the detection signal of the acceleration sensor 22aa... Upon creating a frame, the microcomputer 22ab transmits the created frame to a transmission unit such as an RF circuit provided in the microcomputer 22ab or as a peripheral device not shown. Then, the microcomputer 22ab transmits the frame from the antenna 22d to the receiver 3 through the transmission unit). Denso does not disclose wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device. However, SEL discloses wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device (para [0078]- the semiconductor device 400 preferably includes an antenna 401 and sensor elements 412 to 414; para [0083]- The antenna 401 is capable of converting a wireless signal into an electric signal or converting an electric signal into a wireless signal to receive and transmit a signal from/to an external terminal such as an interrogator; para [0111]- The interrogator includes an antenna and a circuit portion. The circuit portion preferably includes a radio wave interface and a control system. The interrogator may further include an operation portion. For example, the operation portion may include an input button, a touch panel, and the like). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso receive information transmitted from an external device to change one or more feature of the electrical sensor device to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

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Regarding claim 56, Denso discloses the method as recited in claim 41. Denso does not disclose wherein the electrical sensor device comprises a gyroscope. However, SEL discloses wherein the electrical sensor device comprises a gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0107]- Examples of an object having a sealed space include a tire).
It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a gyroscope to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 57, Denso in view of SEL discloses the sensing system as recited in claim 56. Denso discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and information is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). SEL discloses information from the gyroscope (para [0095]- The sensor element can include any of various sensors...a gyro sensor; para [0082]- the semiconductor device 400 includes three sensors, the sensor elements 412 to 414. For example, the sensor elements 412 to 414 can each include a sensor selected from a pressure sensor, a temperature sensor, a strain sensor, an acceleration sensor, and the like. One sensor element can have a plurality of functions).

Claims 24, 27, and 44-49 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of US 2019/0160895 A1 to Hankook Tire Co., Ltd. (hereinafter Hankook).

Regarding claim 24, Denso discloses the sensor assembly as recited in claim 20, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein the retaining member is attached to an inside surface of the vehicle tire or an element attached with the tire that rotates with the tire (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0027]). Denso does not disclose vulcanized rubber tire. However, Hankook, drawn to container structure for sensors, discloses, a vulcanized rubber tire (para [0107]- a method of manufacturing a tire-integrated container structure according to an embodiment can perform a step of preparing a vulcanized tire (S110)).
It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso a vulcanized rubber tire to prevent breakdown of a sensor due to high temperature as disclosed in Hankook (see Hankook, para [0010]).

Regarding claim 27, Denso in view of Hankook discloses the sensor assembly as recited in claim 24, Denso further discloses wherein the retaining member is attached to the inside surface of the vehicle tire by an adhesive layer (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like). Hankook discloses after the vehicle tire has been vulcanized (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130)).

Regarding claim 44, Denso discloses the method as recited in claim 41. Denso does not disclose wherein the object is a made from vulcanized rubber, and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object after the object has been formed. However, Hankook discloses wherein the object is a made from vulcanized rubber (para [0107]- a method of manufacturing a tire-integrated container structure according to an embodiment can perform a step of preparing a vulcanized tire (S110)), and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object after the object has been formed (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130)). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the object is a made from vulcanized rubber to prevent breakdown of a sensor due to high temperature as disclosed in Hankook (see Hankook, para [0010]).

Regarding claim 45, Denso in view of Hankook discloses the method as recited in claim 44, Denso further discloses wherein the retaining member is attached to a surface of the object by use of an adhesive layer (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Regarding claim 46, Denso in view of Hankook discloses the method as recited in claim 45, Denso further discloses wherein the retaining member is attached to the object after the step of attaching the housing to the retaining member (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0050]- The tire-mounted sensor 2 configured as described above is provided by, for example, pushing out the hollow portion of the rubber bracket 21 by elastic deformation and disposing the sensor device 22 in a space surrounded by the rubber bracket 21. Then, in this state, the adhesive 23 is applied to the back surface of the bottom portion 21a of the rubber bracket 21, and the tire-mounted sensor 2 is attached to the inner wall surface of the corresponding tire 71a to 71d).

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Regarding claim 47, Denso in view of Hankook discloses the method as recited in claim 45, Denso further discloses wherein the retaining member is attached to the object (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d; para [0027]). While neither Denso nor Hankook specifically discloses by applying hand pressure onto the retaining member once placed into contact with the surface of the object to cause the adhesive layer to form an attachment therebetween, it would have been obvious to one of ordinary skill in the art based on optimization that applying hand pressure onto the retaining member once placed into contact with the surface of the object (para [0050]- The tire-mounted sensor 2 configured as described above is provided by, for example, pushing out the hollow portion of the rubber bracket 21 by elastic deformation and disposing the sensor device 22 in a space surrounded by the rubber bracket 21. Then, in this state, the adhesive 23 is applied to the back surface of the bottom portion 21a of the rubber bracket 21, and the tire-mounted sensor 2 is attached to the inner wall surface of the corresponding tire 71a to 71d) would cause the adhesive layer to form an attachment therebetween.

Regarding claim 48, Denso in view of Hankook discloses the method as recited in claim 44, Denso further discloses wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein the retaining member is attached to a surface that is inside of the vehicle tire (para [0027]- One surface of the bottom portion 21a is a surface to be adhered to the inner wall surface of the corresponding tire 71a to 71d through an adhesive 23 or the like).

Regarding claim 49, Denso in view of Hankook discloses the method as recited in claim 44. Hankook further discloses wherein the retaining member is mechanically attached to an element that is connected to and that rotates with the object (para [0113]- In the step of forming a container structure by injecting and compressing non-vulcanized rubber to the inner liner of a vulcanized tire (S130), the non-vulcanized rubber can be injected and compressed by any one of a C-type press, a robot arm, or an injection machine 300).

Claims 25 and 26 lack an inventive step under PCT Article 33(3) as being obvious over Denso in view of Hankook and further in view of SEL.

Regarding claim 25, Denso in view of Hankook discloses the sensor assembly as recited in claim 24, Denso discloses the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22). Neither Denso nor Hankook discloses wherein the retaining member is attached to a wheel that the tire is mounted on. However, SEL discloses wherein the semiconductor device is attached to a wheel that the tire is mounted on (see Fig. 5A, elements 301 and 302; para [0133]- The semiconductor device 302 may also be mounted on the wheel 301 as illustrated in FIG. 5A). It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the retaining member is attached to a wheel that the tire is mounted on to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Regarding claim 26, Denso in view of Hankook discloses the sensor assembly as recited in claim 24, Denso discloses the retaining member (para [0024]- the tire-mounted sensor 2 has a rubber bracket 21, which configures a sensor holding member, and a sensor device 22).Neither Denso nor Hankook discloses wherein the retaining member is attached to a valve stem of a wheel that the tire is mounted on. However, SEL discloses wherein a pressure sensor is attached to a valve stem of a wheel that the tire is mounted on (para [0121]- A pressure sensor can be mounted on, for example, a valve cap of the tire. The pressure sensor is preferably mounted inside the tire).
It would have been obvious to a person of ordinary skill in the art at the time of the invention to dispose sensor assembly of Denso the retaining member is attached to a valve stem of a wheel that the tire is mounted on to provide a moving object with a high degree of safety as disclosed in SEL (see SEL, para [0007]).

Claims 14, 15, 30, 36, and 54 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not disclose or fairly suggest the subject matter claimed.

The prior art for claims 4, 15, 30, 36, and 54 is exemplified by Denso.

Regarding claim 14:
Denso discloses the sensing system as recited in claim 13, wherein one or more of the tire diameter, tire tread depth, and tire radial load is determined from data (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected; para [0091] groove depth). Denso does not disclose data including a specific rotational speed of the tire at a given vehicle velocity.
None of the prior art discloses data including a specific rotational speed of the tire at a given vehicle velocity. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 14, therefore claim 14 meets the criteria set out in PCT Article 33(2)-(3).

--see next page

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 20/58402

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2 (Citations and Explanations)

Regarding claim 15:
Denso discloses the sensing system as recited in claim 12, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and a radial load experienced by the tire is determined from data comprising an interval of radial deformation (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected). Denso does not disclose using a correction coefficient.
None of the prior art discloses using a correction coefficient. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 15, therefore claim 15 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 30:
Denso discloses the sensor assembly and sensing system as recited in claim 28, wherein the housing includes a wall structure having a top cover end of the wall structure and a base section (para [0048]- The second housing 22fab forms an accommodation chamber for accommodating each component of the sensor device 22 in cooperation with the first housing 22faa...Also, the second housing 22fab has a cup shape having an upper surface and a side surface, and is integrated with the first housing 22faa at an open end of the cup shape so as to configure the accommodation chamber), wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith (para [0025]- the rubber bracket 21 is a member for holding the sensor device 22 on an inner wall surface of the corresponding tire 71a to 71d, for example, on a back surface of a tread; para [0026]- the rubber bracket 21 has a bottom portion 21a and a holding portion 21b; para [0028]- so that the holding portion 21b holds the sensor device 22 not to be pulled out. More specifically, the hollow portion of the holding portion 21b has a shape corresponding to an outer shape of the sensor device 22). Denso does not disclose top cover at a first axial end of the wall, and a base section at an opposed second axial of the wall.
None of the prior art discloses top cover at a first axial end of the wall, and a base section at an opposed second axial of the wall. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 30, therefore claim 30 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 36:
Denso discloses the sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire) and the system is configured to determine one or more of a tire diameter, a tire tread depth, and a fire radial load from data (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected). Denso does not disclose data including a specific rotational speed of the tire at a given vehicle velocity.
None of the prior art discloses data including a specific rotational speed of the tire at a given vehicle velocity. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 36, therefore claim 36 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 54:
Denso discloses the method as recited in claim 52, wherein the object is a vehicle tire (para [0023]- The tire-mounted sensor 2 is a tire side device provided on a tire), and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, and a tire radial load is determined from information (para [0031]- More specifically, when a portion of the corresponding tire 71a to 71d at which the acceleration sensor 22aa is attached comes in contact with the traveling road surface and when the portion moves away from the traveling road surface again after coming in contact with the traveling road surface, the acceleration, in other words, the vibration changes greatly. During the road contact, the acceleration changes so as to vibrate in accordance with the road surface condition. The changed acceleration appears as a detection signal of the acceleration sensor 22aa; para [0032]- When the acceleration sensor 22aa is the multi-axis sensor, for example, the acceleration in a radial direction of the corresponding tire 71a to 71d as the other two axes, that is, in a centrifugal direction, or the acceleration in a width direction of the corresponding tire 71a to 71d is detected). Denso does not disclose information relating to a specific rotational speed of the tire at a given vehicle velocity.
None of the prior art discloses information relating to a specific rotational speed of the tire at a given vehicle velocity. Further, the prior art whether taken alone or combination, fails to disclose or suggest the particular arrangement of these parts as required by claim 54, therefore claim 54 meets the criteria set out in PCT Article 33(2)-(3).

Claims 1- 57 have industrial applicability as defined by PCT Article 33(4) because the invention can be made or used in the industry.

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PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference		FOR FURTHER ACTION
67838-00716		see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US 20/58402	30 October 2020 (30.10.2020)	31 October 2019 (31.10.2019)
Applicant		
FERRY, KEITH G		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 1

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

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Revvo v. Cerebrum
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 20/58402

A. CLASSIFICATION OF SUBJECT MATTER

IPC - B60C 23/00, 23/02, 23/04, 23/20 (2020.01)

CPC - B60C 23/00, 23/0408, 23/0433, 11/243, 11/246, 23/02, 23/04, 23/0493, 23/0452, 23/20; B60G 2204/113, 2400/52, 2800/984; G01M 17/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y --- A	US 2019/0184773 A1 (DENSO CORPORATION) 20 June 2019 (20.06.2019) entire document, especially Fig. 3, para [0022]-[0032], [0034]-[0037], [0041], [0045]-[0048], [0050]	1,3, 4, 6-8, 11-13, 20-23, 28, 31, 34, 35, 41-43, 52, 53 ---------- 2, 5, 9, 10, 16-19, 24-27, 29, 32, 33, 37-40, 44-51, 55-57 ---------- 14, 15, 30, 36, 54
Y	US 2018/0186200 A1 (PIRELLI TYRE S.P. A.) 05 July 2018 (05.07.2018) entire document, especially para [0010], [0011], [0125], [0128], [0194]	2, 5, 9, 32, 33, 50
Y	US 2011/0025487 A1 (LAIRD et al.) 03 February 2011 (03.02.2011) entire document, especially para [0004]	10
Y	US 2019/0187027 A1 (THE GOODYEAR TIRE & RUBBER COMPANY) 20 June 2019 (20.06.2019) entire document, especially para [0039]	16, 17, 37, 38, 55
Y	US 2016/0332493 A1 (SEMICONDUCTOR ENERGY LABORATORY CO., LTD.) 17 November 2016 (17.11.2016) entire document, especially Fig. 5A, para [0078], [0082], [0083], [0095], [0107], [0121], [0133]	18, 19, 25, 26, 29, 39, 40, 51, 56, 57
Y	US 2019/0160895 A1 (HANKOOK TIRE CO., LTD.) 30 May 2019 (30.05.2019) entire document, especially para [0107], [0113]	24-27, 44-49

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 December 2020	02 FEB 2021

Name and mailing address of the ISA/US	Authorized officer
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Lee Young Telephone No. PCT Helpdesk: 571-272-4300

Form PCT/ISA/210 (second sheet) (July 2019)

Electronic Acknowledgement Receipt

EFS ID:	42672014
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	67838.01000
Receipt Date:	07-MAY-2021
Filing Date:	29-OCT-2020
Time Stamp:	22:18:00
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	050721_IDS_as_filed_67838_01000.pdf	1034641 5aab77b8b409ccb888ac1fadfdd88af3e1baf22f	no	4

Warnings:

Information:					
2	Other Reference-Patent/App/Search documents	WO2021087391-ISR-20210506-3325.pdf	104236 5c11348dfce5159b63e898fe4612138f459f49df	no	2
Warnings:					
Information:					
3	Other Reference-Patent/App/Search documents	WO2021087391-WOSA-20210506-3328.pdf	1163473 b01ede8e2e3b09752e0ffcf8eed9e07c37b3d7d6	no	13
Warnings:					
Information:					
			Total Files Size (in bytes):	2302350	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/084,483	10/29/2020	Keith George Ferry	67838.01000

CONFIRMATION NO. 7585

125632
Snell & Wilmer (LA)
400 East Van Buren Street
One Arizona Center
Phoenix, AZ 85004

PUBLICATION NOTICE

OC000000125405165

Title:SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

Publication No.US-2021-0131916-A1
Publication Date:05/06/2021

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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

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

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

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

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/084,483	10/29/2020	2685	2680	67838.01000	57	3

CONFIRMATION NO. 7585

UPDATED FILING RECEIPT

125632
Snell & Wilmer (LA)
400 East Van Buren Street
One Arizona Center
Phoenix, AZ 85004

OC000000122384498

Date Mailed: 01/12/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Keith George Ferry, Burbank, CA;

Applicant(s)

Keith George Ferry, Burbank, CA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 16/671,105 10/31/2019

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

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 11/06/2020

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Revvo v. Cerebrum
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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/084,483**

Projected Publication Date: 05/06/2021

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

Preliminary Class

340

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 566

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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

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

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

NOT GRANTED

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

SelectUSA

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

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/084,483

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	80		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	350		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	400		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	57 minus 20 =	* 37	x 50 =	1850	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x 240 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	2680		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

Electronic Acknowledgement Receipt

EFS ID:	41597883
Application Number:	17084483
International Application Number:	
Confirmation Number:	7585
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Customer Number:	125632
Filer:	Grant T. Langton/Lauren Coyle
Filer Authorized By:	Grant T. Langton
Attorney Docket Number:	67838.01000
Receipt Date:	08-JAN-2021
Filing Date:	29-OCT-2020
Time Stamp:	16:31:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Response to Pre-Exam Formalities Notice	010821_RCP_as_filed_67838_01000.pdf	78461 6d7cf7a0b5273eac12fbd16e6eb2b80a3bf58045	no	1

Warnings:

Information:					
2	Drawings-only black and white line drawings	010821_Replacement_Sheets_as_filed_67838_01000.pdf	556555 0789e410d4d3c0d354e858e3bff05a9c0a327bb6	no	11
Warnings:					
Information:					
			Total Files Size (in bytes):	635016	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	17/084,483	Confirmation No.:	7585
Inventor(s):	Keith George Ferry	Group Art Unit:	2685
Filed:	October 29, 2020	Examiner:	Not yet assigned
Title:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	Attorney Docket No.	67838.01000

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

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Dear Commissioner:

This is in response to the Notice to File Corrected Application Papers dated November 9, 2020.

Applicant respectfully submits herewith replacement drawings Figure(s) 1 to 20 to replace the drawings previously submitted on October 29, 2020. The replacement drawings are in compliance with 37 CFR 1.84 and 37 CFR 1.121(d).

No fee is believed to be due with this submission. However, the Commissioner is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm), and to credit any overpayment, to Deposit Account No. 19-2814.

Respectfully submitted,

Dated: January 8, 2021

/Grant T. Langton/

Grant T. Langton,
Registration No. 39,739
Snell & Wilmer L.L.P.
400 East Van Buren Street
Suite 1900
Phoenix, AZ 85004-2202
ipladocket@swlaw.com
(213) 929-2525 (Direct); (213) 929-2500 (Fax)
Attorney for Applicant

CUSTOMER NUMBER

125632

4834-5412-5526.1

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 571

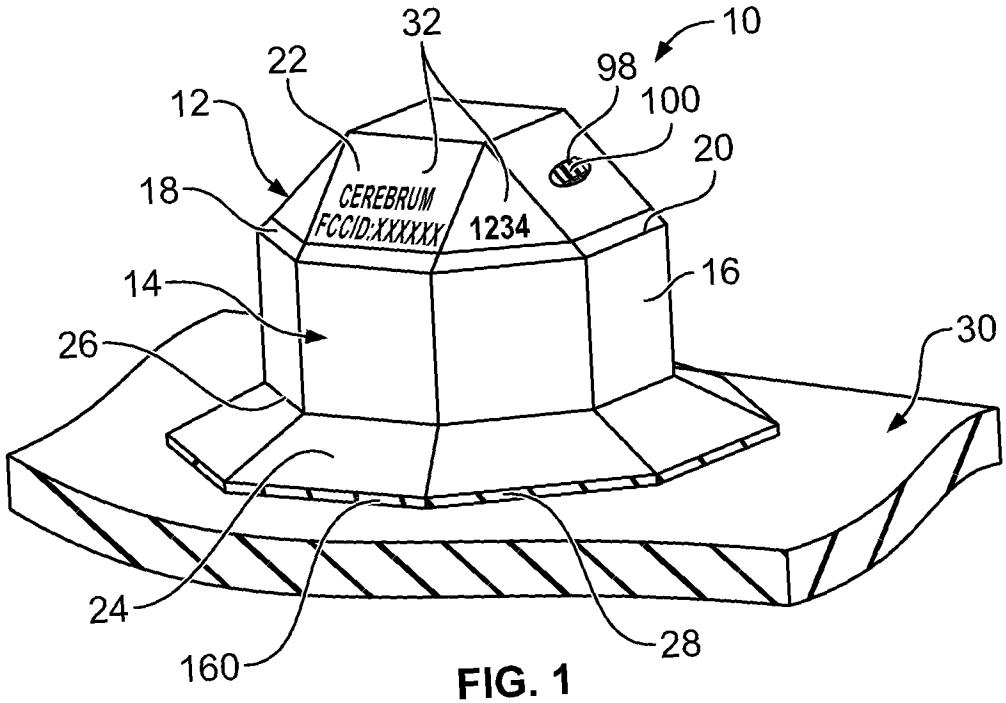
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FIG. 1

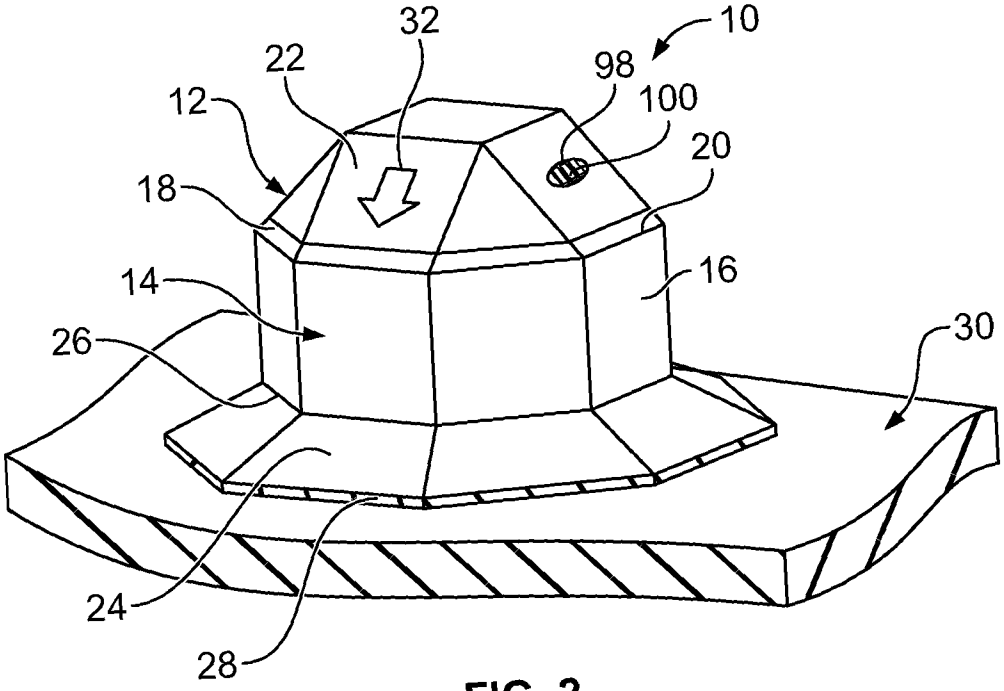
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FIG. 2

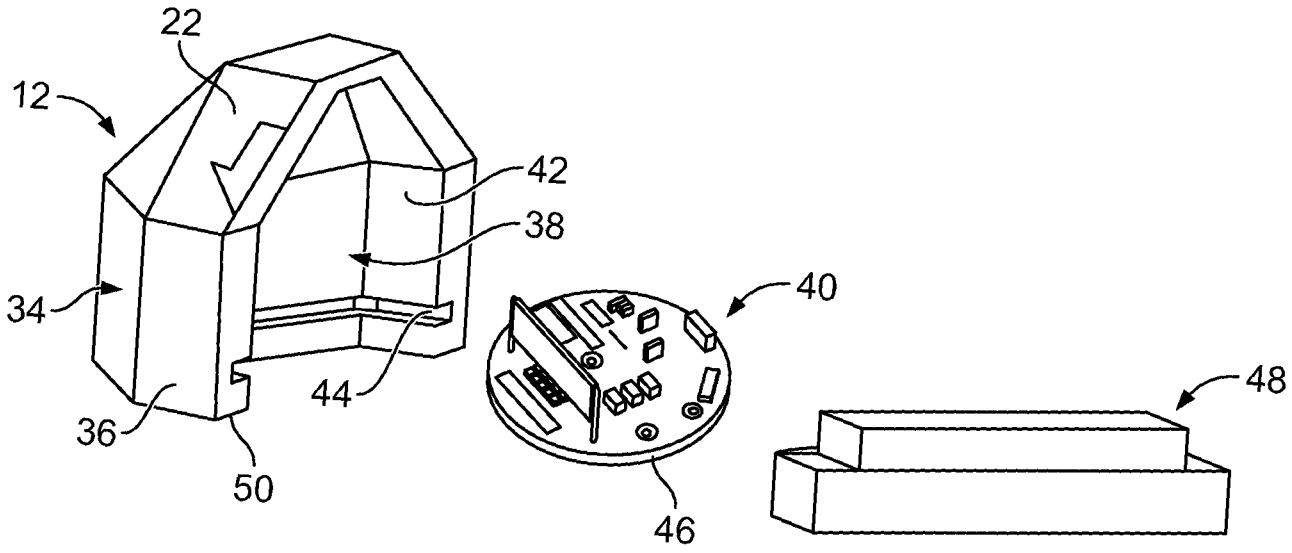

FIG. 3

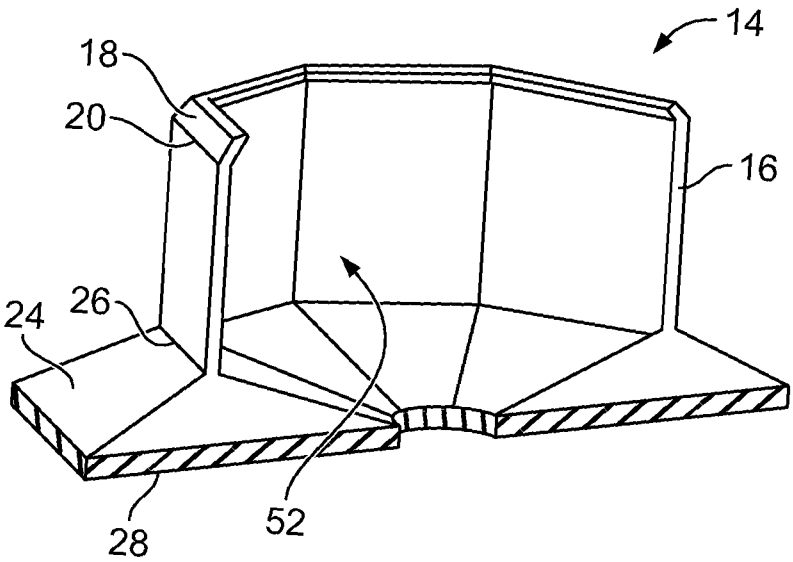

FIG. 4

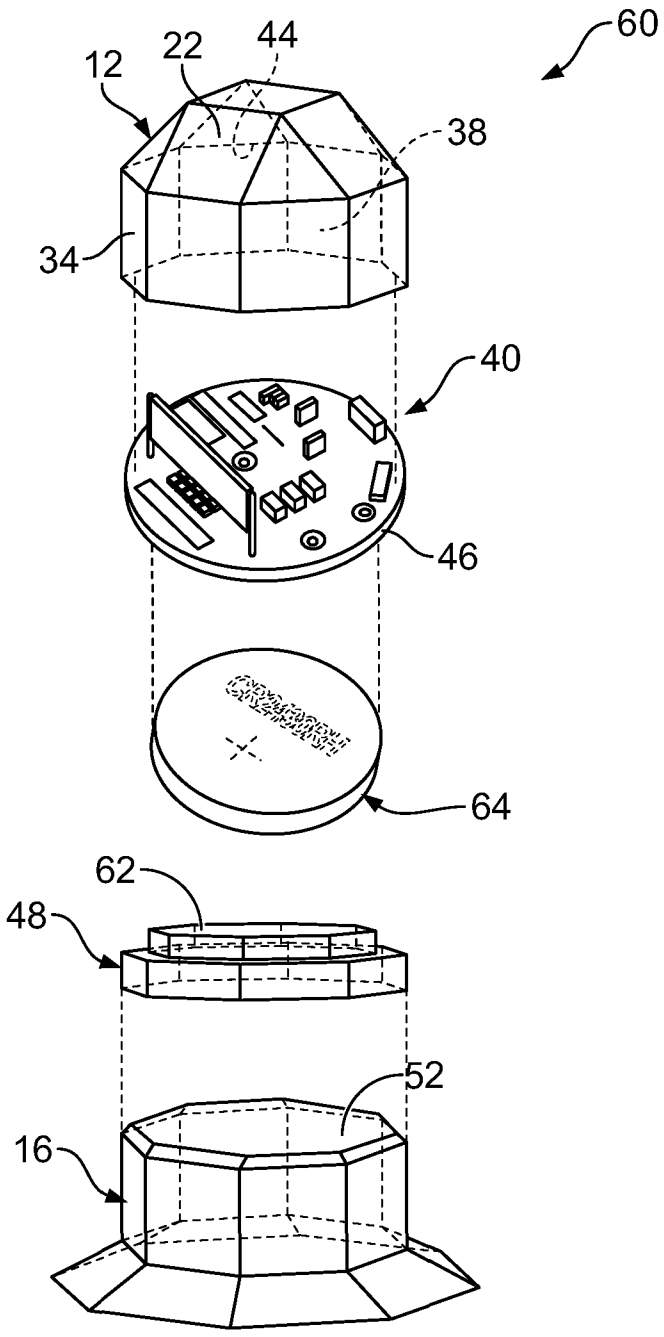

FIG. 5

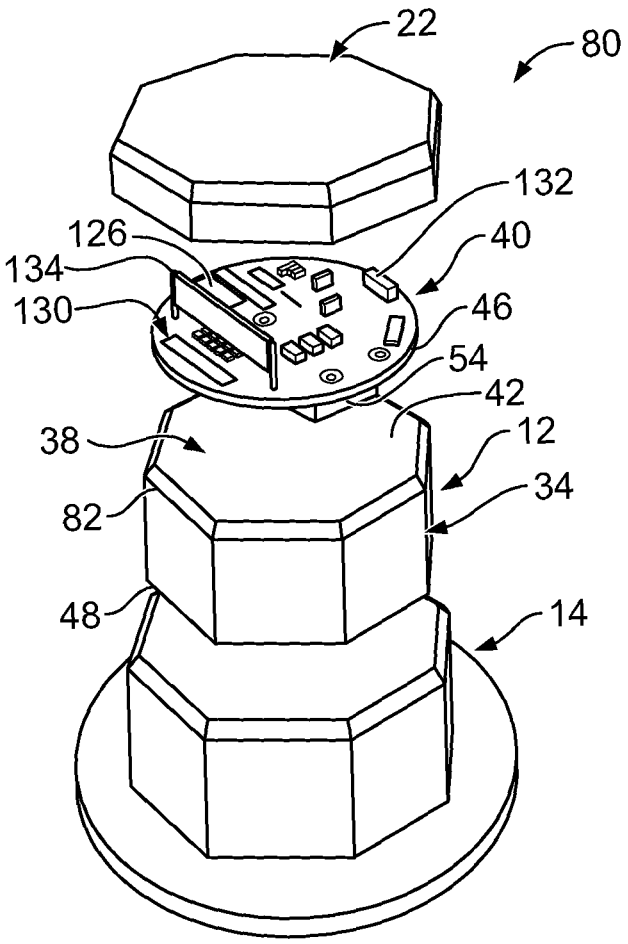

FIG. 6

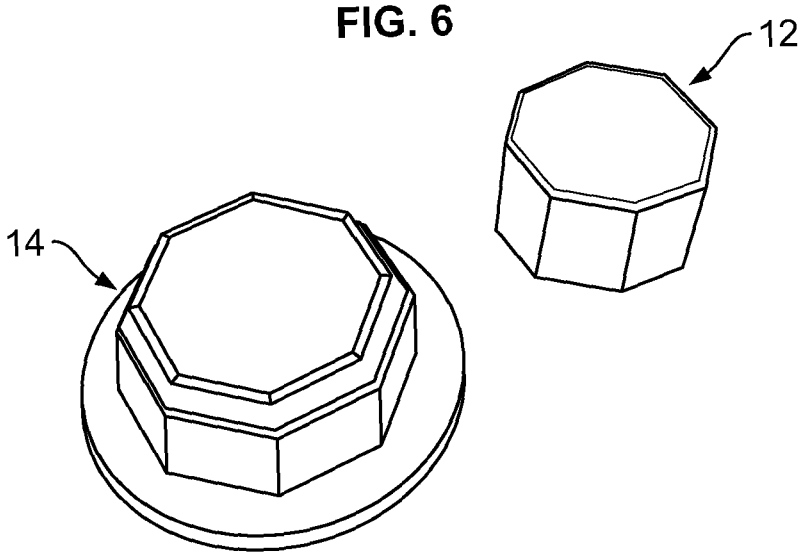

FIG. 7

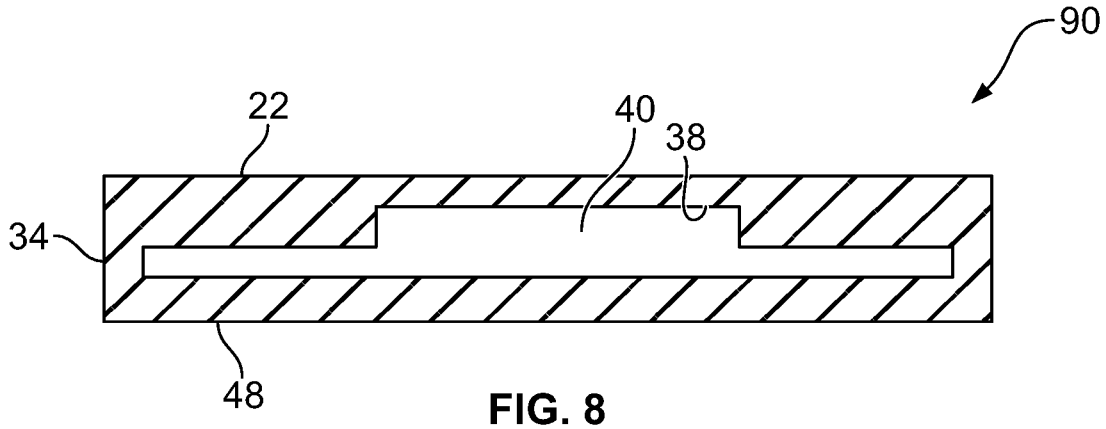

FIG. 8

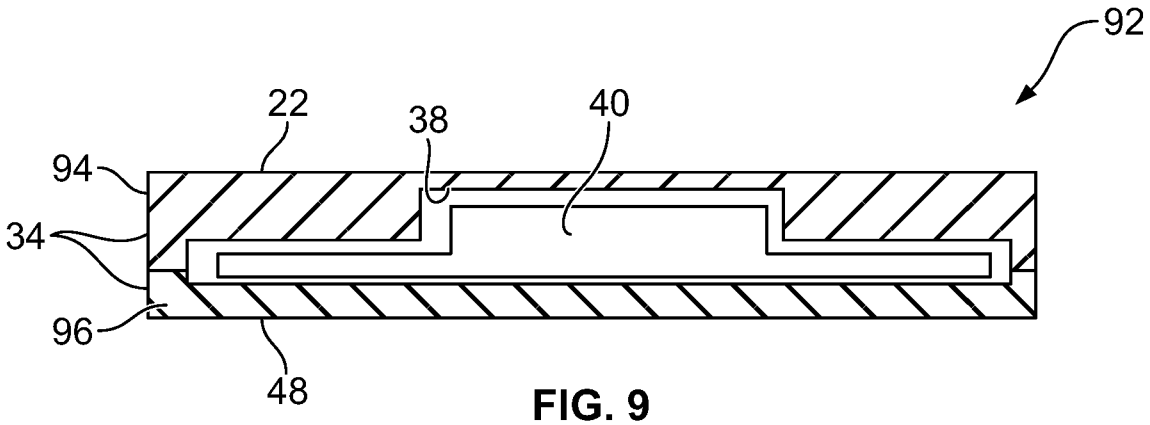

FIG. 9

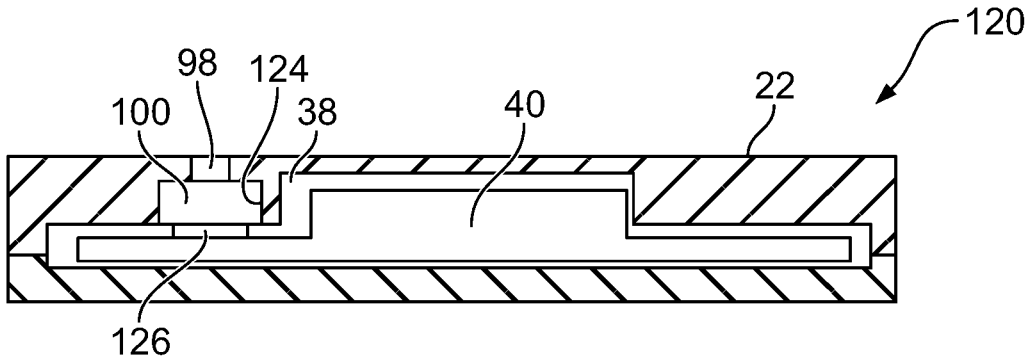

FIG. 10

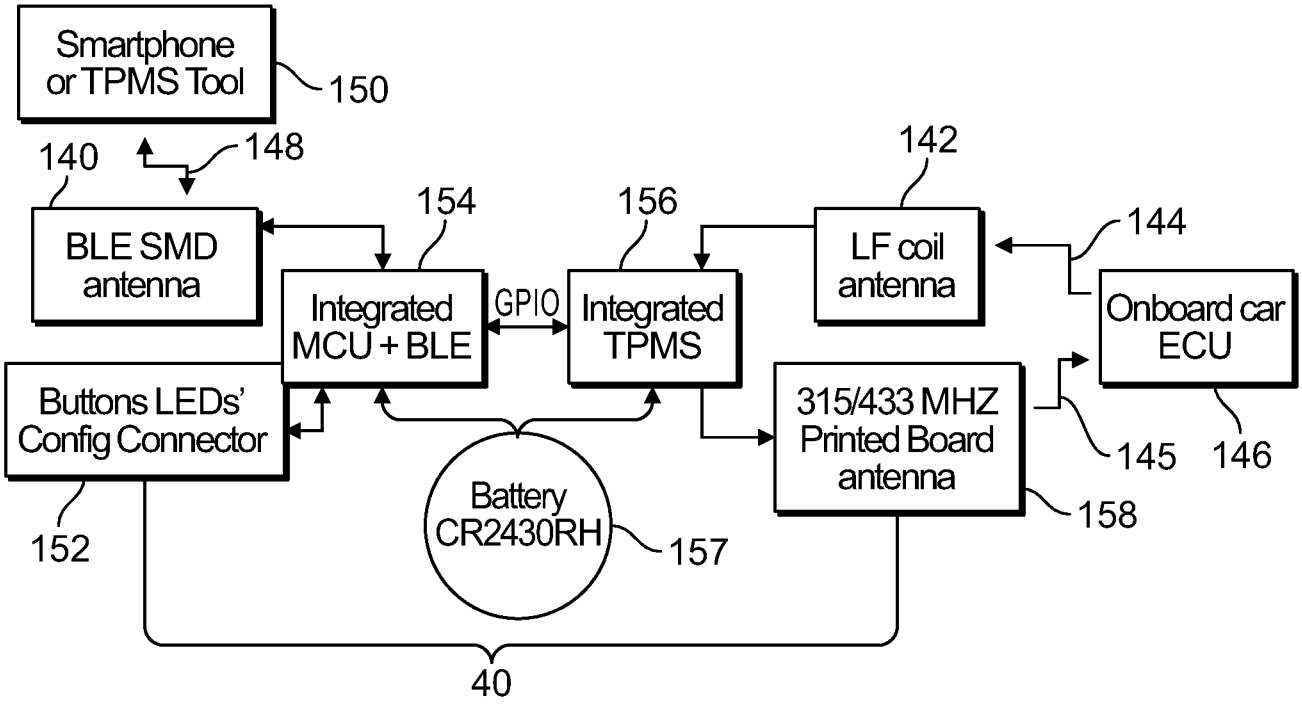
Smartphone or TPMS Tool
150
140
148
142
154
156
144
BLE SMD antenna
Integrated MCU + BLE
GPIO
Integrated TPMS
LF coil antenna
Onboard car ECU
Buttons LEDs' Config Connector
315/433 MHZ Printed Board antenna
145
146
Battery CR2430RH
157
158
152
40

FIG. 11

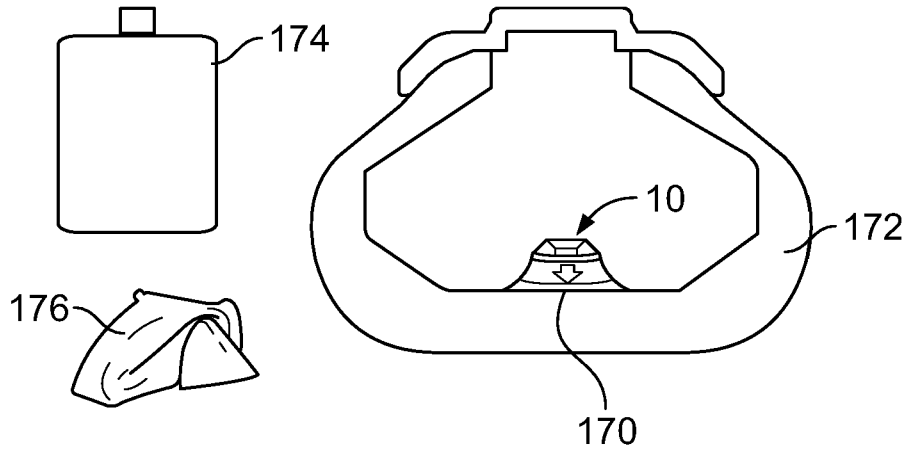
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FIG. 12

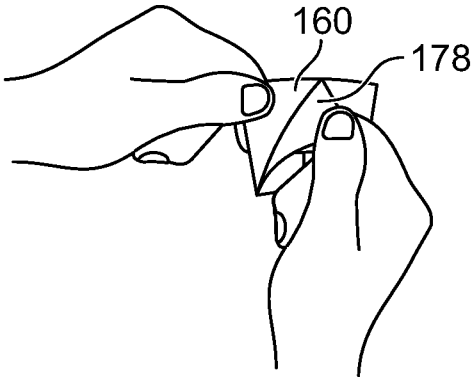

FIG. 13

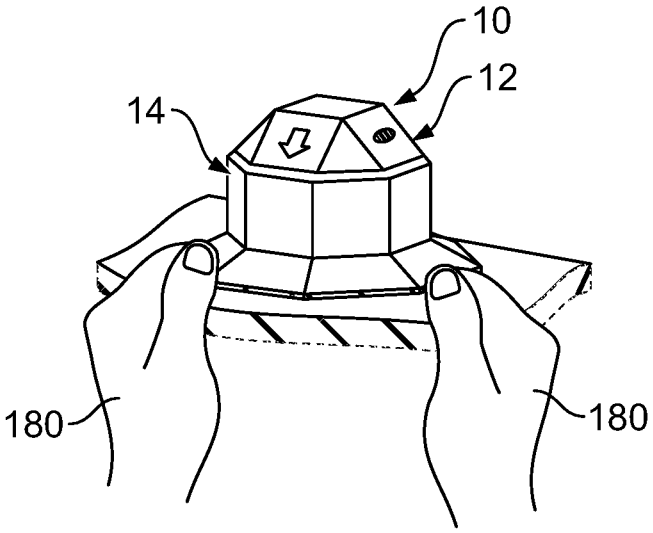

FIG. 14

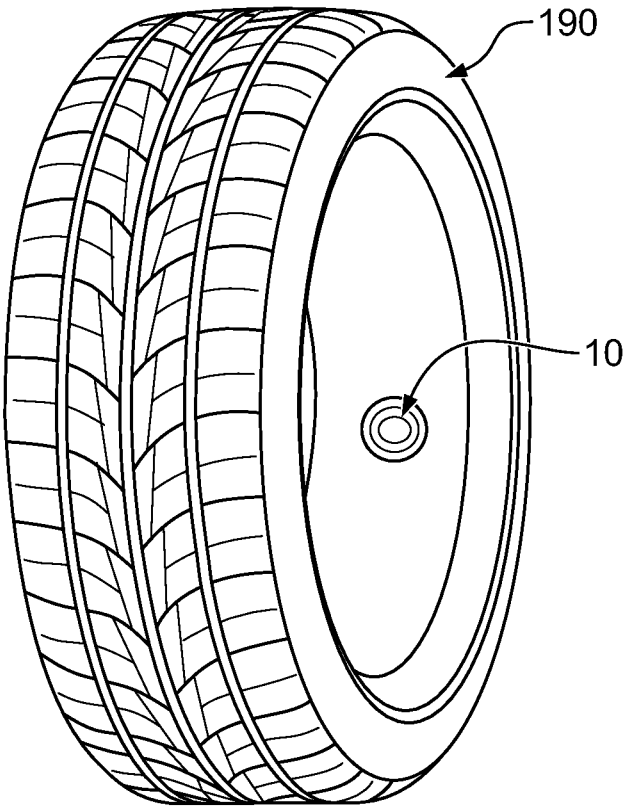

FIG. 15

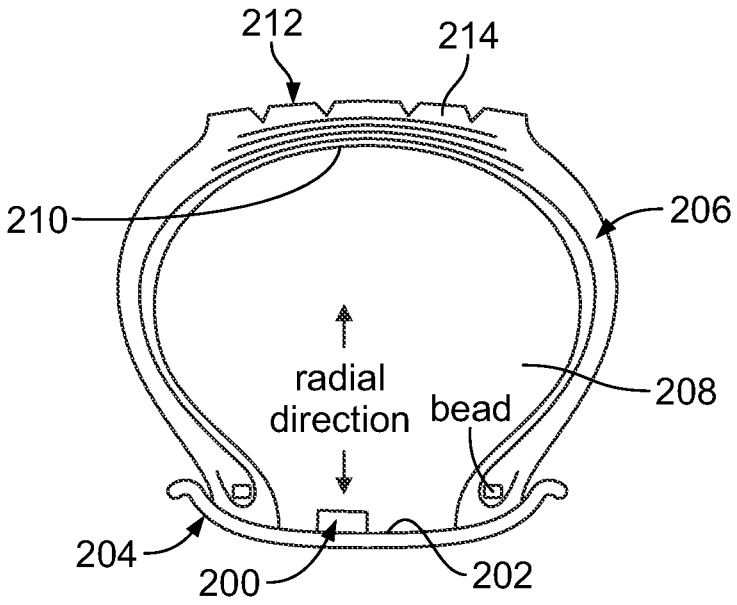

FIG. 16

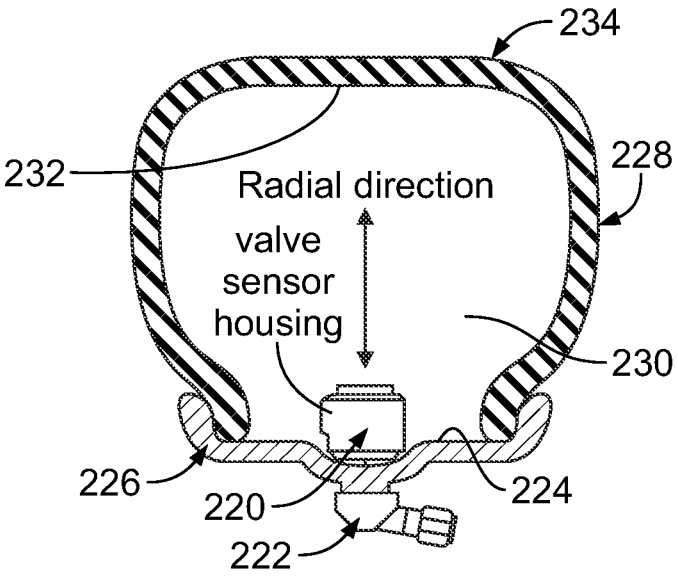

FIG. 17

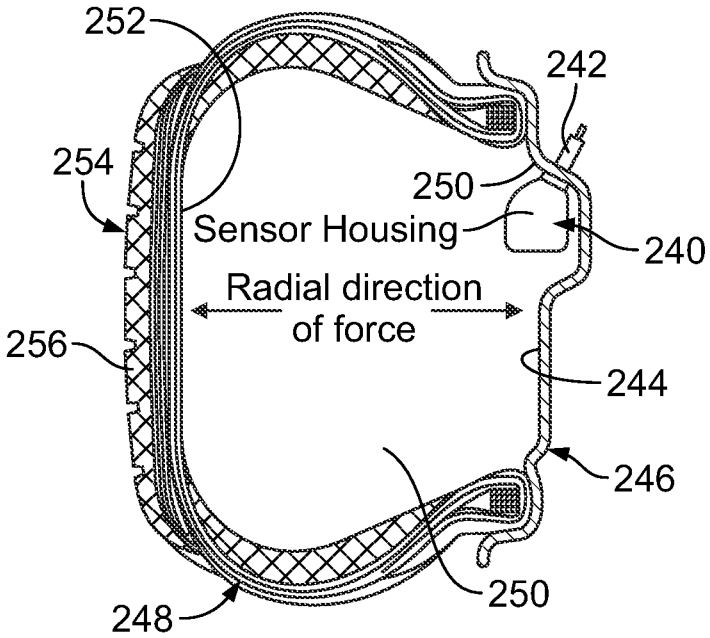

FIG. 18

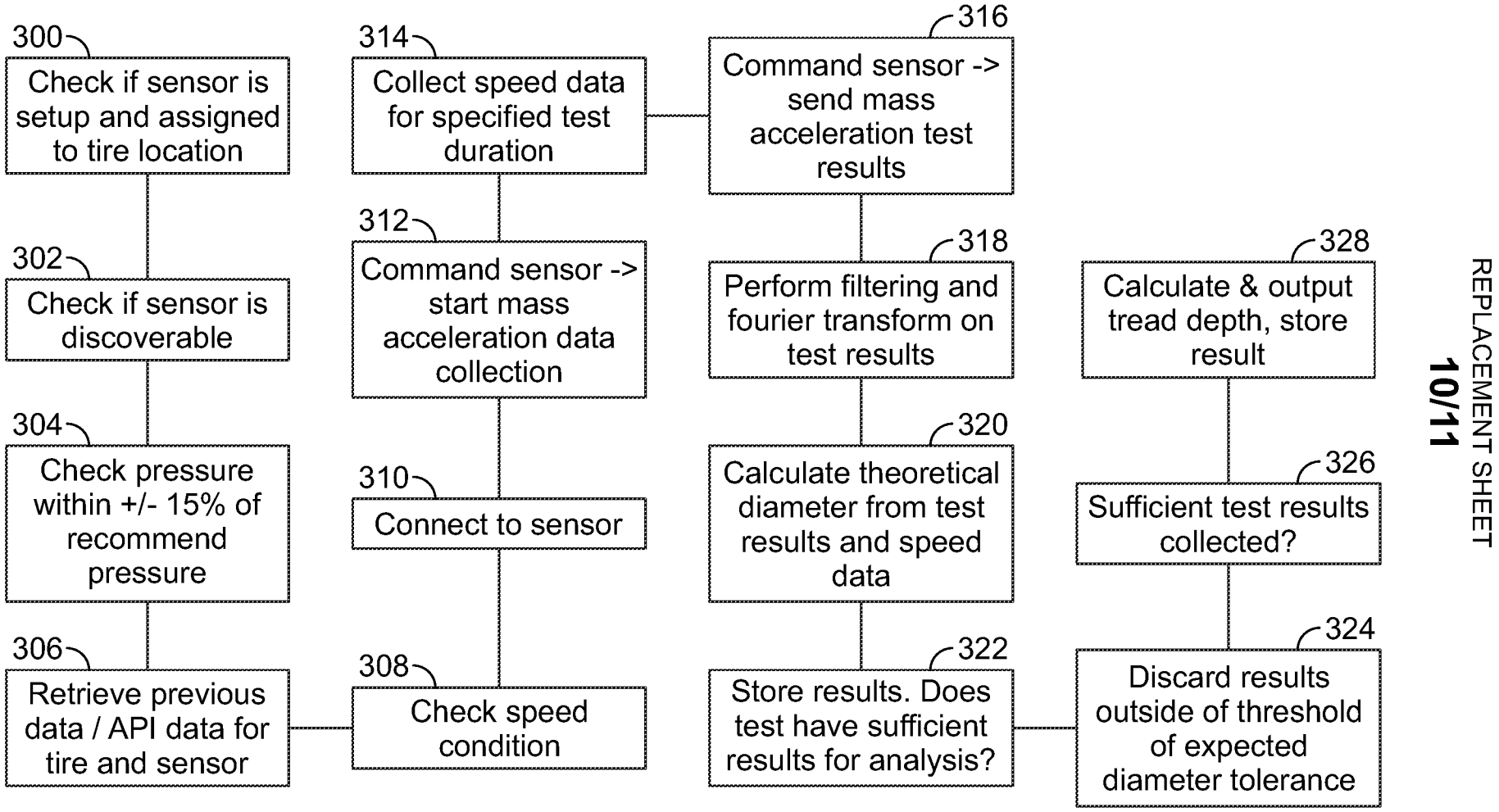

FIG. 19

REPLACEMENT SHEET
10/11

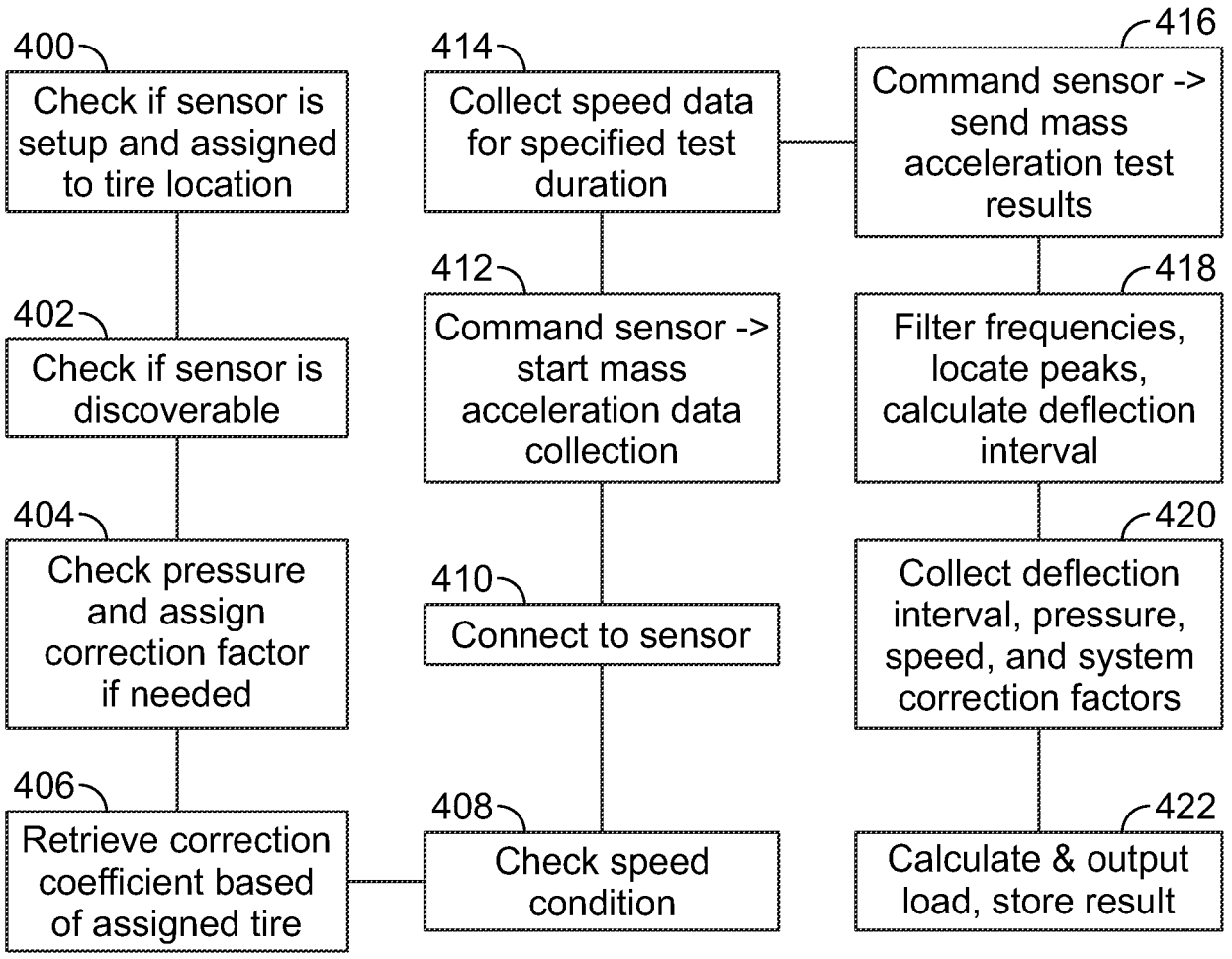

FIG. 20

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 582

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/084,483	10/29/2020	Keith George Ferry	67838.01000

CONFIRMATION NO. 7585

FORMALITIES LETTER

125632
Snell & Wilmer (LA)
400 East Van Buren Street
One Arizona Center
Phoenix, AZ 85004

OC000000121196241

Date Mailed: 11/09/2020

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Filing Date Granted

An application number and filing date have been accorded to this application. The application is informal since it does not comply with the regulations for the reason(s) indicated below. Applicant is given **TWO MONTHS** from the date of this Notice within which to correct the informalities indicated below. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121(d) are required. The drawings submitted are not acceptable because:
  - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 16-20.

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

Revvo's Exhibit 1002
Revvo v. Cerebrum
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Replies must be received in the USPTO within the set time period or must include a proper Certificate of Mailing or Transmission under 37 CFR 1.8 with a mailing or transmission date within the set time period. For more information and a suggested format, see Form PTO/SB/92 and MPEP 512.

Replies should be mailed to:

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

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

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

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

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

/ttran/

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 584

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 17/084,483

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	80		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	350		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	400		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	57 minus 20 =	* 37	x 50 =	1850	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*	x 240 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	2680		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
17/084,483	10/29/2020	2685	2680	67838.01000	57	3

CONFIRMATION NO. 7585

FILING RECEIPT

125632
Snell & Wilmer (LA)
400 East Van Buren Street
One Arizona Center
Phoenix, AZ 85004

OC000000121196240

Date Mailed: 11/09/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Keith George Ferry, Burbank, CA;

Applicant(s)

Keith George Ferry, Burbank, CA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 16/671,105 10/31/2019

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

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 11/06/2020

Revvo's Exhibit 1002
Revvo v. Cerebrum
IPR2025-00632 - Page 586

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/084,483**

Projected Publication Date: To Be Determined - pending completion of Corrected Papers

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

Preliminary Class

340

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

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

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

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

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

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

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

Revvo's Exhibit 1002
Revvo v. Cerebrum
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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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1	Application Data Sheet	WebADS.pdf	116545 ffeb497db5d20f6e4f62d6d15f13e861e4a822f8	no	7
Warnings:					
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2		102920_CIP_APP_as_filed_67838_01000.pdf	227695 3fc8e1d5165fc92a5f6dbeddbed95d583322c76d	yes	53

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	Document Description	**Start**	**End**
	Abstract	53	53
	Claims	44	52
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Warnings:					
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3	Drawings-only black and white line drawings	102920_FIGS_as_filed_67838_01000.pdf	1663270 3a4b467927f32b383e694c8611f9b119f0392d1d	no	10
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SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

ABSTRACT

Sensor assemblies and systems comprise a housing configured with an electrical sensor device retained therein to protect the sensor device. The housing may include display indicia relating to some aspect of the sensor assembly. The electrical sensor device include electrical components useful for the purpose of monitoring and transmitting desired data relating to operating parameters/conditions of the dynamic article that the sensor assembly is attached with. The data is transmitted wirelessly from the electrical sensor device. The housing is removably attached with a retaining member that is also attached with the dynamic article or an element connected thereto. A receiver external from the dynamic article receives the data to determine such operating parameter/or conditions, when the dynamic article is a vehicle tire, as outside diameter, tread depth, pressure, radial load, vehicle camber and/or toe alignment variations, and tire/vehicle location, which may be stored.

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What is claimed:

1. A sensor assembly configured for attachment with an object that is rotated in use, the sensor assembly comprising:

a housing comprising an outer surface and an internal cavity that is enclosed within the housing;

an electrical sensor device that is disposed within the internal cavity attached therein to prevent movement of the device within the internal cavity, wherein the electrical sensor device is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with an object and the object is rotated in use; and

a retaining member that is configured to accommodate attachment of the housing therewith, wherein the retaining member has an outside surface configured for attachment to rotate with the object when the object is rotated in use.

2. The sensor assembly as recited in claim 1, wherein the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member.

3. The sensor assembly as recited in claim 1, wherein the housing comprises a top cover, a wall structure, and a base section that define the internal cavity, and wherein the top cover, wall structure and base section may be formed from the same or different materials, and wherein one or more of the top cover, wall section, and base section may separate or integral with one another.

4. The sensor assembly as recited in claim 1, wherein one of the top cover or base section is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity.

5. The sensor assembly as recited in claim 1, wherein the electrical sensor device is attached within the internal cavity by one or more surface features within the cavity that contact the electrical sensor device to retain its position therein, and wherein there is open space above and below the electrical sensor device within the internal cavity.

6. The sensor assembly as recited in claim 1, wherein the electrical sensor device is encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical sensor device within the housing.

7. The sensor assembly as recited in claim 1, wherein the housing and retaining member are configured having a complementary shape to facilitate attachment of the housing with the retaining member.

8. The sensor assembly as recited in claim 7, wherein the housing comprises a wall structure that surrounds the internal cavity, and wherein the retaining member comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith.

9. The sensor assembly as recited in claim 1, wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces from the object to the housing when the retaining member is attached to the object and the housing is attached to the retaining member.

10. The sensor assembly as recited in claim 1, wherein the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device.

11. A sensing system comprising the sensor assembly as recited in claim 1, wherein the sensing system comprises a receiver that is external from the object and that is configured to receive data from the electrical sensor device by wireless communication.

12. The sensing system as recited in claim 11, wherein the electrical sensor device comprises an accelerometer sensor connected therewith and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

13. The sensing system as recited in claim 12, wherein the object is a vehicle tire, and wherein one or more parameter selected from the group consisting of tire diameter, tire tread depth, tire radial load, vehicle camber and/or toe alignment is determined from the accelerometer sensor data measuring in a radial direction of the vehicle tire.

14. The sensing system as recited in claim 13, wherein one or more of the tire diameter, tire tread depth, and tire radial load is determined from data including a specific rotational speed of the tire at a given vehicle velocity.

15. The sensing system as recited in claim 12, wherein the object is a vehicle tire and a radial load experienced by the tire is determined from data comprising an interval of radial deformation and using a correction coefficient.

16. The sensing system as recited in claim 11, wherein the electrical sensor device comprises a global positioning device.

17. The sensing system as recited in claim 16, wherein the object is a vehicle tire and a location of the vehicle tire is determined from information provided by the global positioning device.

18. The sensing system as recited in claim 11, wherein the electrical sensor device comprises a gyroscope.

19. The sensing system as recited in claim 18, wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more parameter selected from the group consisting of tire alignment, tire orientation, tire radial load, and tire tread depth.

20. The sensor assembly as recited in claim 1, wherein the electrical sensor device comprises:

a printed circuit board comprising electrical circuitry;

a portable power source for providing power to the electrical sensor device;

at least one sensor element; and

and

an antenna for receiving and/or transmitting information from the electrical sensor device.

21. The sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of a storage element and a processor.

22. The sensor assembly as recited in claim 20, wherein the electrical sensor device comprises one or both of an accelerometer sensor and a global positioning device.

23. The sensor assembly as recited in claim 20, wherein the sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, and orientation or location of the environment, the sensor assembly, or the object.

24. The sensor assembly as recited in claim 20, wherein the object is a vulcanized rubber vehicle tire, and wherein the retaining member is attached to an inside surface of the vehicle tire or an element attached with the tire that rotates with the tire.

25. The sensor assembly as recited in claim 24, wherein the retaining member is attached to a wheel that the tire is mounted on.

26. The sensor assembly as recited in claim 24, wherein the retaining member is attached to a valve stem of a wheel that the tire is mounted on.

27. The sensor assembly as recited in claim 24, wherein the retaining member is attached to the inside surface of the vehicle tire by an adhesive layer after the vehicle tire has been vulcanized.

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28. A sensor assembly and sensing system for use with an object that rotates in use comprising:

a housing comprising an outer structure that defines an open internal cavity therein,

an electrical sensor device disposed within the internal cavity and having a fixed placement therein through the use of one or more surface features of the internal cavity in contact with the electrical sensor device, wherein the electrical sensor device is configured to monitor and transmit and/or receive information regarding surrounding conditions, orientation and/or location, wherein the electrical sensor device comprises:

a portable power source;

a sensor; and

an antenna for transmitting and/or receiving information relating to the operating parameter being monitored by the sensor;

a retaining member having an outside surface configured for attaching with a surface of the object or an element connected with the object to rotate with the object in use, wherein the retaining member is configured to accommodate placement a portion of the housing therein to provide an attachment between the housing and the retaining member; and

a receiver external from the vehicle tire that is configured to receive information from the electrical sensor device wirelessly.

29. The sensor assembly and sensing system as recited in claim 28, comprising an external transmitter for sending information wirelessly to the electronic sensor device.

30. The sensor assembly and sensing system as recited in claim 28, wherein the housing includes a wall structure having a top cover at a first axial end of the wall structure and a base section at an opposed second axial of the wall structure, wherein the retaining member has a wall structure and an open chamber defined therein that is configured to complement the housing wall structure to accept placement of the housing within the retaining member and attachment therewith.

31. The sensor assembly and sensing system as recited in claim 28, wherein one of the top cover or the bottom section are made separately from the wall section and are attached to the wall section after the electrical sensor device has been installed within the housing internal cavity.

32. The sensor assembly and sensing system as recited in claim 28, wherein open space exists above and below the electrical sensor device when disposed within the internal cavity.

33. The sensor assembly and sensing system as recited in claim 28, wherein the retaining member is formed from an elastomeric material that mitigates transmission of shock forces received from the object when attached to the object before reaching the housing attached with the retaining member.

34. The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises an accelerometer sensor and is configured to send data from the accelerometer sensor wirelessly to the external receiver.

35. The sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire and the system is configured to determine one or more parameters consisting of a tire diameter, a tire tread depth, a tire radial load, and vehicle camber and/or toe alignment from the accelerometer sensor data.

36. The sensor assembly and sensing system as recited in claim 34, wherein the object is a vehicle tire and the system is configured to determine one or more of a tire diameter, a tire tread depth, and a tire radial load from data including a specific rotational speed of the tire at a given vehicle velocity.

37. The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises a global positioning device.

38. The sensor assembly and sensing system as recited in claim 37, wherein the object is a vehicle tire and the system is configured to determine a location of the vehicle tire from information provided by the global positioning device.

39. The sensor assembly and sensing system as recited in claim 28, wherein the electrical sensor device comprises a gyroscope.

40. The sensing system as recited in claim 39, wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

41. A method for using a sensor assembly and sensing system with an object that rotates in use comprising the steps of:

installing an electrical sensor device within an internal cavity of a housing, wherein the housing includes an outer structure that defines the internal cavity, and wherein the electrical sensor device comprises a sensor, a portable power source, an antenna, a printed circuit board, and related electrical circuitry;

attaching the housing after the step of installing to a retaining member, wherein the retaining member is configured to accommodate attachment with the housing by mechanical or bonding technique, wherein the retaining member is connected with the object before or after formation of the object; and

monitoring an operating parameter of the object through the use of the electrical sensing device, wherein information related to the operating parameter is wirelessly transmitted from the electrical sensing device to a receiver that is external from the sensor assembly.

42. The method as recited in claim 41, wherein during the step of installing, the housing includes a wall structure having an opening through which the electrical sensor device is installed and, after the step of installing, the opening is closed by attaching a top cover or bottom section to the opening.

43. The method as recited in claim 41, wherein during the step of installing, the electrical sensor device is attached in place within the internal cavity by contact between the electrical sensor device and one or more surface features in the internal cavity.

44. The method as recited in claim 41, wherein the object is a made from vulcanized rubber, and before the step of attaching, the retaining member is attached with the object or an element that rotates with the object after the object has been formed.

45. The method as recited in claim 44, wherein the retaining member is attached to a surface of the object by use of an adhesive layer.

46. The method as recited in claim 45, wherein the retaining member is attached to the object after the step of attaching the housing to the retaining member.

47. The method as recited in claim 45, wherein the retaining member is attached to the object by applying hand pressure onto the retaining member once placed into contact with the surface of the object to cause the adhesive layer to form an attachment therebetween.

48. The method as recited in claim 44, wherein the object is a vehicle tire, and wherein the retaining member is attached to a surface that is inside of the vehicle tire.

49. The method as recited in claim 44, wherein the retaining member is mechanically attached to an element that is connected to and that rotates with the object.

50. The method as recited in claim 41, wherein during the step of attaching, the housing is positioned relative to the retaining member according to a display feature that is positioned on the housing.

51. The method as recited in claim 41, wherein during the step of monitoring, the sensor monitors operating parameters comprising one or more of operating conditions, orientation, and location and transmits by use of the antenna information related to the monitored operating parameter to the receiver, and wherein the electrical device is configured to receive information transmitted from an external device to change one or more feature of the electrical sensor device.

52. The method as recited in claim 41, wherein the sensor assembly electrical sensor device comprises an accelerometer sensor.

53. The method as recited in claim 52, wherein the object is a vehicle tire, and wherein during the step of monitoring, on or more of a tire outside diameter, a tire tread depth, a tire radial load, and a vehicle camber and/or toe alignment parameter is determined from information sent wirelessly from the sensor assembly.

54. The method as recited in claim 52, wherein the object is a vehicle tire, and wherein during the step of monitoring, one or more of a tire outside diameter, a tire tread depth, and a tire radial load is determined from information relating to a specific rotational speed of the tire at a given vehicle velocity.

55. The method as recited in claim 41, wherein the object is a vehicle tire and the electrical sensor device comprises a global positioning device, and wherein the step of monitoring a location of the tire is determined from information provided by the global positioning device.

56. The method as recited in claim 41, wherein the electrical sensor device comprises a gyroscope.

57. The sensing system as recited in claim 56 wherein the object is a vehicle tire and information from the gyroscope is used to determine one or more of tire alignment, tire orientation, tire radial load, and tire tread depth.

SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application is a continuation-in-part of U.S. Application No. 16/671,105 filed October 31, 2019, which application is hereby incorporated by reference in its entirety.

FIELD

[0002] Sensor assemblies and systems as disclosed herein are configured for use in measuring, monitoring and/or determining one or more features and/or operating conditions or parameters associated with a dynamic object and, more specifically, are configured for use in measuring, monitoring and/or determining a feature, operating parameter, condition, and/or performance aspect of a rotating element such as a vulcanized rubber object or article such as a vehicle tire.

BACKGROUND

[0003] It is known that the overall performance and safety of vehicles such as automobiles is highly correlated with tire condition. Since the mid-20th century, tires have moved from a 'basic necessity' often overlooked, to one of the most important components of a vehicle's safety and performance on the road.

[0004] Several institutions including the National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT), and Society of Automotive Engineers (SAE) have all linked over thousands of accidents, hundreds of deaths, and countless injuries directly with tire condition. These incidents have been determined to source from multiple causes including blowouts, tread separations, and pressure abnormalities. Despite vehicle and tire manufacturer and regulatory institution recommendations, most consumers rarely have the know-how or discipline to perform routine necessary tire maintenance. And, even still, many symptoms of a possible tire failure are undetectable through basic tire maintenance. The introduction of 'run flat' tires (which can operate properly for a period of time despite a low pressure condition) has further exacerbated the issue of failure detectability since many drivers

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are completely unaware of the tire condition. Thus, the importance of a tire monitoring system to initiate proper tire maintenance for safety became significant.

[0005] In addition to the importance of tire condition as it relates to safety, research also proves the economics of fuel economy and tire durability as associated with tire pressure, temperature, etc. Experts in the field have found that the underinflation of tires can reduce fuel economy by 1-3% per psi below the manufacturers' recommended tire inflation level. In addition, over the course of the tire service lifetime, underinflation of 10% can result in premature tire wear of over 15%. Between the cost associated with additional fuel and increased new tire purchase frequency (not to mention the cost associated with vehicle downtime and the cost of maintenance), it is well proven that basic tire awareness and maintenance techniques can save hundreds to thousands of dollars annually for the average consumer. With fleet vehicles that travel hundreds of thousands of miles annually, these savings are exponentially higher. However, despite the economic benefits associated with basic tire awareness and maintenance, the increased costs noted above hit nearly every consumer and businesses due to real-time data limitations and the effort necessary to efficiently monitor tire and maintain inflation pressure conformity with the manufacturer recommendations.

[0006] The 21st century has marked the start of a new era for the advancement of automotive vehicles with the integration of advanced technological systems known as vehicle telematics. This technology has proven useful for related industries such as insurance, which can monitor vehicle behavior (particularly surrounding an event such as a crash) for usage-based-insurance rate adjustments. Systems like rear camera detection, lane departure and blind spot notifications, and adaptive cruise control (to name a few) are driving improvements for safety, fuel efficiency and performance and leading towards the feasibility of autonomous vehicles. Whereas drivers have historically relied on subjective handling and steering feedback, an autonomous vehicle depends entirely on feedback through sensors to perform and react. Yet, while vehicle technology continues to advance and adapt quickly in support of autonomous vehicles, it is the tires that have shown the least progression. Without the real-time feedback of tire conditions such as tire pressure, temperature, slip, strain, load, object shape such as the outside, free, or rolling radius/diameter, tread wear, etc., autonomous vehicles will have never achieved optimum performance and safety.

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[0007] Recognizing these limitations and the importance of tire monitoring as it relates to the aforementioned factors, the automotive industry and regulatory entities have introduced waves of products and regulations associated with vehicle tires with the goal of improving vehicle safety and performance and supporting autonomous vehicle technology. One major advancement in tire technology has been the solution to continuously monitor tire inflation pressure and in some cases temperatures.

[0008] Currently there are two mainstream methods for automatically detecting tire inflation pressure; namely, an indirect method and a direct method. The indirect method is generally based on monitoring the number of tire rotations over a period of time utilizing an anti-lock braking system (ABS) of the vehicle and determining tire pressure variations. Though effective as a general indication of tire pressure variations, this method is not able to detect immediate and significant tire pressure loss conditions or provide specific data as it relates to each tire pressure condition. The direct detection method seeks to resolve these limitations utilizing microelectromechanical (MEMS) pressure sensors mounted in the wheel of each tire which communicates with the vehicle's primary on-board engine computer or control unit (ECU) and/or other receiver devices such as a mobile phone. This direct detection method has gained widespread popularity, and in 2007 the U.S. government mandated the use of direct tire-pressure monitoring system (TPMS) technology in nearly all motor vehicles. This mandate has since been adopted by several other countries and continents and thousands of tire monitoring products have since been developed.

[0009] Over the past decade or so, three main types of direct TPMS sensors have emerged from technology leaders in the automotive industry. The first type is a clamp-on-rim sensor which mounts directly to the well bed of the wheel utilizing a clamp. The second and most commonly chosen type for OE applications is the valve-stem-attached sensor which affixes within the tire and wheel assembly on the base of a valve stem. These two types typically require installation by an industry professional with technical training as well as access to TPMS tools for activating and programming the sensors to properly communicate with the vehicle ECU. The third type, which is common in aftermarket and used for do-it-yourself applications, is the valve-cap-attached sensor which replaces the valve stem cap and does not typically require special tooling. However, this third type generally communicates via BLE with a receiver such as a mobile phone or similar to display to the driver as opposed to the vehicle ECU. This valve-

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cap-attached sensor has proven useful for vehicles manufactured prior to the government TPMS mandate, which are not equipped with TPMS to ECU communication or displays.

[0010] Despite this progress in tire monitoring technology, nearly all TPMS sensors available today remain inadequate when it comes to complete tire condition monitoring. Tire (and vehicle) safety and performance is a consideration of multiple factors including but not limited to pressure, temperature, condition, load and alignment. As it stands today, the majority of vehicles equipped with TPMS technology only communicate single tire parameter; pressure. Further limiting, most vehicle manufacturers' TPMS displays used to alert drivers of a tire pressure concern do not indicate which tire is experiencing an issue and even fewer display what the issue is (whether pressure variation or simply a sensor communication issue) or how severe of a concern the alert is (slow leak, major pressure loss, etc.).

[0011] Considering further the extremely limited, advanced automotive manufacturer and aftermarket tire sensor displays which provide this level of detail, a second parameter of tire temperature is rarely available and in nearly all cases an irrelevant output. By the nature of TPMS design which is affixed to the wheel, valve stem or valve cap, the temperature which is monitored by these sensors is actually tire air temperature as opposed to the tire rubber temperature itself. This is misleading given the variation (in excess at times of 30 degrees Fahrenheit) that exists between tire rubber and tire air temperature, rendering this sensor output useless particularly for motorsports applications where real-time tire temperature monitoring is pivotal.

[0012] Given the evident shortcomings of traditional TPMS solutions, a limited few companies have developed electronic units which affix directly to the vehicle tires as opposed to the wheel, valve stem or valve cap. These solutions are placed within a flexible "housing" affixed to the inner tire surface typically opposite of the tire tread surface. Further still, it has been found that even these advanced TPMS solutions remain impractical or inadequate either by:

[0013] 1. Excessive sizing and weight causing tire performance and sensor durability issues;

2. Difficulty of affixing to all tire inner surfaces, often solely through the vulcanization of the "housing" to the tire during the green tire process;

[0014] 3. Limited application of the technology to specific tire manufacturers or tire models manufactured with the technology;

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[0015] 4. Limited functionality and reporting of total tire performance parameters such as temperature, treadwear, alignment, load, etc., ;

[0016] 5. Lack of diversity of communication protocols further limiting the availability to specific vehicles; and

[0017] 6. Requirement of significant investment for tooling to configure and output sensor information.

SUMMARY

[0018] Sensor assemblies and systems as disclosed herein are configured for use with a dynamic object for purposes of monitoring one or more operating conditions and/or parameters of the object. In an example, the dynamic object is in the form of a rotating element, and in a particular embodiment the rotating element is a vulcanized rubber article. In an example, the sensor assembly is configured for attachment with the vulcanized rubber article. The sensor assembly may comprise a housing having an outer surface and an internal cavity that is enclosed within the housing. In an example, the housing comprises a top cover, a wall structure, and a base section that define the internal cavity. The top cover, wall structure and base section may be formed from the same or different materials, and one or more of the top cover, wall section, and base section may separate or integral with one another.

[0019] An electrical sensor device may be disposed within the housing internal cavity and attached therein to prevent movement of the electrical sensor device within the cavity. In an example, the one of the top cover or base section is removably attached with the wall structure to facilitate installation and/or removal of the electrical sensor device from the internal cavity. In an example, the electrical sensor device is mechanically attached within the internal cavity by one or more surface features within the internal cavity that contact the electrical sensor device to retain its position therein, and wherein an open space exists above and below the electrical sensor device within the internal cavity. In an example, the electrical sensor device may be encapsulated by the inner cavity of the housing during a process of making the housing that operates to retain the position of the electrical sensor device within the housing. In an example, the housing includes an opening through the outside surface to the internal cavity, and further includes a filter that is positioned to filter air passing into the internal cavity before reaching the electrical sensor device.

[0020] The electrical sensor device is configured to sense, transmit and/or receive information regarding surrounding conditions, orientation and/or location when the sensor assembly is attached with a dynamic object such as a vulcanized rubber article. In an example, sensor element is configured to sense one or more variables selected from the group consisting of air pressure, temperature, acceleration, or orientation or location of the environment, sensor assembly, of the vulcanized rubber article. In an example, the electrical sensor device comprises a printed circuit board having electrical circuitry, a portable power source for providing power to the electrical sensor device, at least one sensor element, a storage element, and an antenna for receiving and/or transmitting information from the electrical sensor device.

[0021] In an example, the electrical sensor device is configured to communicate wirelessly with one or more receivers or transmitters that are external from the rubber article to thereby provide a sensing system as disclosed herein. In an example, sensing system receivers have one or more antennas and are capable of wirelessly communicating to and from the electrical sensor device, e.g., with the printed circuit board or component attached therewith of the electrical sensor device. In an example, the electrical sensor device may include more than one antenna that are capable of transmitting and/or receiving wireless communication via Bluetooth Low Energy (BLE), Low Frequency, and/or similar wireless communication technology. In an example, the sensing system external receiver may be in the form of a mobile phone, a vehicle ECU, or alternative electronic device capable of storing, interpreting, displaying and/or again transmitting data that is output from the electrical sensor device. In an example, the sensing system external receiver may be in the form of a signal repeater or booster which will again transmit the original signal or a variation of translated, filtered or similarly altered data of the electrical sensor device wirelessly or by wired connection to another external receiver as such would be useful when the range of the wireless signal from the electrical sensor device is exceed such as with multi-axle, commercial fleet vehicles. In an example, the sensing system external receiver may be configured to clone the protocol of a traditional TPMS sensor and assign it to the electronic sensor device for communication with a separate external receiver such as a vehicle ECU. In an example, the sensing system external receiver may comprise multiple, unique protocols which can be selected and assigned via LF communications to the electrical sensor device and then transmitted via RF communication with a separate external receiver such as a vehicle ECU. In an example, the sensing system external receiver contains multiple, unique

protocols which can be selected and assigned via BLE or similar wireless communications to the electrical sensor device for wireless communication with a separate external receiver such as a vehicle ECU which requires a specific protocol.

[0022] In an example, the sensing system comprising the sensing assembly and external devices is capable of calculating a rotating element shape such as the outside, free, or rolling radius/diameter or a tire tread depth condition, e.g., when the rubber article is a vehicle tire. In such example, the external receiver or cloud-based system collects raw data from an accelerometer sensor that is connected with the electrical sensor device and utilizes one or more filtering algorithms and fast furrier transformation (FFT) algorithms from which the external receiver or cloud-based system can determine the specific rotational speed of the vehicle tire at a given velocity from which the rotating element shape such as the outside, free, or rolling radius/diameter or vehicle tire tread depth can be calculated using known industry or manufacturer's outside diameter specifications or tire tread depth specifications, which specifications may be stored and available to a processor for purposes of calculating the rotating element shape such as the outside, free, or rolling radius/diameter or tire tread depth. In an alternative example, the sensing system external receiver collects raw data from a gyroscope that is connected with the electrical sensor device and that is used to calculate the object's geometry from which the rotating element shape such as the outside, free, or rolling radius/diameter or vehicle tire tread depth can be calculated. Additionally the gyroscope may provide information used to determine the alignment of the rotating element or tire, e.g., camber and/or toe parameters. In an example, the sensing system external receiver collects raw data from an accelerometer sensor that is connected with the electrical sensor device and which is used to calculate vehicle camber and/or toe alignment variations, wherein an external processor may be used to provide such calculations. In an example, the sensing system may be configured with the sensor assembly electrical sensor device comprising a global positioning sensor or system that may be used to transmit the location of the rotating element or rubber article, e.g., vehicle tire, within which the sensor assembly is attached to an external receiver or cloud-based system. In an example, the sensor assembly and sensing system as disclosed herein may include storage and processing devices for the purpose of determining the above-described parameters and/or storing desired operating parameters, wherein such storage and/or processing devices may be disposed with the electrical sensor device and/or the external receiver or other external device or cloud-

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based system, and wherein such operating parameters may be used for research and/or commercial purposes.

[0023] The sensor assembly may comprise a retaining member configured to accommodate attachment of the housing therewith, wherein the retaining member has an outside surface configured for attachment with the vulcanized rubber article. In an example, the housing and retaining member may be attached together by mechanical or bonding attachment mechanism. In an example, the housing and electrical sensor device disposed therein may be removed from the retaining member without the use of tools. In an example, the housing and retaining member are configured having a complementary shape to facilitate attachment of the housing with the retaining member. In an example, the housing comprises a wall structure that surrounds the internal cavity, and wherein the retaining member comprises a wall structure having an open chamber that is configured to accommodate the housing wall structure therein to provide attachment therewith. In an example, the housing outer surface includes one or more display features or indicia that are viewable to a user when the housing is attached with the retaining member.

[0024] In an example, the retaining member is formed from an elastomeric material that mitigates transmission of shock forces from the vulcanized rubber article to the housing when the retaining member is attached to the vulcanized rubber article and the housing is attached to the retaining member. In an example, the vulcanized rubber article is a vehicle tire, and the retaining member is attached to an inside surface of the vehicle tire. In such an example, the retaining member is attached to an inside surface of the vehicle tire, and such attachment may be provided by the use of an adhesive layer that is interposed between the retaining element and the vehicle tire inside surface. In an alternative example, the retaining member may be vulcanized to the rubber article during a curing manufacturing process of the rubber article. In an example, the housing, electrical sensor device disposed therein, and the retaining member may be removable from the vulcanized rubber article. In an alternative example, the retaining member is attached to an inside surface of a vehicle wheel, and such attachment may be provided by use of an adhesive layer that is interposed between the retaining element and the vehicle wheel inside surface. In an alternative example, the retaining member is attached to a vehicle wheel via the valve-stem location, and such attachment is provided by mechanically fixturing the retaining element to the valve-stem, e.g., at a location within the wheel or outside of the wheel.

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[0025] An example method for using pressure assemblies and sensing systems as disclosed herein comprises installing the electrical sensor device within the housing internal cavity such that the electrical sensor device placement is mechanically fixed therein and the electrical sensor device is surrounded by the housing, and attaching the housing to the retaining member. In an example, the retaining member may be adhesively attached to an already vulcanized rubber article, which adhesive attachment may be done by hand pressure. In an example, a target surface of the vulcanized rubber article may be cleaned or otherwise prepared for attachment with the retaining member. Alternatively, the retaining member may be vulcanized with the rubber article during a curing process. In an example, the retaining member may be attached with the rubber article before the housing is attached to the retaining member. Alternatively, the retaining member may be attached with the rubber article with the housing already attached with the retaining member. Alternatively, the retaining member may be attached to the vehicle wheel with an adhesive or magnet. Alternatively, the retaining member may be attached to the vehicle wheel valve-stem mechanically such as through a screw and bolt technique or the like. In an example, the housing is oriented with respect to the retaining member according to the display feature on the housing. Once the retaining member and housing are both attached with the desired article, the sensor assembly is used to monitor an operating condition or parameter through the use of the electrical sensing device, wherein information related to the operating condition or parameter is wirelessly transmitted from the electrical sensing device to a receiver that is part of the sensing system and that is external from the sensor assembly.

[0026] As noted above, sensor assemblies as disclosed herein may be configured to accommodate attachment with inside surface of the dynamic rotating element such as the vehicle tire itself, or the sensor assembly may be configured to accommodate attachment with another dynamic article or element connected with or mounted to the dynamic rotating element, such as a vehicle wheel or valve stem.

[0027] Configured in the manner described above, sensor assemblies and sensing systems enable and facilitate monitoring a number of operating parameters and/or conditions of the dynamic rotating element attached with the sensor assembly, e.g., a vehicle tire, not otherwise possible given the conventional state of such technology, and does so in a manner that enables such monitoring wirelessly through the use of commonly-used external devices such as

vehicle ECUs, mobile phones, tablets, cloud-based devices and the like.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0028] Vehicle tire monitoring sensor assemblies and systems as disclosed herein will now be described by way of example with reference to the accompanying figures, wherein like reference numerals refer to like elements, and of which:

[0029] FIG. 1 is a perspective view of a sensor assembly, in accordance with various embodiments;

[0030] FIG. 2 is a perspective view of a sensor assembly, in accordance with various embodiments;

[0031] FIG. 3 is a perspective sectional view of a sensor assembly and electrical sensor device, in accordance with various embodiments;

[0032] FIG. 4 is a perspective sectional view of a sensor assembly retainer, in accordance with various embodiments;

[0033] FIG. 5 is a perspective exploded view of a sensor assembly in an unassembled state, in accordance with various embodiments;

[0034] FIG. 6 is a perspective exploded view of a sensor assembly in an unassembled state, in accordance with various embodiments;

[0035] FIG. 7 is a perspective view of a sensor assembly housing and retainer in an unassembled state, in accordance with various embodiments;

[0036] FIG. 8 is a cross sectional side view of a sensor assembly housing, in accordance with various embodiments;

[0037] FIG. 9 is a cross sectional side view of a sensor assembly housing, in accordance with various embodiments;

[0038] FIG. 10 is a cross sectional side view of a sensor assembly housing, in accordance with various embodiments;

[0039] FIG. 11 is a block diagram view of data flow and electrical components of a sensor assembly and system, in accordance with various embodiments;

[0040] FIG. 12 is a perspective view of a sensor assembly attached with a vehicle tire and articles useful for attaching the same, in accordance with various embodiments;

[0041] FIG. 13 is a perspective view of an attachment method for a sensor assembly including an adhesive layer, in accordance with various embodiments;

[0042] FIG. 14 is a perspective view of an attachment method for a sensor assembly involving hand pressure, in accordance with various embodiments;

[0043] FIG. 15 is a perspective view of a sensor assembly attached with a vehicle tire, in accordance with various embodiments

[0044] FIG. 16 is a perspective sectional view of an example sensor assembly as disclosed herein as attached with a wheel of a wheel and tire assembly;

[0045] FIG. 17 is a perspective sectional view of an example sensor assembly as disclosed herein as attached with a valve stem of a wheel and tire assembly;

[0046] FIG. 18 is a perspective sectional view of an example sensor assembly as disclosed herein as attached with angular valve stem of a wheel and tire assembly;

[0047] FIG. 19 is a flowchart of example process steps used for determining a tread depth of a dynamic rotating object using sensor assemblies and systems as disclosed herein; and

[0048] FIG. 20 is a flowchart of example process steps used for determining a dynamic load on a dynamic rotating object using sensor assemblies and systems as disclosed herein.

DESCRIPTION

[0049] Embodiments of sensor assemblies and systems for monitoring dynamic objects will be described hereinafter in detail with reference to the attached drawings, wherein like reference numerals refer to the like elements. Sensor assemblies and systems as disclosed herein may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, these embodiments are provided so that the disclosure will be thorough and complete, and will fully convey the concept of sensor assemblies and systems as disclosed herein to those skilled in the art. Further the type of dynamic object used with sensor assemblies and systems as disclosed herein can and will vary depending on the particular use application. For example, the dynamic object, element, or article can be one that generally moves, rotates, stretches, etc. Thus, while sensors assemblies and systems as disclosed herein will be described and illustrated as being used with a dynamic rotating element in the form of a vulcanized rubber article, e.g., a vehicle tire, it is understood that such sensor assemblies and systems are intended to be used with other types of dynamic objects, e.g., those that may be used in other types of applications in other industries including an not limited to sports & fitness, industrial, electrical and the like for purposes of monitoring certain operating parameters/conditions of the same. Examples of other types of dynamic rotating elements that may be monitored by sensor assemblies and systems as disclosed herein include metallic wheels, non-pneumatic or solid rubber tires, cushion tires, and the like.

[0050] In an example, sensor assemblies and systems as disclosed herein embodied for use with a vehicle tire seek to fulfill the shortcomings of both traditional TPMS systems as well as the few existing vehicle tire-mounted monitoring products, thus advancing industry vehicle safety and performance with a total tire monitoring system.

[0051] Generally, sensor assemblies as disclosed herein are configured to both accommodate attachment of a desired electrical sensor device within a housing internal cavity, and facilitate attachment of the sensor assembly with a surface of a dynamic object, whether it be the surface of the actual dynamic object being monitored or the surface of an element that is attached with the dynamic object. In an example, the dynamic object may be a vulcanized rubber article such as a vehicle tire in accordance with a specific application method developed to ensure durability and functionality throughout the lifecycle of use for the vulcanized rubber article. The combination of the specific sensor assembly configuration and method for affixing

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the sensor assembly to the vulcanized rubber article, enables use of systems as disclosed herein to obtain information from the sensor assembly to measure, monitor, determine and/or report data relating to such features or parameters as the object's shape such as the outside, free, or rolling radius/diameter and/or tread depth, operating conditions, orientation, and/or location of the vulcanized rubber article, specifically a vehicle tire.

[0052] FIG. 1 illustrates an example embodiment sensor assembly 10 as disclosed herein comprises a housing 12 that includes an internal cavity (shown in FIG. 3) that contains an electrical sensor device (shown in FIG. 3) therein. In an example, the housing 12 is disposed within a retaining member or retainer 14 that is specifically configured to accommodate attachment with the housing 12 (e.g., placement of the housing 12 therein). In an example, the retainer 14 comprises a wall structure 16 (shown in FIG. 4) that is configured to surround and capture a wall structure of the housing therein. In an example, the retainer 14 may include a lip 18 that extends radially inwardly a distance from a first axial end 20 of the wall structure 16, wherein the lip 18 contacts an adjacent section of a top cover 22 of the housing to assist (by imposing a downward pressure on the housing top cover) retaining the housing 12 in a fully seated or disposed position within the retainer 14. The retainer 14 includes a base section 24 that extends radially outwardly a distance from a second axial end 26 of the wall structure 16 to thereby provide an increased surface area along a bottom surface 28 of the retainer 14 for attachment with a target surface of a vulcanized article 30 such as a vehicle tire.

[0053] In an example, the sensor assembly housing top cover 22 may include one or more display features 32 or indicia that may be disposed thereon or be integral therewith, which display features 32 may include indicia such as a model number, serial number, directional information, or any other type of indicia that may serve a purpose to provide information about the sensor assembly 10 to a user upon viewing such indicia. In an example, the display features or indicia 32 may be utilized for identification of the sensor assembly 10 such as brand, model or contents of the assembly; namely the technical specifications or Federal Communication Commission ID (FCC ID) of the electrical sensor device contained therein. The display features or indicia 32 may be printed or otherwise adhered to the housing top cover 22 or may be molded into the top cover 22. While FIG. 1 illustrates the use of display features 32 in the form of alpha-numeric characters, it is to be understood that the display features 32 may be provide in the form of different shapes, objects, signs, figures and the like.

[0054] FIG. 2 illustrates an example sensor assembly 10 as disclosed herein, wherein the housing top cover 22 includes a display feature or indicia 32 in the form of an arrow that may provide orientation information to a user for the purpose of properly positioning the sensor assembly (such as "this end up" or an intended alignment direction of the sensor assembly 10) relative to a rotational direction of the vehicle tire to which the sensor assembly is to be attached.

[0055] The display features 32 or indicia may be constructed by way of applying the indicia to the housing top cover 22 by printing, stamping, or the indicia may be formed in the top cover itself by during the molding process of making the housing 12 or by subsequent technique of pressing, branding, or the like. While display features 32 as disclosed herein have been described and illustrated as being on a top cover 22 of the housing 12, it is to be understood that the display feature 32 may be positioned at different locations on the housing 12 that is viewable by a user and that all such other placement positions are intended to be within the scope of pressure assemblies disposed herein. Alternatively, the display feature 32 may be positioned on the retainer 14, or display features 32 may be positioned on both the retainer 14 and the housing 12.

[0056] FIG. 3 illustrates a cut-away view of an example sensor assembly housing 12 for the purpose of illustrating a wall structure 34 connected with and extending from the top cover 22, wherein the wall structure 34 defines an outer side surface 36 of the housing 12. The housing 12 includes an internal cavity 38 that is disposed within the top cover 22 and wall structure 34 and that is specially configured to accommodate placement of one or more electrical sensor device 40 therein. In an example, the wall structure 34 includes an inside wall surface 42 comprising a surface feature 44 that is specially configured to accommodate and retain placement of the electrical sensor device 40 therein. In an example, the surface feature 44 is provide in the form of a slot or recessed groove that extends laterally along the wall structure inside surface 42 and that is configured to accommodate placement of a peripheral edge 46 of a component of the electrical sensor device 40, e.g., a printed circuit board or the like, therein to thereby ensure secure fitment of the electrical sensor device 40 within the housing internal cavity 38.

[0057] While the surface feature 44 in this example is provided in the form of a recessed groove that extends completely around the wall structure inside surface 42, it is to be understood that the surface feature 44 may be configured differently for the purpose of securing fitment or

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attachment of the electrical sensor device 40 within the housing internal cavity 38 so the electrical sensor device 40 does not move therein. For example, rather than a recessed groove, the surface feature can be provided in the form ribs or tabs or the like that extend radially outwardly a distance from the wall structure inside surface 42 and that are positioned and configured to engage the electrical sensor device 40 peripheral edge 46 to secure placement of the electrical sensor device 40 within the housing internal cavity 38.

[0058] Further illustrated in FIG. 3 is a housing bottom section 48 shown in an unattached form that is configured for attachment with a bottom portion 50 of the housing wall structure 34 to thereby close off the housing internal cavity 38. In an example, the bottom section 48 may be formed separately from the housing top cover 22 and the wall structure 34, and may be attached to the wall structure 34 by mechanical attachment and/or by chemical or adhesive bonding or the like. Thus, a feature of the housing 12 as disclosed herein is that it is specially configured to include an internal cavity configured to retain the electrical sensor device in an immovable fixed state therein, and to provide a protective surrounding to the electrical sensor device.

[0059] FIG. 4 illustrates a cut-away view of an example retainer 14 for purposes of better illustrating the configuration of the retainer wall structure 16 and an open chamber 52 that is formed within the wall structure 16 and that is configured to complement the housing wall structure 34 for accommodating placement/attachment of the housing 12 therein. Also illustrated is the lip 18 that extends radially inwardly from the wall structure first axial end 20 that is configured to fit over a portion of the housing top cover 22 when the housing 12 is disposed within the open chamber 52 to help retain placement of the housing 12 within the retainer 16. Further illustrated is the base section 24 that extends radially outwardly a distance from the retainer wall structure second axial end 26 that gives an enhanced surface area along the bottom surface 28 to provide a strong adhesive attachment with a target surface of the vulcanized rubber article, e.g., vehicle tire.

[0060] While the above described figures illustrate a housing 12 having a top cover 22 configured with a domed shape defined by a flat or planer top surface a number of flat surfaces extending in an angular manner downwardly and outwardly therefrom, it is to be understood that the top cover 22 may be configured differently as called for by the particular end-use application and/or as called for by the configuration of the internal cavity 38 useful for accommodating the

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electrical sensor device 40 therein, and all such different configurations are intended to be within the scope of sensor assemblies as disclosed herein. The same is true for the configuration of the housing wall structure 34 and the complementary configuration of the retainer wall structure 16 for accommodating placement of the housing 12 therein. While housing and retainer wall structures having an octagonal configuration have been illustrated, it is to be understood that the housing and retainer wall structures may be configured differently as called for by a desire to ensure secure and nonrotatable placement of the housing 12 relative to the retainer 14, the particular end-use application, and/or as called for by the configuration of the internal cavity useful for accommodating the electrical sensor device therein, and all such different configurations are intended to be within the scope of sensor assemblies as disclosed herein.

[0061] FIG. 5 illustrates an example sensor assembly 60 in an unassembled state showing a portion of the housing 12 including the top cover 22 and the wall structure 34 in an assembled state and comprising the internal cavity 38 disposed therein. In an example, the internal cavity 38 includes one or more surface features 44 positioned along the wall structure inside wall surface 42 that operates to fix an axial placement position of the electrical sensor device 40 therein. In an example, the surface feature may be in the form of a continuous element or the form of a number of individual elements such as ribs or tabs that project outwardly from the inside wall surface 42 and that contact an upper surface of a peripheral edge of the electrical sensor device 40. In this example, the surface feature 44 is an edge formed between the intersecting inside surfaces of the housing wall structure and top cover.

[0062] A housing bottom section 48 is positioned below the housing wall structure 34 and is configured having an internal surface 62 configured to accommodate placement of a battery 64 therein. The above-described sensor assembly components are assembled by loading the electrical sensor device 40 into the housing internal cavity 38 such that axial movement of the electrical sensor device 40 is limited by the inside wall surface feature 44, and the battery 64 is disposed onto a backside surface of the electrical sensor device 40 that includes contacts thereon to provide an electrical connection with the battery. Then the housing bottom section 48 is attached to the housing wall structure 34 such that the housing 12 protectively surrounds the electrical sensor device therein. In an example, the bottom section 48 may be mechanically attached to the housing wall structure 34, e.g., by complementary surface features that operate to form a mechanical attachment (such as a threaded attachment, and tongue in grove attachment, a

snap attachment, and the like) and/or by chemical or adhesive bonding or the like. Once the housing 12 is assembled, it may be disposed within the open chamber or cavity 52 and attached to the retainer 16 in the manner described above.

[0063] FIG. 6 illustrates an example sensor assembly 80 comprising a housing 12 that is configured somewhat differently from that described above and illustrated in FIG. 5. Specifically, the housing 12 comprises a wall structure 34 and bottom section 48 that is provided in an assembled state, wherein the wall structure 34 and bottom section 48 may be mechanically attached, bonded together, and/or provided in the form of a one-piece molded construction. In an example, the housing wall structure 34 and bottom section 48 are provide in the form of a one-piece molded construction. The housing 12 includes an inside cavity 38 that is configured having one or more surface features (not shown) disposed therein that engage an underside of the electrical sensor device 40 peripheral edge 46 to fix axial displacement of electrical sensor device 40 within the inside cavity 38. In an example, the surface features may be in the form of one or more ribs or tabs that project outwardly a distance from the wall structure inside surface 42. The housing 12 includes a top cover 22 that is configured to attach over an opening 82 of the housing inside cavity 38, which attachment may be mechanical and/or bonded. In an example, the sensor assembly 80 is assembled by inserting the electrical sensor device 40 into the housing inside cavity 38 until the surface features engage the electrical sensor device 40 to fixedly limit its axial displacement therein. The housing top cover 22 is then positioned over the inside cavity opening 82 and is attached to the housing wall structure 34. In an example, the housing top cover 22 may include one or more surface features disposed therein that contact the electrical sensor device 40 for the purpose of fixing its position within the housing internal cavity 38 so it does not move therein once the top cover 22 is attached over the internal cavity opening 82. FIG. 7 shows the housing 12 in an assembled state with the electrical sensor device disposed thereon. Once the housing 12 is assembled, it may be disposed within and attached to the retainer 14 in the manner described above.

[0064] Sensor assembly housings 12 as disclosed herein are constructed to provide the inside or internal cavity 38 configured in a manner to fixedly retain and house the electrical sensor device 40 therein without the need for filling agents or materials. In an example, the housing 12 and internal cavity 38 may be constructed via multiple techniques by way of a single material element or multiple material elements. In the case of a single material element

construction, the sensor assembly housing 12 may be formed as a one-piece construction around the electrical sensor device 40 by injection molding process or the like. In such example, the housing top cover 22, wall structure 34, and bottom section 48 are provided in the form of the single element formed from the same material as described above. In the case of a multiple-element construction, the sensor assembly housing 12 may be formed from separate elements, wherein the elements may be mechanically attached with one another or bonded with one another after the electrical sensor device 40 has been disposed within the internal cavity 38.

[0065] FIG. 8 illustrates an example sensor assembly housing 90 formed from a single material element, e.g., wherein the top cover 22, wall structure 34, and bottom section 48 are all formed from a single material surrounding or encapsulating the electrical sensor device 40, e.g., during an injection molding process or the like. In this example, the housing internal cavity 38 is formed during the process of making the housing 90 by displacement by the electrical sensor device 40, and such encapsulation operates to fixedly retain placement of the electrical sensor device 40 therein. Like the housing examples described above, the housing 90 is configured to fit within a retainer 16 for purposes of attaching the housing 90 to the vehicle tire. Alternatively, a housing comprising a single material element construction can be first formed and then modified to include an internal cavity within which the electrical sensor device may be placed.

[0066] A housing may also be formed by using two material elements, wherein a first material element is accompanied by a second material element disposed beneath the first material element, and wherein a cavity is formed therebetween to contain the electrical sensor device. In such embodiment, the first and second material elements may be affixed to one another to surround the electrical sensor device therein simultaneously during the formation of the first and second material elements. In such embodiment, the first and second material elements may be formed from the same or different types of materials.

[0067] FIG. 9 illustrates another example sensor assembly housing 92 as disclosed herein. In this example, a first material element 94 and a second material element 96 have already been formed in a specific shape so as to create the internal cavity 38 when the two layers are affixed together either mechanically or chemically after the electrical sensor device 40 has been disposed therein. In such embodiment, the first and second material elements may be formed from the same or different types of materials. In this example, the first material element

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94 includes the top cover 22 and a portion of the wall structure 34, and the second material element 96 includes a remaining portion of the wall structure 34 and the bottom section 48.

[0068] Regardless of the construction, the material used to form the sensor assembly housing 12 as disclosed herein is one that is specifically and intentionally designed to protect the integrity and functionality of the electrical sensor device 40 that is disposed therein when installed within the retainer 14, attached to a tire, and placed into use given the demanding environment of a vehicle tire. Examples of materials useful for forming the housing 12 include, and are not limited to, those materials commonly used for TPMS housings such as rigid plastics as well as elastomeric materials commonly found in the tire and rubber industry like butyl rubber, EPDM rubber, natural rubber, or the like.

[0069] A feature of the material selected for forming the housing 12 is that such material operates to protect the electrical sensor device 40 disposed within the internal cavity 38 from contaminants such as oils and moisture, extreme temperatures, and forces such as acceleration, load, vibration, etc., that may be encountered during use within a dynamic object such as a vehicle tire. A further feature of the sensor assembly housings 12 as disclosed herein is the construction of the internal cavity 38 and the use of surface features 44 to mechanically fix and retain the placement position of the electrical sensor device 40 therein. A common technique used to assist in fixturing the electrical sensor device 40 known within the automotive industry is to fill the internal cavity with a coating material such as a neutral silicone or the like for purposes of retaining placement position. A feature of sensor assemblies as disclosed herein is that they do not use or require the use of any such coating or filling agents or materials for any fixturing of the electrical sensor device 40 within the internal cavity 38. Again, structural support of the electrical sensor device 40 within the internal cavity 38 to fix the position of the electrical sensor device 40 therein is provide by mechanical fixturing, e.g., through the use of surface features within the housing internal cavity 38. As noted above, such fixturing of the electrical sensor device 40 may be achieved by integrating the electrical sensor device 40 into the manufacturing process of the housing 12, e.g., such as by transfer or injection molding or the like as illustrated in in FIG. 9. In such example, the housing first material element 94 and second material element 96 comprise internal cavity profiles which are complimentary to the components of the electrical sensor device 40, which after assembly provides the necessary stabilization to the battery, sensors, or similar components.

[0070] Sensor assemblies as disclosed herein may include an electrical sensor device 40 comprising a sensor configured to rely on the pressure of the surrounding environment, which (when attached within a pneumatic vehicle tire) is the air pressure inside of the vehicle tire, e.g., for the purpose of providing an indication of vehicle tire pressure. In such sensor assembly embodiment, it is necessary that the housing 12 be configured to include one or more openings to provide air flow communication between such external environment and the electrical sensor device 40 disposed within the housing internal cavity 38. With reference to FIGS. 1 and 2, the sensor assembly 10 comprises the housing 12 that is configured to include an opening 98 positioned along the top cover 22. The opening 98 is configured and positioned to enable air outside of the housing to reach the internal cavity 38 and the electrical sensor device 40 disposed therein. It is well known that moisture and other contaminants exist within the assembly of a vehicle pneumatic tire and wheel with proper operating temperature. Therefore, for purposes of protecting the electrical sensor device 40 from such contaminants, it may be desired that a moisture barrier 100 be positioned within the opening 98 or within a cavity or the like that is interposed between the opening 98 and the electrical sensor device 40 for the purpose of permitting only filtered air to reach the electrical sensor device 40. In an example, the moisture barrier 100 may be in the form of a filter element or a molecular sieve, and may or may not be configured to be removable and/or replaceable.

[0071] FIG. 10 illustrates an example sensor assembly housing 120 that includes a top cover 22 configured to include an opening 98 therethrough to permit air from the external environment, e.g., the air within a pneumatic tire when the sensor assembly is disposed within a vehicle tire, to access the internal cavity 38 and the electrical sensor device 40 disposed therein. In this example, the housing top cover 22 includes a cavity 124 that is downstream from the opening 98 and that includes a moisture barrier 100 disposed therein. In this example, the cavity 124 and moisture barrier 100 are positioned adjacent a sensor 126 of the electrical sensor device 40 that is configured to sense the pressure of the air. As noted above, configured in this manner, only filtered air reaches the electrical sensor device 40 and sensor 126.

[0072] In an example embodiment, the electrical sensor device 40 disposed within the sensor assembly housing 12 may comprise a variety of different electrical components as called for by the particular end-use application and types of operating parameters to be measured, monitored and/or determined. In an example, with reference back to FIG. 5, the electrical sensor

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device 40 may comprise a number of components that may include a printed circuit board 130, one or more sensors 126 configured to measure operating parameters such as tire shape such as the outside, free, or rolling radius/diameter or tire depth, operating conditions, orientation, and/or location and the like, one or more transmitters 132, one or more antennas 134 for wireless transmission of the monitored operating parameters from the electrical sensor device 40 and for wireless receipt of information from an external device, a portable power source or battery 64, and all necessary electrical connections and circuitry. It is to be understood that the electrical sensor device 40 as disclosed herein may be configured differently depending on the particular tire data or operating parameters to be monitored, and this is but one example of the same for purposes of reference and example.

[0073] In an example, the portable power source 64 may be in the form of a lithium ion or nickel metal hydride battery. Alternatively, the electrical sensor device 40 may be designed in such a manner so as to receive power through the kinetic energy forces of the tire movement. In such variation, the functionality of the electrical sensor device 40 may be minimized due to limitations of the power source. Therefore, it is preferred that sensor assemblies as disclosed herein comprise an electrical sensor device 40 that utilizes a lithium ion battery as is commonly used in the automotive industry and proven to achieve several years of use thereby enabling the sensor assembly 10 to be re-used between multiple sets of vehicle tires.

[0074] For pressure sensor assemblies as disclosed herein configured for use in a tire-mounted application, it is desired that the electrical sensor device 40 include at least one sensor 126 preferably a microelectromechanical (MEMS) pressure and temperature sensor as is common in traditional TPMS devices. Utilizing pressure and temperature sensors along with other necessary components, the sensor assembly can communicate conditions of the tire with a receiver such as the vehicle ECU, a mobile device, or the like. As indicated, these sensors are well utilized throughout the automotive industry and therefore for advancement of tire technology it is preferred that the electrical sensor device 40 possess additional sensors and functionality including and not limited to accelerometers, gyroscopes, RFID tag, SIM, and/or GPS technology. In the circumstance of the electrical sensor device 40 including an accelerometer, the sensor assembly can be utilized for analyzing advanced tire conditions such as and not limited to traction, alignment variations, tire shape such as the outside, free, or rolling radius/diameter and/or tire tread depth, and load, e.g., radial load. In another variation, the

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electrical sensor device 40 configured to include gyroscope sensor technology would enable the calculation of tire orientation such as for slip angle or oversteer measurements which are of particular importance in the motorsports industry. The gyroscope may be used to provide tire alignment information such as toe and/or camber position, and well as being useful for determining tire tread depth. Further, the electrical sensor device 40 configured to include GPS technology is of significant value for loss prevention of tires and/or vehicles as are susceptible to theft.

[0075] In an example, it is desired that the electrical sensor device 40 be configured to include electrical components that enable minimal storage capability. Though the majority of the raw data collected from the sensor(s) of the electrical sensor device will be transmitted through wireless communication to a receiver(s) and/or cloud-based system, storage capacity by the electrical sensor device 40 is very desired and useful. In an example, it is desired that the storage capacity be read/write capable to support over writing of non-essential data. In an example, it is desired that the storage capacity of the electrical sensor device 40 support firmware updates or similar functions common with electronic units. In the particular circumstance of use as a tire sensor assembly, the storage capacity will contain information such as the sensor identification number and/or or unique protocol information through which the sensor is capable of communicating with the vehicle ECU. Further still, with storage capacity the sensor assembly can contain vehicle information such as the Vehicle Identification Number (VIN) which can be utilized for tracking and security purposes such as by fleet business or regulatory authorities like the Department of Transportation.

[0076] In an example, the electrical sensor device 40 may comprise connectors through which firmware updates or data which is stored in the device may be transmitted to and/or from an external device such as a receiver or cloud-based system or the like. However, in a preferred embodiment, it is desired that the electrical sensor device 40 comprise one or more antennas 134 through which information can be communicated wirelessly. Such feature of wireless information/data transmission to and/or from the electrical sensor device 40 to a remote device is of particular advantage when the sensor assembly comprising the same is attached within a pneumatic tire, mounted to a wheel and vehicle wherein the sensor assembly is not easily accessible for the use of connectors. The use of LF/RF technology as is common with direct TPMS units located within the mounted tire and wheel assembly or BLE communication as

found with valve-stem cap-mounted aftermarket TPMS devices are preferred though other forms of wireless communication may be utilized.

[0077] FIG. 11 illustrates an example of the different components that may be used with sensor assemblies and electrical sensor devices 40 disposed therein as disclosed herein. In such example, the electrical sensor device 40 may comprise one or both of an BLE antenna 140 and an LF antenna 142 to support traditional RF communication 144 and 145 with an ECU 146 of the vehicle as well as Bluetooth communication 148 with one or more receivers 150 such as mobile phones, tablets or smartphone-based vehicle information systems like Apple CarPlay or the like.

[0078] FIG. 11 also illustrates the use of additional components which may not be necessary in all variations of sensor assemblies and systems as disclosed herein. One such component is a button 152 which is useful for developers and manufacturing operations for activating or resetting a master control unit (MCU) 154. The electrical sensor device 40 may also contain an LED 152 to provide a visual indication that the device 40 is active and connections as aforementioned are relevant for development and firmware updates. FIG. 11 also depicts two primary components functioning as the MCU, BLE and TPMS units 154 and 156 (where the MCU and BLE units may be provided in the form of an integrated unit), which are utilized in an example embodiment though may not be necessary in other variations that still fall within the scope of sensor assemblies and systems as disclosed herein. In an example, a portable power source 157 is provided in the form of a lithium coin battery to provide power to one or all of the MCU/BLE and TMPS units 154 and 156. FIG. 11 also features the printed circuit board (PCB) and multiple frequency antennas 158 as are used for communication with a vehicle ECU 146. It is preferred for the electrical sensor device 40 to contain components supporting multiple frequencies (i.e. 315MHz and 433 MHz) which can communicate universally with all vehicles on a global scale so-as to reduce manufacturing variation as well as inventory commonly stocked by wheel and tire shops. Additionally, the electrical sensor device 40 may include a processor (not shown) for purposes of processing data received from sensors or data received wirelessly from an external transmitter.

[0079] In an example embodiment where the electrical sensor device 40 comprises a number of sensors 126, the traditional vehicle ECU 146 is not capable of processing data beyond temperature and pressure communication from the sensor assembly. Therefore, a secondary

wireless receiver with RF, BLE or similar capability, configured to receive the wireless signals provided from the electrical sensor device, is useful for the purposes of being able to access and process advanced dynamic object, e.g., tire, analytics. However, it is intended that with the development of sensor assemblies as disclosed herein, automobile manufacturers will integrate receiving capability of the advanced data provided by the sensor assembly to the vehicle ECU for convenience of drivers as well as to further the capability of autonomous vehicles which rely almost entirely on data transmitted from sensors. Therefore, the systems described herein can still fully operate within the single wireless communication method (LF/RF) that is generally used by the industry today.

[0080] In an example, the sensor assembly retainer 14 may be made from materials that facilitate a secure attachment with the housing 12, and that promotes a strong adhesive attachment with the target surface of a vehicle tire. In an example, the material may be selected to support mechanical attachment and/or chemical bonding with housing 12. In an example, the material selected for forming the retainer 14 may be one that is capable of absorbing shock and/or forces such as deformation or the like commonly experience in a vehicle tire for the purpose of minimizing or mitigating the transmission of such forces to the housing 12 and the electrical sensor device 40 disposed therein to thereby extend the effective service life of sensor assemblies as disclosed herein. In an example, the retainer 14 may be formed from materials including, but not limited to, EPDM rubber, natural, butyl or similar rubber compounds such as is common with tire patches and that provide resistance to weather, water, greases, and acids, and that maintains sufficient flexibility in varying temperature conditions which are found to range beyond -50 ºF to 250 ºF in common consumer and beyond for motorsports tire applications.

[0081] In an example, using a material having shock absorbing properties for forming the retainer 14 enables the use of a rigid plastic material for forming the housing 12 as is commonly found with traditional direct TPMS sensor devices. These materials may be of preference for forming the housing 12 due to manufacturing cost savings. Without having a separate retainer 14 and the ability to form the retainer 14 from a shock absorbing material selected to promote attachment to the vehicle tire, the rigid housing 12 and electrical sensor device 40 would be susceptible to failure and/or damage to the electrical sensor device 40, failed bond with the tire, and/or excessive resistance to flexibility of the tire rubber where the sensor assembly unit is

affixed. Naturally these conditions present functionality and safety concerns. As such, a feature of sensor assemblies as disclosed herein is the ability to select the material for making the retainer 14 so as to minimize, mitigate, and/or eliminate such functionality and safety concerns.

[0082] In an example, where the retainer 14 may be bonded with the housing 12, it is desired that the material selected for forming the retainer 14 be one that is compatible with and promotes a desired bond strength with housing 12 in the event that the housing 12 is chemically bonded with the retainer 14. In the circumstance of chemical bonding between the retainer 14 and housing 12, commonality of material is desired to ensure durable connection between the components. In such example, it may be desired to make the retainer 14 and housing 12 each from EPDM rubber to support the use of a rubber bonding adhesive such as a cyanoacrylate, pressure-sensitive, or chemical vulcanizing agent as is common in the tire patch and repair industry.

[0083] Alternatively, in the circumstance where different materials are used for forming the retainer 14 and the housing 12, e.g., where the retainer 14 is made from EPDM rubber and the housing 12 is made from rigid plastic or metal, it would be desired to utilize complimentary shapes for the purpose of providing a mechanical attachment between the retainer 14 and housing 12. In such an example (as illustrated in FIGS. 1, 6 and 7), attachment of the housing 12 to the retainer 14 would rely on mechanical fixturing techniques that may include complementary surface features and/or the use of additional attachment elements such as dowels, screws, rivets or the like.

[0084] The examples illustrated in FIGS. 1, 6 and 7 rely on a mechanical mating of the housing 12 within the open chamber 52 or pocket of the retainer 14, wherein the retainer 14 comprises a wall structure 16 that complements that of the housing wall structure 34 to accommodate placement and mechanical retention of the housing 12 within the retainer 14 by means of contact between the complementary adjacent wall structures. In an example, it is desired that the housing 12 be attached to the retainer 14 through the use of a mechanical attachment for purposes of being able to readily remove and reuse the housing 12 and electrical sensor device 40 therein (e.g., when placed within a tire) to facilitate removal from an old, worn and/or failed tire and installation into a replacement tire. This is especially desired when sensor assemblies as disclosed herein are used in tires placed into use in the motorsport industry where tires are replaced frequently.

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[0085] That said, the mechanical bonding of the retainer 14 and housing 12 containing the electrical sensor device 40 would permit transfer of the critical and costly components to another vehicle tire such as when the retainer 14 is permanent affixed to the vehicle tire. Other variations of mechanical mating the retainer 14 and housing 12 may be utilized, however, the 'pocket' technique is the preferred variation as this does not require the use of tools for application or removal. A desired feature of the retainer 14 and housing 12 mechanical attachment configuration illustrated in FIGS. 1, 6 and 7 is that such permits the removal of the housing 12 from the retainer 14 without having to use special tools. Further, there may be an instance where the retainer 14 is vulcanized to the rubber article, such as during the green tire manufacturing process. In this instance the retainer 14 is permanently affixed to the tire and cannot be used in another tire vehicle. In such case, mechanical attachment of the housing 12 to the retainer 14 is desired to enable removal of the housing 12 therefrom for reuse in another tire.

[0086] In an example, the retainer 14 is configured to be affixed to a target surface of an already vulcanized rubber article 30, e.g., a vehicle tire, utilizing an adhesive layer 160 (as shown in FIG. 1). In a preferred embodiment, the adhesive chosen for affixing the retainer 14 to the vulcanized rubber article 30 is a cyanoacrylate adhesive given the adhesive's permanent rubber bonding and fast drying properties which are of interest in high volume applications, though other comparable chemical or heat vulcanizing adhesives may be selected. In this circumstance, the housing 12 would be removed from the retainer 14 since the bond between intermediate absorption layer and rubber article is intended to be permanent. Alternatively, pressure sensitive adhesives may be used to support ease of removal of the entire sensor assembly (including the retainer) from the vulcanized rubber article for use in another application. In the situation where the vulcanized rubber article is a vehicle tire, this feature of ease of removal and reuse of the housing 12 and the electrical sensor device 40 disposed therein is of particular significance given that the frequency in which tires are replaced is higher than that of the life of the power source for the electrical sensor device 40.

[0087] For use of sensor assemblies as disclosed therein, there are several methods that may be utilized for attaching the sensor assembly 10 to a target surface of a vulcanized rubber article 30. As previously discussed, the retainer 14 as the connection between the rubber article and the housing 12 and electrical sensor device 40. The retainer 14 can be affixed to the rubber article 30 through what is referred to as pre-cure or post-cure bonding. In pre-cure bonding, the

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retainer 14 is applied to a target surface of the uncured rubber article and cured along with the rubber article. This is commonly referred to the green tire process in the case which the rubber article is a vulcanized rubber article. It is a common variation to incorporate the use of heat cure adhesives to support the bond between the uncured retainer 14 and uncured rubber article in the circumstance that different elastomeric materials are selected. The pre-cure bonding technique is of preference for high volume production, to ensure consistency and quality of retainer 14 to the rubber article permanent bonding.

[0088] This pre-cure bonding technique, however, is a disadvantage in many respects as well. Because the pre-cure method requires vulcanization with the rubber article, it is generally necessary to produce a new mold. In the circumstance of tire manufacturing, mold production comes at a significant cost exceeding tens of thousands of dollars, and therefore it would be necessary to produce hundreds of thousands of tires to recognize a return on investment. In addition, if bonding of the retainer 14 is achieved during the pre-cure process then the ability to use sensor assemblies as disclosed herein could depend on the rubber article manufacturer rather than the user, e.g., one rubber article manufacturer may make tires with the retainer 14 while another rubber tire manufacturer may not make tires with the retainer 14 that would prevent use of the sensor assembly control.

[0089] Therefore, it is an alternative and preferred technique to achieve bonding of the retainer 14 and rubber article 30 in a post-cure method. As previously discussed, this can be done in a permanent manner utilizing heat, chemical or similar curing adhesives as well as pressure sensitive adhesives for a temporary bond. In this circumstance, it is desired to properly prepare the target surface of the vulcanized rubber article 30 which will support a proper bond. In the circumstance of a new vehicle tire, the target surface is likely to contain contaminants including waxes, oils, and mold release agents utilized in the manufacturing process.

[0090] FIG. 12 illustrates an example sensor assembly 10 as attached to a target surface 170 of inside portion of a vehicle tire 172 by the use of a suitable adhesive by post-cure method. In an example, before attaching the sensor assembly 10 the target surface 170 is treated for removal of contaminants, which may be done by using cleaning products and/or solvents 174 common in the tire and rubber industry such as pre-buff, degreaser, acetone, rubbing alcohol or similar and a clean towel or rag 176. It is also common, though not necessary, to roughen the surface of the rubber article which can be done with a common sand paper or the use of a

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specialized tool like a stitcher, roughener, dremel or similar. Roughening the surface can assist in the bond strength given the use of particular adhesives such as those common to the retread industry, however, other adhesives can achieve the intended bond without this roughening step. When the roughening technique is utilized, it is generally necessary to follow this step with the aforementioned cleaning technique. Further still, it may be necessary to remove tire insulation foam or similar materials which are known to be used by tire manufacturers for the purpose of noise dampening.

[0091] One further variation in the preparation of the target surface 170 includes marking the rubber article. This technique can be helpful in assembly line scenarios where the operator or machine cleaning and or roughening the surface may not also be applying the adhesive 160 and retainer 14, and therefore the area must be identified for the next stage of the assembly line. Alternatively, the rubber article may be cleaned and or roughened at one particular time, staged, and at a later time collected for application of the adhesive 160 and retainer 14.

[0092] Further, referring to FIG. 12, it may be of particular preference to place the sensor assembly 10 in a particular orientation and/or position on the rubber article surface 170 such as to compliment the rotational direction of a vehicle tire 172. In an example, the sensor assembly may be attached to the rubber article surface 170 inside the tire that is opposite the tire outside surface or tire tread, and in a particular example the attachment surface may be centrally located between opposed sidewalls of the tire. However, it may be desired to mount the sensor assembly at a different location within the tire depending on the particular tire parameters and/or operating conditions to be monitored. For the above circumstances and those not mentioned, the application method may incorporate marking of the rubber article.

[0093] Once the surface of the rubber article has been properly prepared, the retainer 14 and adhesive layer 160 are bonded to the vulcanized rubber article. Depending on the chosen adhesive and other factors such as the skillset of the person or machine applying the retainer 14, the adhesive layer may be applied to the target surface 170 of the rubber article or to a bottom surface 28 of the retainer 14 or both. In the circumstance where the adhesive is pressure sensitive, it may be preferred to apply the adhesive layer to the bottom surface 28 of the retainer 14 such as through the technique of lamination. In this situation, lamination of adhesive to the retainer 14 can take place in the manufacturing process of the retainer 14 and at a later time and by an unrelated party. With reference to FIG. 13, the adhesive layer 160 can be easily activated

for application with the rubber article, e.g., by removing a release liner 178 therefrom to thereby expose the adhesive layer surface.

[0094] In another example, the adhesive layer 160 may be applied to the surface of the rubber article directly. This can be done with nearly any variation of adhesive including but not limited to heat-activated, chemical cure or 2-part epoxy adhesives. An example where this approach may be of preference such as when the area of the rubber article chosen to receive the retainer 14 is clearly defined or when the adhesive possesses a low viscosity.

[0095] Once the adhesive layer has been applied and rubber article target surface properly prepared, the connection between the retainer 14 and rubber article can take place. At this point, the housing 12 and electrical sensor device 40 disposed therein may or may not be attached with the retainer 14. In the circumstance where the adhesive chosen is a heat-activated method, it would be preferred that the housing 12 is not affixed to the retainer 14 during the retainer attachment process as the curing process of the adhesive may require an elevated temperature beyond a threshold which the housing 12 and/or electrical sensor device 40 may withstand. Alternatively, a select adhesive may require significant use of pressure to achieve activation and lasting bond. This pressure may result in damage to the housing 12 and/or electrical sensor device 40 disposed therein and for this reason should not be attached with the retainer 14 during the step of attaching the retainer 14 to the rubber article. Still further, the bonding of the retainer 14 and rubber article may require the use of tooling whether by hand or machine, which may not be adapted to the profile of the housing 12. For these and other reasons not mentioned, in an example embodiment the step of attaching the retainer 14 to the rubber article is carried out without the housing 12 attached within the retainer 14.

[0096] Alternatively, it may be desired to bond the rubber article with adhesive to the entire sensor assembly; the retainer 14 as containing the housing 12 and the electrical sensor device 40 disposed within the housing 12. In this embodiment, the entire sensor assembly 10 can be bonded to the rubber article using a select adhesive without the need to later affix or attach the housing 12 to the retainer 14. This option may be of particular use when the application of the sensor assembly is performed by a consumer and reducing the number of required installation steps is preferred. With reference to FIG. 14, in an example, this option of installing the sensor assembly 10 with the housing 12 attached within the retainer 14 may be done by a user applying pressure to the sensor assembly 10 by their hands 180, e.g., by using hand pressure. As indicated

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previously, the sensor assembly 10 may alternatively be affixed to the rubber article using tooling which is of preference with high volume operations, use of machinery, and or when forces, temperatures or conditions exceed the capability of hand application.

[0097] As referenced, the sensor assembly housing 12 may be used for multiple purposes including ways related to the method of application. In an example shown in FIG. 1, the housing top cover 22 may include a display feature 32 configured to assist with installation, e.g., providing a desired installation orientation in which the sensor assembly 10 is to be attached and used relative to the rubber article. This may relate to the rotational direction of the tire or a particular orientation which supports more robust communication with the electrical sensor device 40 disposed within the housing 12. In another variation shown in FIG 1, the housing top cover 22 comprises a display feature 32 that contains information such as a unique identifier which is used for setup and functionality of the sensor assembly 10. This unique identifier could include an electronic identification number through which receivers associate the sensor assembly for use in the sensing system such as identifying a particular vehicle tire from another. Still further, the housing display feature 32 may provide specification information such as an FCC ID or similar certification information about the electrical sensor device contained within. These are but a few examples of how the sensor assembly housing may include information useful to install and or use the sensor assembly.

[0098] Once the sensor assembly 10 is affixed to the rubber article, there is a method for removing the housing 12 and electrical sensor device 40 from the retainer 14 and rubber article, and reusing the same with a different rubber article. This is of particular importance when the rubber article is a vehicle tire which has a fixed lifespan that is generally shorter than that of the power supply of the electrical sensor device 40. In this scenario, the housing 12 is preferably mechanically affixed to the retainer 14 and easily removable therefrom. To promote reuse of the housing 12 and electrical sensor device 40, a new retainer 14 and adhesive are used to affix the retainer to the new tire, or perhaps the new tire already possess retainer 14 which was pre-cured with the rubber article as described above. In another embodiment, the entire sensor assembly 10 including the retainer 14 and housing 12 may be removed from the old tire and placed into a new vehicle tire or rubber article, e.g., through reuse of the existing adhesive or use of a new adhesive layer.

[0099] It is desired, such as for automotive aftermarket use of the sensor assembly, that the aforementioned application methods are selected through which jobbers and consumers are empowered to apply and utilize sensor assemblies as disclosed herein. However, pressure assemblies as disclosed herein may also be made and used at the rubber article manufacturing level. This approach supports mass distribution through traditional channels such as tire dealers and warehouses and supports efficiency and quality of the application of the sensor assembly. Therefore, as shown in FIG 15, it is intended to be within the scope of sensor assemblies as disclosed herein the combination of sensor assemblies 10 with variations of a rubber article, such as a vehicle tire 190, which may already be equipped with the sensor assembly 10 by way of the methods aforementioned.

[00100] Lastly, the sensor assemblies and systems as disclosed herein comprise a sensing system that is designed to measure, monitor, and/or determine, and/or report operating parameters and/or conditions, orientation and/or the location of a vulcanized rubber article such as a vehicle tire. The sensing system comprises of the aforementioned components and methods including and not limited to:

[00101] - A sensor assembly 10 comprising a housing 12, an electrical sensor device 40 within an internal cavity 38 of the housing 12, and a retainer 14 that is attached together with the housing 12;

[00102] - applied to the vulcanized rubber article such as a vehicle tire;

[00103] - by method of surface preparation and pre-cure or post-cure adhesion;

[00104] - which communicates with one or more receivers having a plurality of antennas capable of receiving and sending wireless communication.

[00105] While example sensor assemblies as disclosed herein have been described above and configured for attachment with a dynamic rotating object, and more specifically for attachment with an inside portion of a pneumatic tire, it is to be understood that sensor assemblies as disclosed herein may be configured to accommodate attachment with an element, object or article attached or otherwise connected with the dynamic rotating object that also is a dynamic rotating object. In an example where the dynamic rotating object is a pneumatic tire, the sensor assembly may be configured for attachment with a wheel that the pneumatic tire is mounted with, or may be configured for attachment with a valve stem that is connected with such wheel. In each such case the wheel and valve stem are dynamic rotating elements that

rotate with the pneumatic tire. In each such case, the sensor assembly may be modified to properly affix to the alternative surface or object and still fall within the scope of the invention. For example, rather than using an adhesive layer to affix the sensor assembly to a vehicle tire, the sensor assembly can be affixed to the valve-stem position mechanically. In an alternative example when affixed to the valve-stem position, the sensor assembly can be comprised of a rigid material within risk of damage to the electrical components since the valve-stem position does not experience the same deformation as the vehicle tire position. It is to be understood that all such alternative constructions of the sensor assembly is within the scope as disclosed herein.

[00106] FIGS. 16 to 18 illustrate example sensor assemblies as disclosed herein that are configured for attachment with a wheel or valve stem that is mounted or otherwise connected to rotate with the dynamic rotating object, e.g., a pneumatic tire. FIG. 16 illustrates an example sensor assembly 200 as disclosed herein, configured to include the sensor device elements and the like disclosed above, and configured to attach to an inside diameter surface 202 of a wheel 204 on which a pneumatic tire 206 is mounted. As illustrated, the sensor assembly 220 is positioned such that it is exposed to the internal cavity 208 of the tire 206 and radially opposed from an inside surface 210 of the tire that is opposite the tire outside diameter surface 212 and tread 214. FIG. 17 illustrates an example sensor assembly 220 as disclosed herein, that configured in the manner and comprising the sensor device elements disclosed above. In this example, the sensor assembly 220 is attached to a valve stem 222 that extends through an inside diameter surface 224 of a wheel 226 on which a pneumatic tire 228 is mounted. As illustrated, the sensor assembly 220 is positioned such that it is exposed to the internal cavity 230 of the tire 228 and radially opposed from an inside surface 232 of the tire that is opposite the tire outside diameter surface 234 and tread 236. FIG. 18 illustrates an example sensor assembly 240 as disclosed herein, that configured in the manner and comprising the sensor device elements disclosed above. In this example, the sensor assembly 240 is attached to a valve 242 that extends through an inside diameter surface 244 of a wheel 246 on which a pneumatic tire 248 is mounted. Unlike the example illustrated in FIG. 17, the valve extends through an angled section 250 of the wheel inside diameter surface 244. As illustrated, the sensor assembly 240 is positioned such that it is exposed to the internal cavity 246 of the tire 248 and radially opposed from an inside surface 250 of the tire that is opposite the tire outside diameter surface 252 and tread 253. Alternatively, the sensor assembly 240 as disclosed herein, may be configured for

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positioning external to the wheel and tire cavity. In one such example, the sensor assembly may be configured for attached with a portion of the valve stem extending outwardly from the wheel, e.g., configured for attachment with the valve stem in the form of a valve stem cap or the like. Such sensor assembly placement position would still require the sensor assembly be oriented in a manner such that it is exposed to the Earth's gravitational force and the radial forces from rotation of the dynamic object. The valve-cap position simply allows for ease of access to the sensor assembly 240.

[00107] Sensor assemblies configured and mounted in the manner illustrated in FIGS. 16 to 18 within a pneumatic tire function to provide the tire operating parameters and/or conditions described above for the earlier-discussed sensor assemblies. For example, sensor assemblies mounted as illustrated in FIGS. 16 to 18, include one or more accelerometer disposed therein having an axis oriented to sense the Earth's gravitational force and the radial force of the rotating object, in this case a pneumatic tire, which is useful for monitoring among other things the tire shape such as the outside, free, or rolling radius / diameter and/or tread depth.

[00108] While FIGS. 16 to 18 illustrated alternative placement positions for sensor assemblies as disclosed herein for use with a dynamic rotating object such as a pneumatic tire, it is to be understood that sensor assemblies and systems as disclosed herein are also intended to be used in applications where the dynamic rotating object is solid or otherwise does not include an internal cavity, e.g., such as with solid metallic wheels, rubber tires, cushion tires, and the like. In such end-used applications, sensor assemblies as disclosed here may be attached to a portion of the rotating dynamic object, or another element attached to the rotating dynamic object so it also rotates with the rotating dynamic object, radially inwardly from the outside diameter of the rotating dynamic object so that the accelerometer is oriented to sense the Earth's gravitational force and the radial force of the dynamic rotating object.The sensing system relies on wireless communication techniques to relay data, commands, updates, and similar between the electrical sensor device 40 within the sensor assembly 10 and the receiver(s). Common examples of the wireless communication applicable useful in the automotive market segment and TPMS sensors include Bluetooth Low Energy (BLE) and low frequency (LF) radio frequency (RF). Modern technology is also allowing for telecommunication such as through 5G service, directly to cloud-based systems. These communication methods are utilized for connection between sensors and receivers utilizing a plurality of antennas.

[00109] Referring back to FIG. 11, the sensor assembly and system as disclosed herein is capable of transmitting and receiving BLE 148 for communication with mobile devices 150 used by the vehicle driver, as well as RF for LF communication 144 and 145 with the vehicle ECU 146, which then relays information to the user dashboard. This dual communication system is preferred given the plurality of conditions which traditional vehicle computer systems are not equipped to receive. For example, traditional TPMS sensors relay conditions of temperature and pressure to the vehicle ECU which is communicated with the driver through signals on the dashboard to similar interface. However, most vehicles are not capable of receiving additional sensor conditions such as accelerometer data or cannot translate this data into meaningful information to display to the driver. This presents a barrier given the complexity of programming and fact that control of vehicle ECU development is generally held by the vehicle manufacturers. It is known that at some time, vehicle manufacturers will incorporate advanced tire information into the vehicle ECU and dashboard. However, this change will likely take years and will constantly be behind the technology. Therefore, sensor assemblies and systems as disclosed herein operate to address this limitation by incorporating a second form of communication for the sensing system such as BLE which is commonly utilized by other receivers such as smart phones, tablets, vehicle systems like CarPlay, etc., and through which data can easily be accessible with applications.

[00110] An alternative technique relying solely on one form of communication such as RF is to utilize a receiver which is programmed to collect and translate the information. This could be the vehicle ECU or a 3rd-party receiver which could be plugged into the cigarette lighter or USB connection for power or hardwired to the vehicle electrical system such as with fleet vehicles, all of which would need to be adapted to translate the communication into meaningful information and fulfill the purpose of the sensor assembly and systems as disclosed herein. This receiver in turn could also transmit the information to one or more receivers or even a cloud-based system utilizing the same form of communication or perhaps an alternative signal such as telecommunications like 5G. For example, the sensor assembly may transmit through RF communication to a receiver, which then transmits information to a 2nd receiver using BLE communication or perhaps to a 2nd receiver over USB wired connection. There are any number of combinations that one skilled in the art can develop which would still fall within the scope of sensor assemblies and systems as disclosed herein. As indicated, in an example embodiment, the

sensing system utilizes dual wireless communication protocols as such is advantageous until automotive manufacturers begin to incorporate functionality of translating the data from the sensor assembly into meaningful information from which drivers and the vehicle can rely.

[00111] Expanding on this variation of sensor assemblies and systems disclosed herein, sensing systems are also capable of replacing traditional TPMS devices. When setting up a traditional TPMS device, it is critical that the unique protocol of the particular vehicle is used to ensure proper communication between the sensor and vehicle. When the protocol is designated, the vehicle needs to be 'taught' to find the sensor(s) and assign the signal to a particular tire. The process is often complex and only performed by wheel and tire experts with specialized tools. To avoid the process of relearning sensors, one common technique is to clone the ID and or protocol of the original TPMS sensor and assign this to new sensor. Through the cloning process, the vehicle continues to identify the tire using the original unique ID of the sensor transmitted by the RF communication, typically 315MHz or 433MHz frequency. Many TPMS sensors even incorporate both signals and multiple protocols to reduce inventory and complexity.

[00112] As a direct replacement for traditional TPMS sensors, the sensor assemblies and systems as disclosed herein utilize the same industry standards and techniques for programming the sensor assembly for ECU communication. Therefore, the vehicle ECU is capable of receiving standard conditions such as temperature and pressure as designed by the OEM while the additional information is relayed to another receiver. However, it is the unique and preferred variation of sensor assemblies and systems as disclosed herein that the programming techniques typically reliant on RF communication from specialized receivers, can alternatively be performed over a secondary form of communication such as BLE from a mobile device. In an example embodiment utilizing dual communication, a vehicle owner can assign the designated protocol information during the vehicle selection process in a mobile application which would then be transmitted over BLE to the electrical sensor device 40 of the sensor assembly 10 which then programs the protocol and communicates over RF to the ECU. The mobile device or similar can similarly be utilized to clone the unique ID of the original TPMS sensor, send the information of BLE to the electrical sensor device for programing and RF communication with the ECU. Through this method, sensor assemblies and systems as disclosed herein empower users to eliminate the need for expensive TPMS tooling and specialized training. As mentioned, however, as receivers (e.g. ECU) are adapted to accept additional information (e.g.

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accelerometer data, tread depth results, tire load) there would not be the necessity of dual wireless communication and still fall within the scope of the sensor assemblies and systems as disclosed herein.

[00113] Beyond unique use of communication protocols, sensor assemblies as systems as disclosed herein provide a method through which critical wheel and tire conditions are evaluated, specifically critical safety and performance conditions like tire shape such as the outside, free, or rolling radius/diameter and/or tread depth, radial load and alignment. Whereas conventional approaches demonstrate evaluation of tread depth, radial load and alignment conditions through the use of camera systems or measuring acoustics, the sensor assemblies and systems as disclosed herein evaluate these conditions utilizing raw sensor data from the electrical sensor device 40 of the sensor assembly 10.

[00114] To evaluate these conditions, using sensor assemblies and systems as disclosed herein, to rely accelerometer data and the technique of measuring the rotations per second (RPS) of a particular tire at a given speed to calculate the shape such as the outside, free, or rolling radius/diameter of said tire. Using known manufacturing specifications for tire models, the shape such as the outside, free, or rolling radius/diameter of said tire will generally indicate the health and remaining service life of the tire, or may be used to determine the tread depth related health and remaining service life of the tire. It is an alternative technique to utilize gyroscopic data to calculate the shape such as the outside, free, or rolling radius/diameter of the tire based on the path of the gyroscope and known position of the sensor assembly within the tire. Similarly, this data can be utilized to calculate camber and/or toe angle measurements to determine alignment variation.

[00115] As earlier noted, a feature of sensor assemblies and systems as disclosed herein is the ability to use the same for monitoring operating parameters and conditions of the dynamic rotating object such as the tread depth of a tire. FIG. 19 is a flow chart illustrating an example methodology for determining tire tread depth using sensor assemblies and systems as disclosed herein. In an initial step 300 the sensor is checked to confirm it is correctly setup and assigned a tire location. Then 302 the sensor is checked by a receiver to confirm it is discoverable by the system. Next 304 information from the sensor is evaluated to determine tire pressure, and in an example, to check if the tire pressure is within about 15 percent of a recommended tire pressure. Step 304 is used to ensure the tire pressure is within a tolerance so-as not to affect the resulting

tread depth calculation. Alternatively, a correction coefficient can be utilized in the calculation to account for any tire pressure variation. The flowchart of FIG. 19 is simply providing an example of a system to calculate tread depth by maintaining tire pressure within a preferred range. Next 306 previous data/API (Application programming interface) data for the tire and the sensor are retrieved to provide necessary tire and vehicle specifications and/or previous measurements or baseline data from which the system can more accurately proceed with its calculations. Next 308 the speed/velocity condition is checked from a GPS sensor of the sensor assembly or by the GPS system of the receiver(s) to which the sensor assembly is in communicating with. If the GPS data is provided from the receiver, it is necessary that the raw data from the sensor and the GPS data are synchronized accordingly. Next 310 the system/receiver is connected with the sensor, and 312 a signal is sent from the receiver such as a mobile phone or vehicle ECU to command the sensor to initiate mass acceleration data collection. Next 314 speed data is collected for a specified test duration by the GPS-enabled sensor or external receiver such as a mobile device or vehicle ECU. Next 316 a signal is sent from the receiver to command the sensor to send the collected mass acceleration data from step 312. Next 318 the system performs a filtering process and Fourier transform process on the collected mass acceleration data. Next 320 the system calculates the theoretical diameter of the tire from processed acceleration data and speed data. Next 322 the results from step 320 are stored by the system, and the results are evaluated to determine if they are sufficient for further analysis. Next 324 the results outside of a threshold of expected diameter tolerance are discarded. In an example, the expected diameter is derived from known manufacturer's tire specifications and/or previously calculated results. Next 326 the remaining results are evaluated to determine whether they are sufficient for purposes of further analysis. If the remaining results are not deemed sufficient, then steps 312 to 326 are repeated until a desired sample size of remaining results are obtained. If the remaining results from step 326 are deemed sufficient, then 328 the system calculates the tread depth from the results, provides an output of the same and stores the determined tread depth.

[00116] The example process described above and illustrated in FIG. 19 is understood to be an example of but one way which sensor assemblies and systems as disclosed herein may operate to determine tread depth and that other and/or additional processes, steps and or methodologies may be used, which are understood to be within the scope this disclosure. For

example, while the above process was one developed for monitoring the tread depth of a dynamic rotating element, it is to be understood that a similar process with adjustment may be used for monitoring the shape such as the outside, free, or rolling radius/diameter of a dynamic rotating element, e.g., in an application where the dynamic rotating element is a solid wheel or tire that does not have tread.

[00117] For the above-described example process illustrated in FIG. 19, it is desired that the sensor and/or sensor accelerometer include or meet the following desired criteria. The sensor be mounted within the dynamic rotating object in the manner disclosed above. The sensor include a "two-way" radio connection, e.g., Bluetooth LE or the like. The sensor include an accelerometer with a measuring range of about 400 G or greater. The sensor accelerometer resolution be about 0.1 G or better. The sensor be mounted in a position where its accelerometer axis should sense Earth's gravitational force and the radial force of the dynamic rotating object. The sensor have an acceleration measuring frequency of about 40 Hz or greater. The sensor accelerometer be configured to collect and store at least about 100 measurements. The sensor be configured to retain measured data until uploaded to a host, e.g., vehicle, phone, etc. The sensor acceleration measuring interval be stable, e.g., better than 0.001 s. The sensor battery have sufficient power to repeatedly perform collection of measurements and communications to the host. These are examples of desired sensor operating parameters for purposes of performing the tread depth determination process illustrated in FIG. 19, and it is to be understood that such sensor operating parameter can and may vary depending on a variety of factors, and that such variations are intended to be within the scope of sensor assemblies as systems as disclosed herein.

[00118] As earlier noted, a feature of sensor assemblies and systems as disclosed herein is the ability to use the same for monitoring operating parameters and conditions of the dynamic rotating object such the dynamic load placed on the dynamic rotating object. FIG. 20 is a flow chart illustrating an example methodology for determining the dynamic object load on a pneumatic tire using sensor assemblies and systems as disclosed herein. In an initial step 400 the sensor is checked to confirm it is correctly setup and assigned a tire location. Then 402 the sensor is checked to confirm it is discoverable by the system by wireless communication from a receiver such as a mobile device or vehicle ECU. Next 404 information from the sensor is evaluated to determine tire pressure, and a correction factor is assigned if needed. Next 406 if a

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correction factor is needed a correction coefficient is retrieved from the system and sent to the sensor. In an example, the correction coefficient defined as a coefficient used to adjust the formula for determining radial load based on the dynamic rotating object, e.g., tire classification. This coefficient varies depending on a number factors but it is essentially an expected behavior of the object under radial load. In the case of a pneumatic tire, the coefficient considers factors such as tire section width, aspect ratio, wheel size, load rating, etc. This coefficient enables proper consideration of the interval of radial deformation, velocity of the object and type of object being evaluated to then calculate the radial load estimation. For example, a large profile truck tire will behave (deflect) differently than a low profile high performance tire. The interval of deformation and velocity may be the same for these two tires, but knowing the behavior of the tire (correction coefficient) enables the proper assessment of the radial load for the given tire.

[00119] Next 408 the speed condition is checked by a GPS sensor of the sensor assembly or by a GPS system of the receiver(s) to which the sensor assembly is communicating with. If the GPS data is provided from the receiver, it is necessary that the raw data from the sensor and the GPS data are synchronized accordingly. Next 410 the system is connected with the sensor, and 412 a signal is sent from the system to command the sensor to initiate mass acceleration data collection. Next 414 speed data is collected for a specified test duration by the GPS-enabled sensor or external receiver such as a mobile device or vehicle ECU. Next 416 a signal is sent from the system to command the sensor to send the collected mass acceleration data from step 412. Next 418 the system performs a process on the data that filters frequencies, locates peaks, and calculates deflection interval or interval of radial deflection. The interval of radial deformation is defined as the time, length, period, etc., which the dynamic rotating object is experiencing radial deformation when compared to its 'free radius' or radius/diameter while rotating freely in space. Next 320 the system collects the processed deflection interval data, the pressure, the speed, and the system correction factors. Next 322 the system calculates the load and provides an output of the same and stores the determined load.

[00120] The example process described above and illustrated in FIG. 20 is understood to be an example of but one way which sensor assemblies and systems as disclosed herein may operate to determine dynamic object load on a rotating object and that other and/or additional processes, steps and or methodologies may be used, which are understood to be within the scope this disclosure. For the above-described example process illustrated in FIG. 20, it is desired that

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the sensor and/or sensor accelerometer meet the same desired criteria describe above for the process illustrated in FIG. 19. Additionally, the sensor assembly is mounted within the dynamic rotating object in the manner disclosed above where the sensor is mounted to tire for the purpose of sensing deflection of the object in rotation, e.g., radial deflection in a sidewall of a tire.It is known that the conditions of a vehicle tire are extreme and no two rotations of the tire are identical. Even in an environment where external factors like road conditions, temperature, moisture, etc., are controlled, the accelerometer and gyroscope data would vary due to pressure and temperature variations of the tire itself as well as always changing behavior of the rubber compounds. Therefore, the sensing system relies on complex filters and algorithms as well as multiple sample sets to perform tire diameter calculations and draw meaningful evaluation of tread depth and alignment conditions.

[00121] In an example embodiment, sensor assemblies and systems as disclosed herein activate the collection of accelerometer sample sets based on the speed of the vehicle. The speed of the vehicle is monitored using GPS speed and algorithms contained within a mobile device application, diminishing the burden of power consumption for the sensor assembly. Once the vehicle is determined to be traveling at a particular speed and maintains the speed for a particular period of time, the accelerometer sensor is activated via BLE signal and collects sample sets. The raw data is transmitted back to the mobile device over BLE and the application undergoes the complex process of filtering out 'noise' (such as the impact of the sensor assembly and tire against the road) and converting the raw data to tire RPS and diameter utilizing mathematical techniques such as the fast furrier transformation (FFT) algorithm. Once the diameter is calculated, the information is stored and the process is repeated, typically multiple times, and results are compared to ensure the integrity each individual sample set. Using known tread depth specifications for the particular tire along with repeated processing the aforementioned calculations, the tread depth of the tire is determined.

[00122] In another variation, sensor assemblies and systems as disclosed herein include a GPS device or an RFID chip that is used to transmit the location of the tire. This feature is of particular functionality for fleet organizations that experience vehicle and/or tire theft as well as for evaluation of inventory.

[00123] Another feature of sensor assemblies and systems as disclosed herein is the storage and accessibility of the advanced tire parameters available from the sensing system such

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as for telematics. An example embodiment would have the information collected by the sensor assembly communicated over BLE or RF to a mobile device or receiver that is connected to the internet. The data can then be evaluated and information transmitted to a database such as the cloud. Over time, this database could be utilized for countless applications such as telematics, user-based insurance (UBI), regulatory (D.O.T.) and statistics, as well as by tire companies and automotive manufacturers to improve future products. In still another embodiment, the information transmitted by the sensor assembly is received by the ECU of an autonomous vehicle for adjustments to driving conditions and overall improvement of safety and performance.

[00124] The foregoing description and accompanying figures illustrate the principles, preferred embodiments and modes of operation of sensor assemblies and systems as disclosed herein. However, such sensor assemblies and systems should not be construed as being limited to the particular embodiments discussed above. Additional variations of the embodiments discussed above will be appreciated by those skilled in the art. Therefore, the above-described embodiments should be regarded as illustrative rather than restrictive. Accordingly, it should be appreciated that variations to those embodiments can be made by those skilled in the art without departing from the scope of the sensor assemblies and systems as defined by the following claims.

[00125] For example, the steps recited in any of the method or process descriptions may be executed in any order and are not limited to the order presented. Moreover, any of the functions or steps may be outsourced to or performed by one or more third parties. Modifications, additions, or omissions may be made to the systems, apparatuses, and methods described herein without departing from the scope of the disclosure. For example, the components of the systems and apparatuses may be integrated or separated. Moreover, the operations of the systems and apparatuses disclosed herein may be performed by more, fewer, or other components and the methods described may include more, fewer, or other steps. Additionally, steps may be performed in any suitable order. As used in this document, "each" refers to each member of a set or each member of a subset of a set. Furthermore, any reference to singular includes plural embodiments, and any reference to more than one component may include a singular embodiment. Although specific advantages have been enumerated herein, various embodiments may include some, none, or all of the enumerated advantages.

[00126] In the detailed description herein, references to "in various embodiments," "various embodiments," "one embodiment," "an embodiment," "an example embodiment," etc., indicate that the embodiment described may include a particular feature, structure, or characteristic, but every embodiment may not necessarily include the particular feature, structure, or characteristic. Moreover, such phrases are not necessarily referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with an embodiment, it is submitted that it is within the knowledge of one skilled in the art to affect such feature, structure, or characteristic in connection with other embodiments whether or not explicitly described. After reading the description, it will be apparent to one skilled in the relevant art(s) how to implement the disclosure in alternative embodiments.

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 16/671,105 filed on 10/31/2019.

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

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

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

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Keith George Ferry Date (Optional): 11-12-19

Signature: [signature]

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT
First Named Inventor/Applicant Name:	Keith George Ferry
Filer:	Grant T. Langton/Lauren Coyle
Attorney Docket Number:	67838.01000

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	80	80
UTILITY SEARCH FEE	2111	1	350	350
UTILITY EXAMINATION FEE	2311	1	400	400
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	37	50	1850
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**2680**

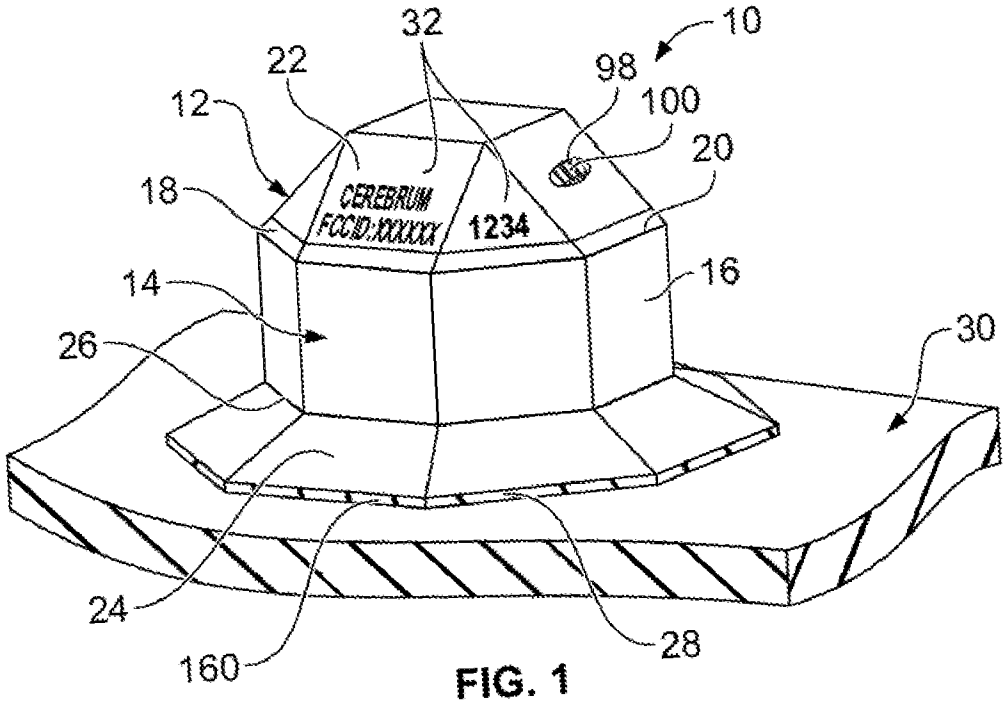
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FIG. 1

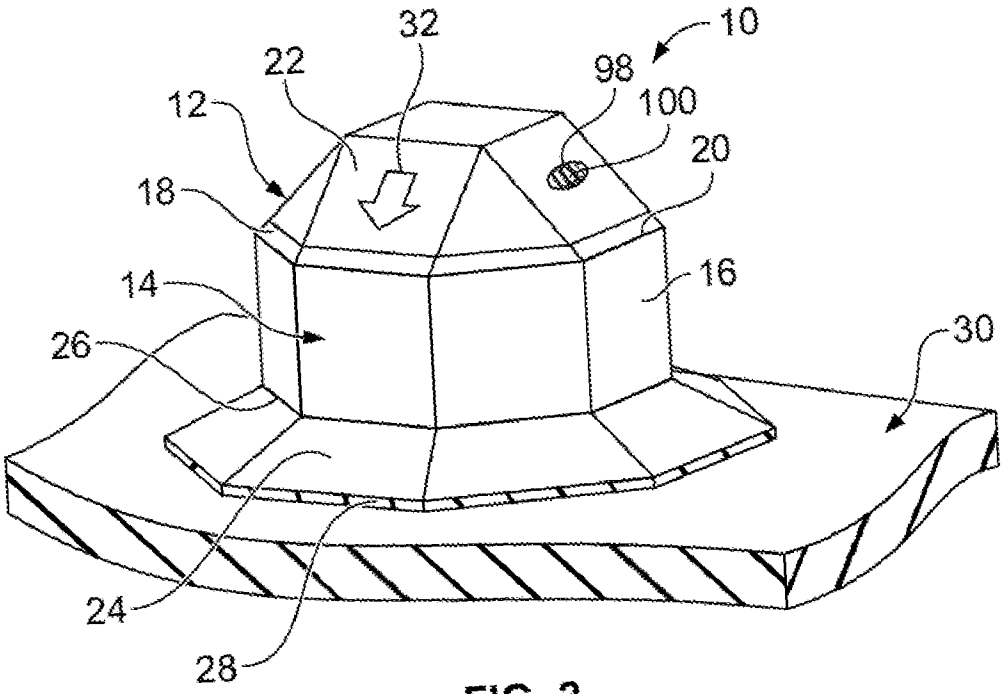
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FIG. 2

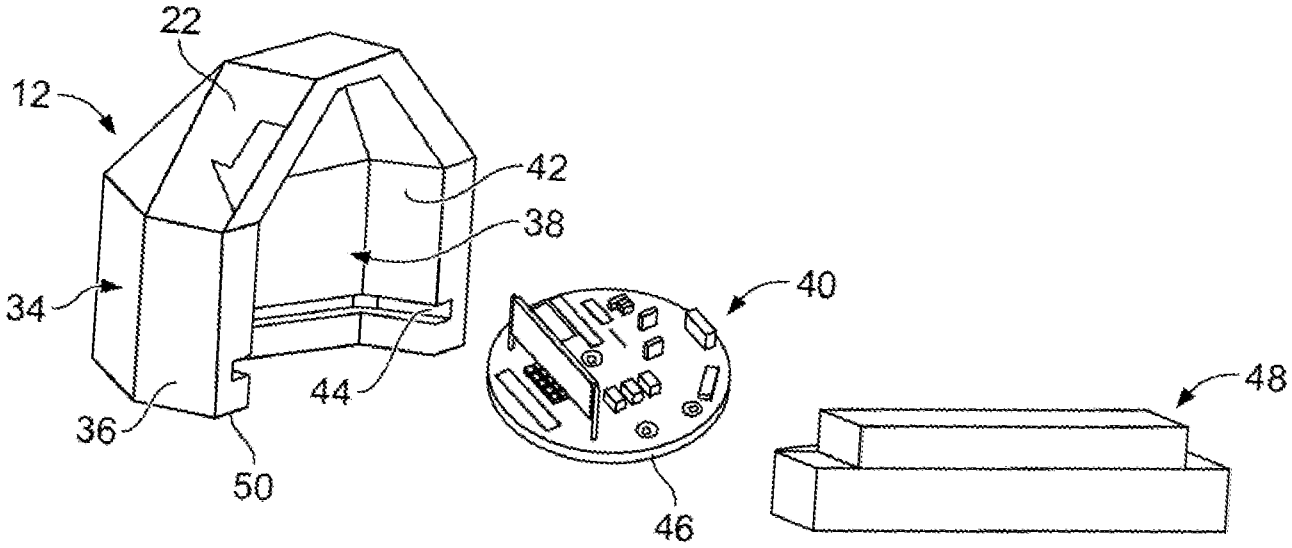


FIG. 3

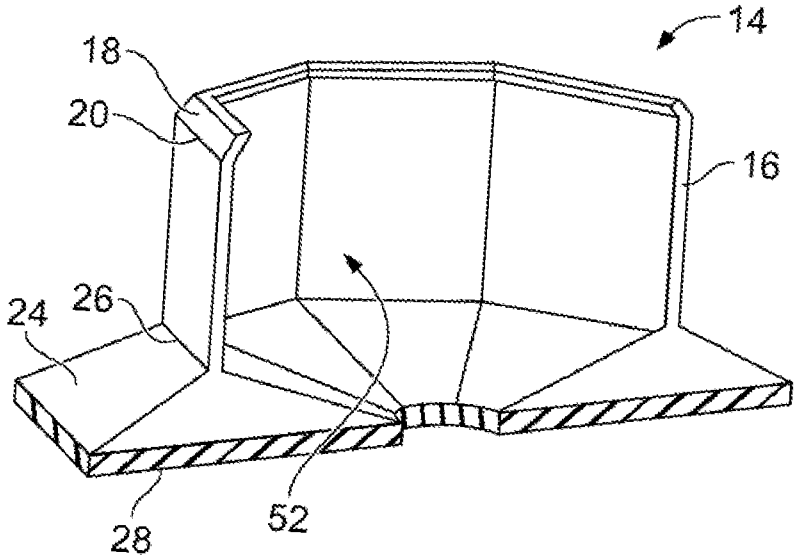


FIG. 4

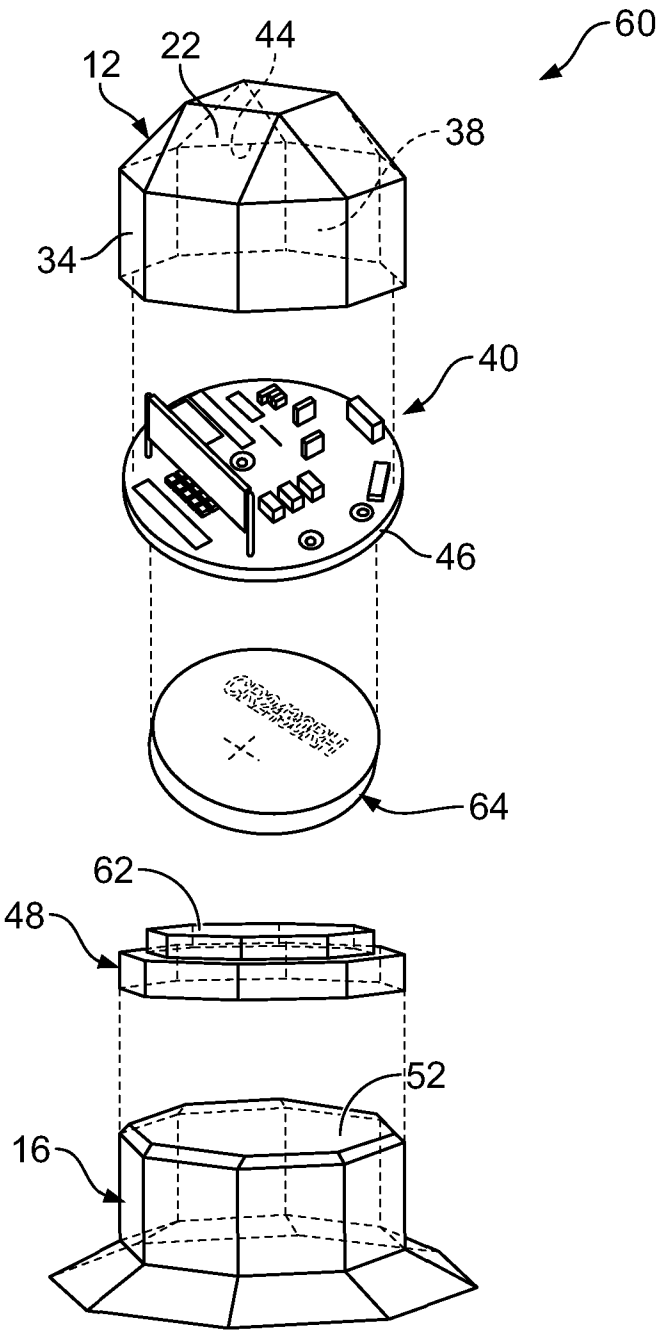


FIG. 5

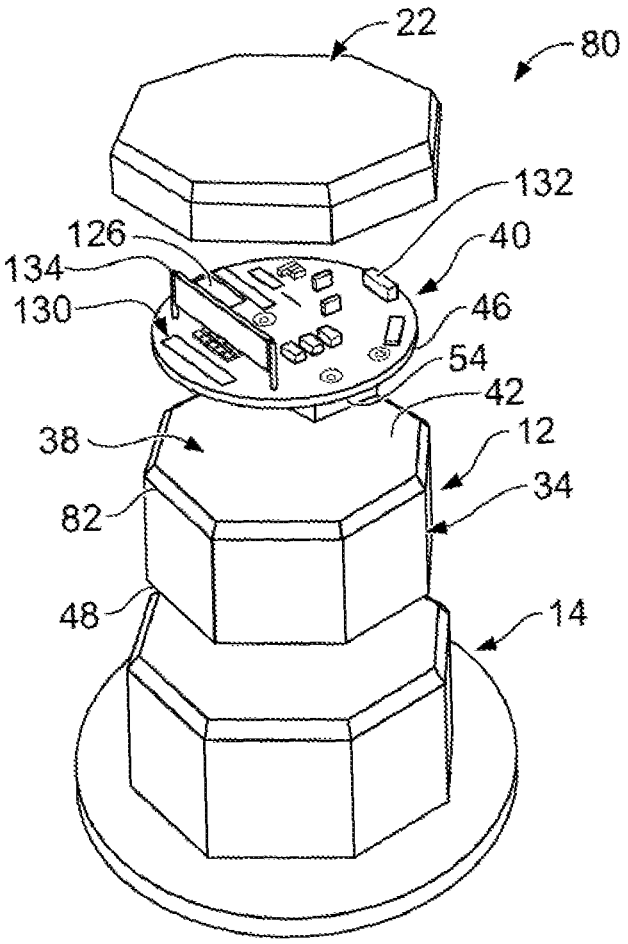


FIG. 6

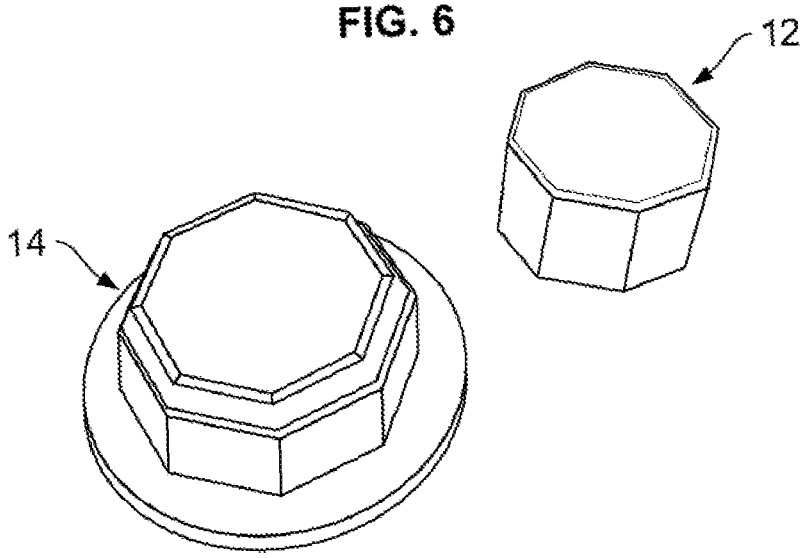


FIG. 7

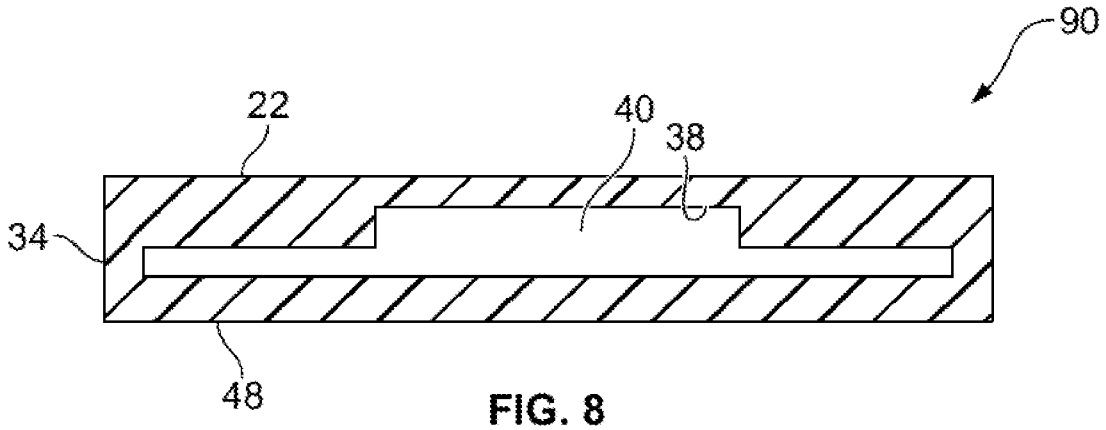


FIG. 8

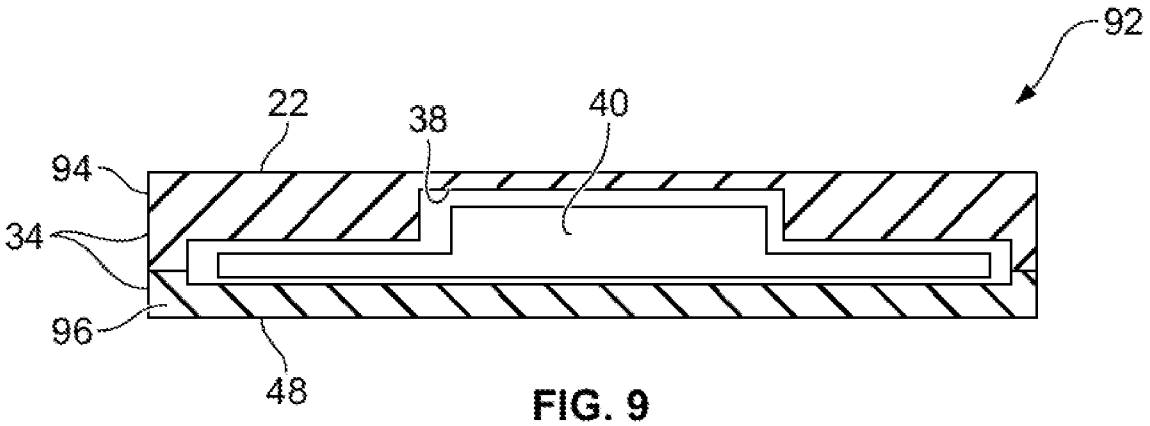


FIG. 9

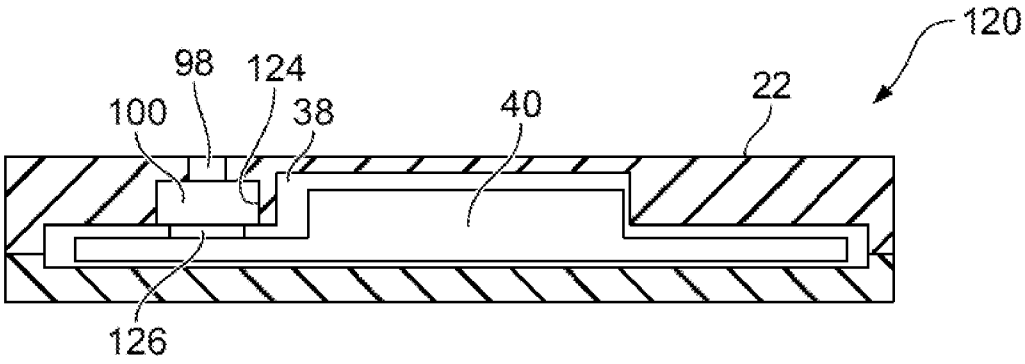
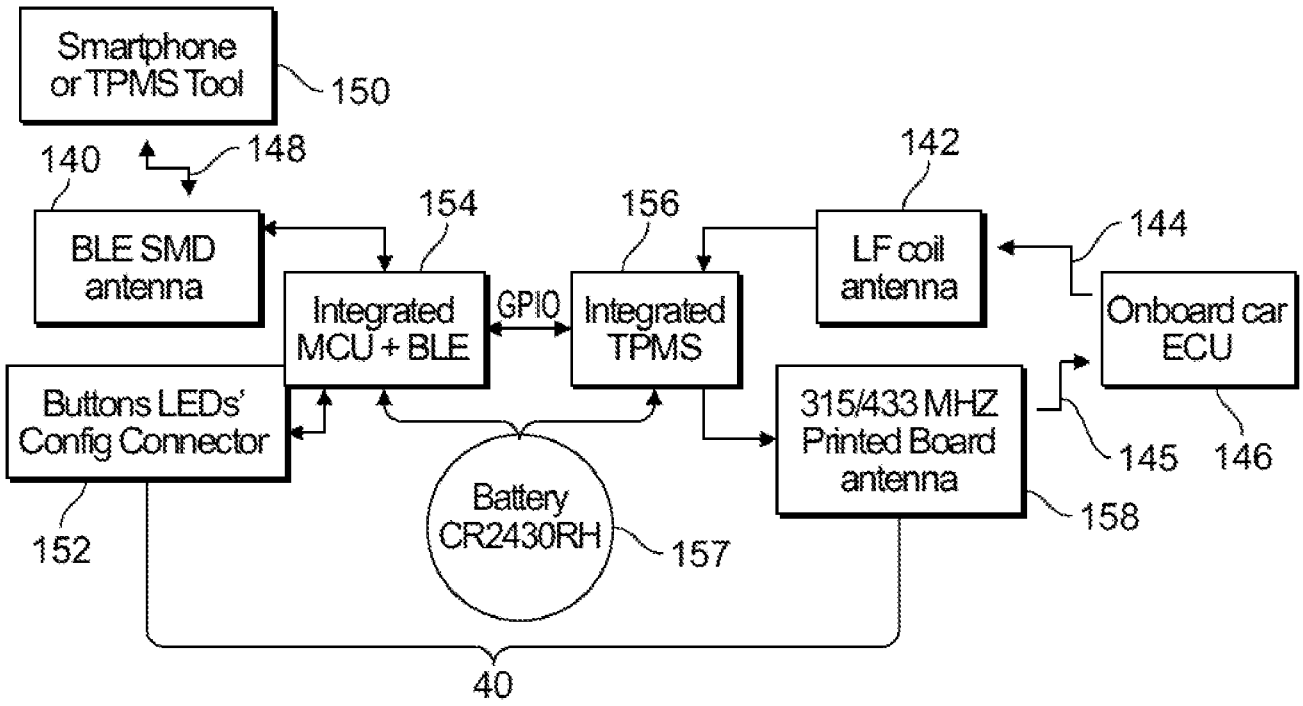


FIG. 10


Smartphone or TPMS Tool
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140
148
142
154
156
144
BLE SMD antenna
Integrated MCU + BLE
GPIO
Integrated TPMS
LF coil antenna
Onboard car ECU
Buttons LEDs' Config Connector
315/433 MHZ Printed Board antenna
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FIG. 11

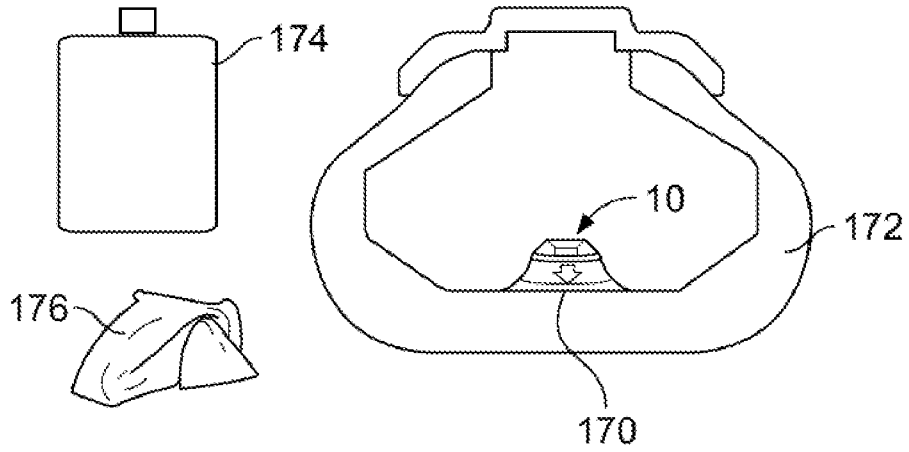
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FIG. 12

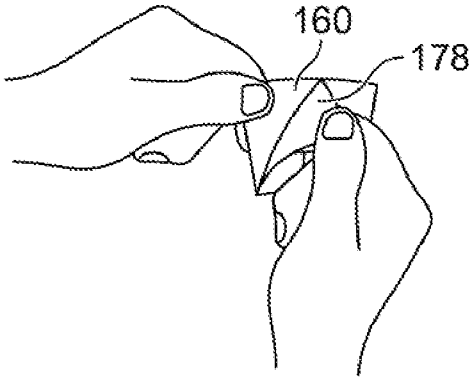

FIG. 13

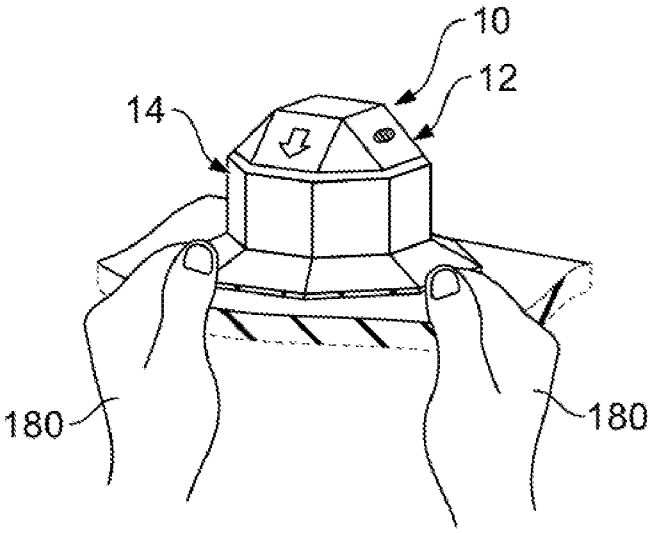

FIG. 14

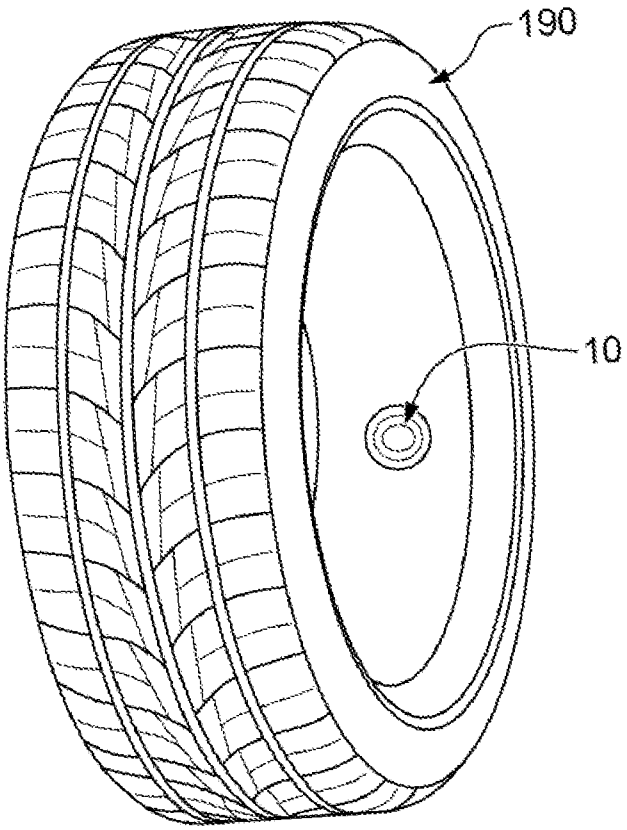

FIG. 15

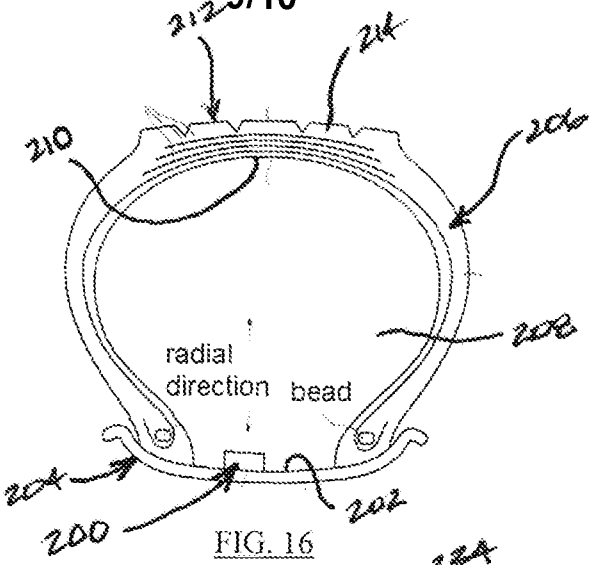

FIG. 16

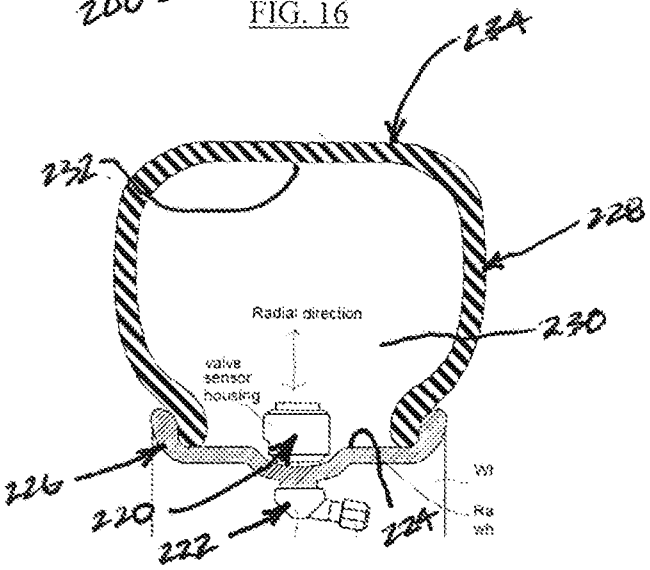

FIG. 17

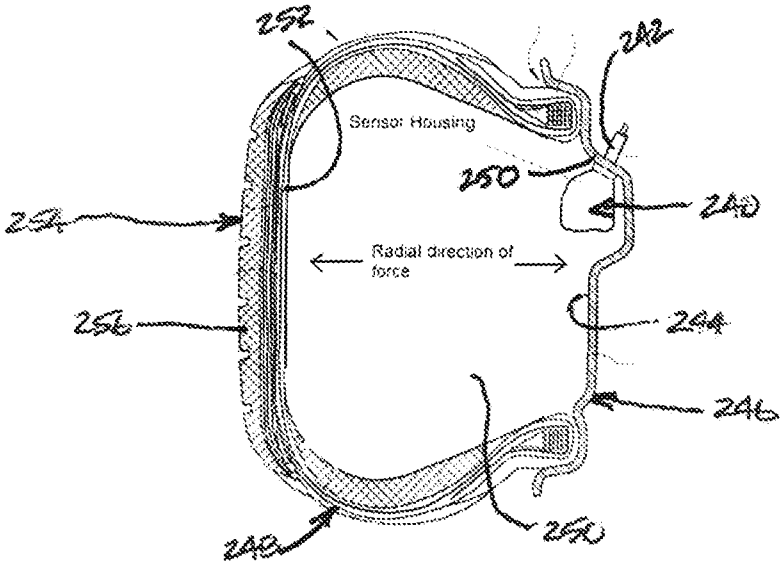

FIG. 18

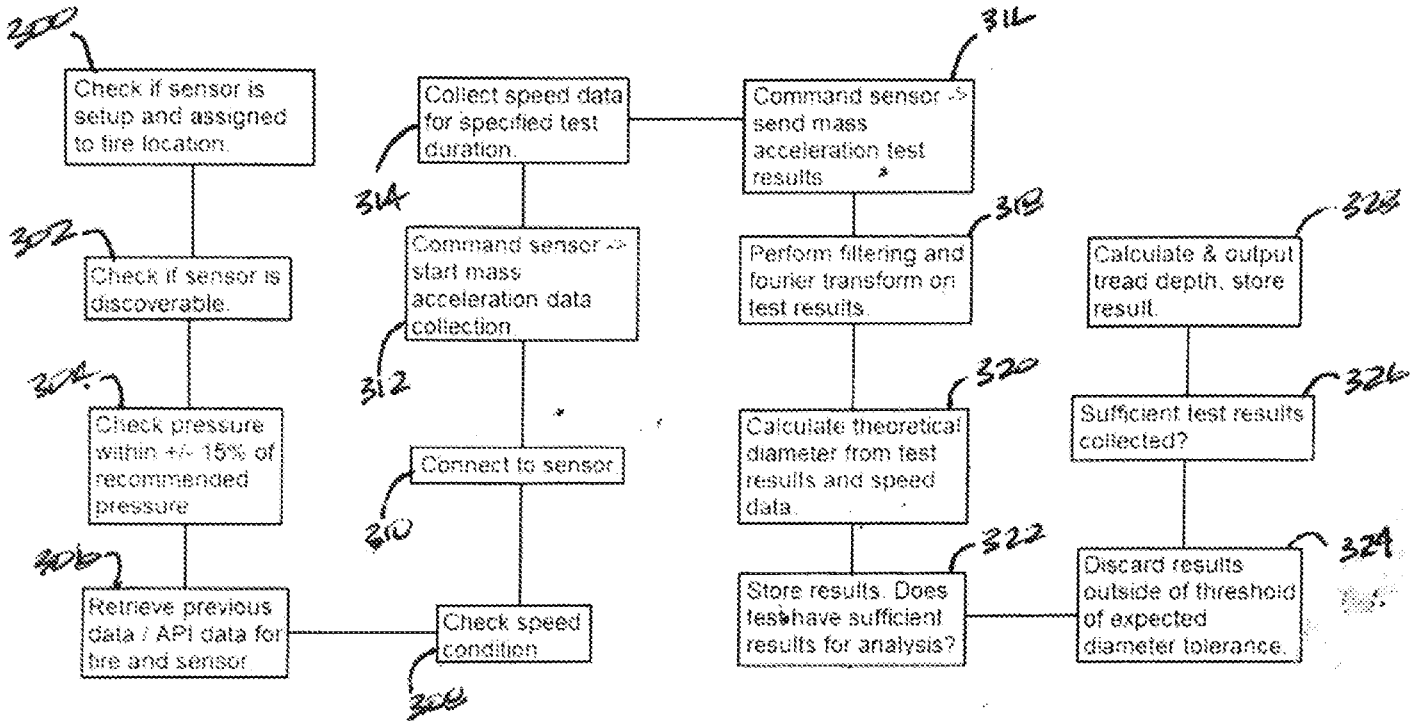
200
Check if sensor is setup and assigned to tire location.
202
Check if sensor is discoverable.
204
Check pressure within +/- 15% of recommended pressure
206
Retrieve previous data / API data for tire and sensor
208
Check speed condition
210
Connect to sensor
212
Command sensor -> start mass acceleration data collection
214
Collect speed data for specified test duration.
316
Command sensor -> send mass acceleration test results
318
Perform filtering and fourier transform on test results.
320
Calculate theoretical diameter from test results and speed data.
322
Store results. Does test have sufficient results for analysis?
324
Discard results outside of threshold of expected diameter tolerance.
326
Sufficient test results collected?
328
Calculate & output tread depth, store result.

FIG. 19

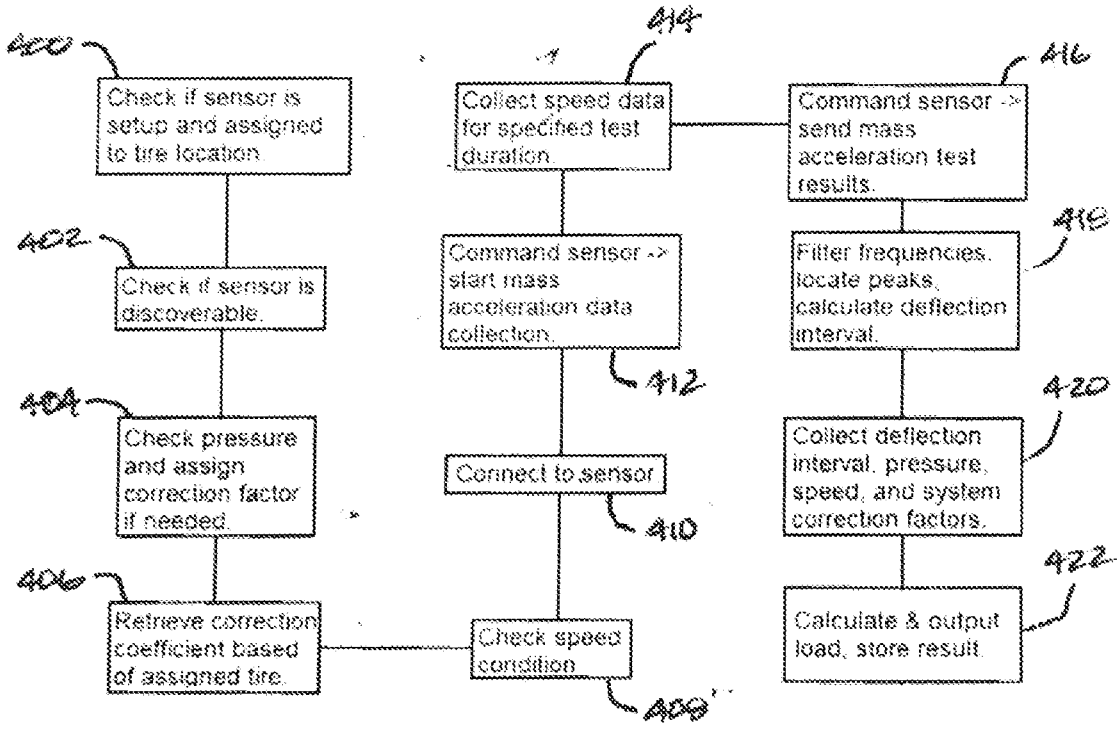
400
Check if sensor is setup and assigned to tire location
402
Check if sensor is discoverable.
404
Check pressure and assign correction factor if needed.
406
Retrieve correction coefficient based of assigned tire.
408
Check speed condition
410
Connect to sensor
412
Command sensor -> start mass acceleration data collection.
414
Collect speed data for specified test duration.
416
Command sensor -> send mass acceleration test results.
418
Filter frequencies, locate peaks, calculate deflection interval.
420
Collect deflection interval, pressure, speed, and system correction factors.
422
Calculate & output load, store result.

FIG. 20

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	Application Number	
Title of Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	

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

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor 1

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Keith	George	Ferry	

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

City	Burbank	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	200 East Angeleo Ave No. 319		
Address 2			
City	Burbank	State/Province	CA
Postal Code	91502	Country i	US

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

Correspondence Information:

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

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

Customer Number	125632		
Email Address	ipladocket@swlaw.com	Add Email	Remove Email
Email Address	glangton@swlaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT		
Attorney Docket Number	67838.01000	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	10	Suggested Figure for Publication (if any)	1

WEB ADS 1.0

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	Application Number	
Title of Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	

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	125632		

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	
					Remove
Registration Number					
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	
					Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

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Domestic Benefit/National Stage Information:

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

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation in part of	16671105	2019-10-31

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

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) 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	Filing Date (YYYY-MM-DD)	Access Code (if applicable)

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	67838.01000
	Application Number	
Title of Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	

Authorization or Opt-Out of Authorization to Permit Access:

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

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

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

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

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

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

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

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

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	67838.01000
	Application Number	
Title of Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	

Applicant Information:

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

Applicant 1

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:	
If the Applicant is an Organization check here. ☐	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Applicant:

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

Additional Applicant Data 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	67838.01000
	Application Number	
Title of Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	

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.

Assignee 1

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

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

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			

Additional Assignee or Non-Applicant Assignee Data 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	67838.01000
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Title of Invention	SENSOR ASSEMBLIES AND SYSTEMS FOR MONITORING A DYNAMIC OBJECT	

Signature:

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

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

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

Signature	/Grant T. Langton/			Date (YYYY-MM-DD)	
First Name	Grant T.	Last Name	Langton	Registration Number	39739

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

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