AO 120 (Rev. 08/10)

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

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

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

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:22-cv-00474	5/10/2022	for the Western District of Texas, Waco Division

PLAINTIFF	DEFENDANT
Auto Telematics Ltd.	United Services Automobile Association

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,311,271	4/12/2016	Auto Telematics Ltd.
2	9,633,487	4/25/2017	Auto Telematics Ltd.
3	10,192,369	1/29/2019	Auto Telematics Ltd.
4	10,198,879	2/5/2019	Auto Telematics Ltd.
5			

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

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

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

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

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

Print Save As... Reset

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.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	04/12/2016	9311271	044228.010200	1621

30734 7590 03/23/2016

BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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

The Patent Term Adjustment is 115 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

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

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

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

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

Andrew William Wright, Surrey, UNITED KINGDOM;

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.

PART B - FEE(S) TRANSMITTAL

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

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

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

30734 7590 12/15/2015
BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

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

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

Kajsa M. Bohman	(Depositor's name)
/Kajsa M. Bohman/	(Signature)
March 4, 2016	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	07/24/2013	Andrew William Wright	044228.010200	1621

TITLE OF INVENTION: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/15/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
PAIGE, TYLER D	3661	701-033400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

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

1 Baker&Hostetler LLP
2
3

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

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

(A) NAME OF ASSIGNEE: Andrew William Wright and Gillian Switalski

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Wentworth, United Kingdom

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

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 502036 (enclose an extra copy of this form).

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 /Mark H. Krietzman/ Date March 4, 2016
Typed or printed name Mark H. Krietzman Registration No. 41,128

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal					
Application Number:	13994455				
Filing Date:	24-Jul-2013				
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR				
First Named Inventor/Applicant Name:	Andrew William Wright				
Filer:	Mark Krietzman H/Kate Duttera				
Attorney Docket Number:	044228.010200				
Filed as Small Entity					
Filing Fees for U.S. National Stage under 35 USC 371					
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**

Electronic Acknowledgement Receipt	
EFS ID:	25106895
Application Number:	13994455
International Application Number:	
Confirmation Number:	1621
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Customer Number:	30734
Filer:	Mark Krietzman H/Kate Duttera
Filer Authorized By:	Mark Krietzman H
Attorney Docket Number:	044228.010200
Receipt Date:	04-MAR-2016
Filing Date:	24-JUL-2013
Time Stamp:	20:00:16
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$480
RAM confirmation Number	6662
Deposit Account	502036
Authorized User	KRIETZMAN, MARK
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 CFR 1.492 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 CFR 1.19 (Document supply fees)

Charge any Additional Fees required under 37 CFR 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 CFR 1.21 (Miscellaneous fees and charges)

Charge any Additional Fees required under 37 CFR 1.492(a) (basic national fee only)

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)	044228_010200_Issue_Fee_Transmittal_FINAL.pdf	94713 91e74c981832f9b0c2ea8b1640680cec2949e853	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30892 400353190e71e19ce489dc4d0fd79adf2c90a7d4	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	125605		

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
13/994,455	07/24/2013	Andrew William Wright	044228.010200

CONFIRMATION NO. 1621

30734
BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

POA ACCEPTANCE LETTER

OC000000080370264

Date Mailed: 02/08/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/25/2016.

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**.

/mabebe/

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

■ Practitioners associated with Customer Number: 30734

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

■ The address associated with Customer Number: 30734

OR

☐

Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address: Andrew William Wright and Gillian Swallow
18 Monks Road
Wentworth, DL25 4NB
United Kingdom

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	A W Wright	Date	8/12/2015
Name	Andrew William Wright	Telephone	+44 1344 864326
Title	Joint Assignee		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Andrew William Wright

Application No./Patent No.: 13/994,455 Filed/Issue Date: July 24, 2013

Titled: Method and System for Logging Vehicle Behavior

Andrew William Wright and Gillian Switalski, a inviduals

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

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

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

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

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

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

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

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

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

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

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

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 037121, Frame 0850, or for which a copy thereof is attached.

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

   1. From: _____ To: _____

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

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

   2. From: _____ To: _____

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

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

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

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

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

4. From: _____ To: _____

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

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

5. From: _____ To: _____

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

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

6. From: _____ To: _____

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

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

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

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

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

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

/Mark H. Krietzman/	January 25, 2016
Signature	Date
Mark H. Krietzman	41,128
Printed or Typed Name	Title or Registration Number

[Page 2 of 2]

Privacy Act Statement

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

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

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

Electronic Acknowledgement Receipt	
EFS ID:	24713374
Application Number:	13994455
International Application Number:	
Confirmation Number:	1621
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Customer Number:	30734
Filer:	Mark Krietzman H/Kate Duttera
Filer Authorized By:	Mark Krietzman H
Attorney Docket Number:	044228.010200
Receipt Date:	25-JAN-2016
Filing Date:	24-JUL-2013
Time Stamp:	14:48:23
Application Type:	U.S. National Stage under 35 USC 371

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		010200_CorrectedPapers_AsFiled.PDF	88446 9a71ee7a9d6e4acb5c69b3753a3bb8406853af5d	yes	3

	Multipart Description/PDF files in .zip description				
	Document Description	**Start**	**End**		
	Applicant Response to Pre-Exam Formalities Notice	1	1		
	Drawings-only black and white line drawings	2	2		
	Applicant Arguments/Remarks Made in an Amendment	3	3		
Warnings:					
Information:					
2	Drawings-only black and white line drawings	044228_010200_Replacement_Sheets.PDF	103476 1f285d80dc0d6d92adbd4e8f8f4b83bb596b20a0	no	3
Warnings:					
Information:					
3	Power of Attorney	010200_Executed_POA.PDF	242143 a6c219ec69c87617dced00cb1b4e01e753d907aa	no	1
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	373cStatement_AsFiled.PDF	118043 a3182dcfd3fe8bd40b89b9b77018fb1f04e00ba4	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	552108		

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

In re Application of: Andrew William Wright	Confirmation No.: 1621
Application No.: 13/994,455	Group Art Unit: 3661
Filing Date: July 24, 2013	Examiner: Tyler D. Paige

For: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

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

RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

Dear Commissioner:

In response to the Notice to File Corrected Application Papers received January 4, 2016, the applicants have filed corrections as indicated below:

☐ **Amendments to the Specification** begin on page __ of this paper.

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

☒ **Amendments to the Drawings** begin on page 2 of this paper and include an attached replacement sheet.

☒ **Remarks** begin on page 3 of this paper.

AMENDMENTS TO THE DRAWINGS

Replacement sheets for the drawings of Fig. 4b, 17, and 18 are provided.

REMARKS

Applicant hereby submits three (3) replacement sheets for Fig. 4b, 17, and 18 for subject patent application. No new matter has been added.

The Commissioner is hereby authorized to charge any fee deficiency, charge any additional fees, or credit any overpayment of fees, associated with this application in connection with this filing, or any future filing, submitted to the U.S. Patent and Trademark Office during the pendency of this application, to Deposit Account No. 50-2036.

Respectfully submitted,

Date: January 25, 2016

/Mark H. Krietzman/
Mark H. Krietzman
Registration No. 41,128

Baker & Hostetler LLP
600 Anton Boulevard, Suite 900
Costa Mesa CA 92626
United States of America
mkrietzman@bakerlaw.com
(714)754-6600

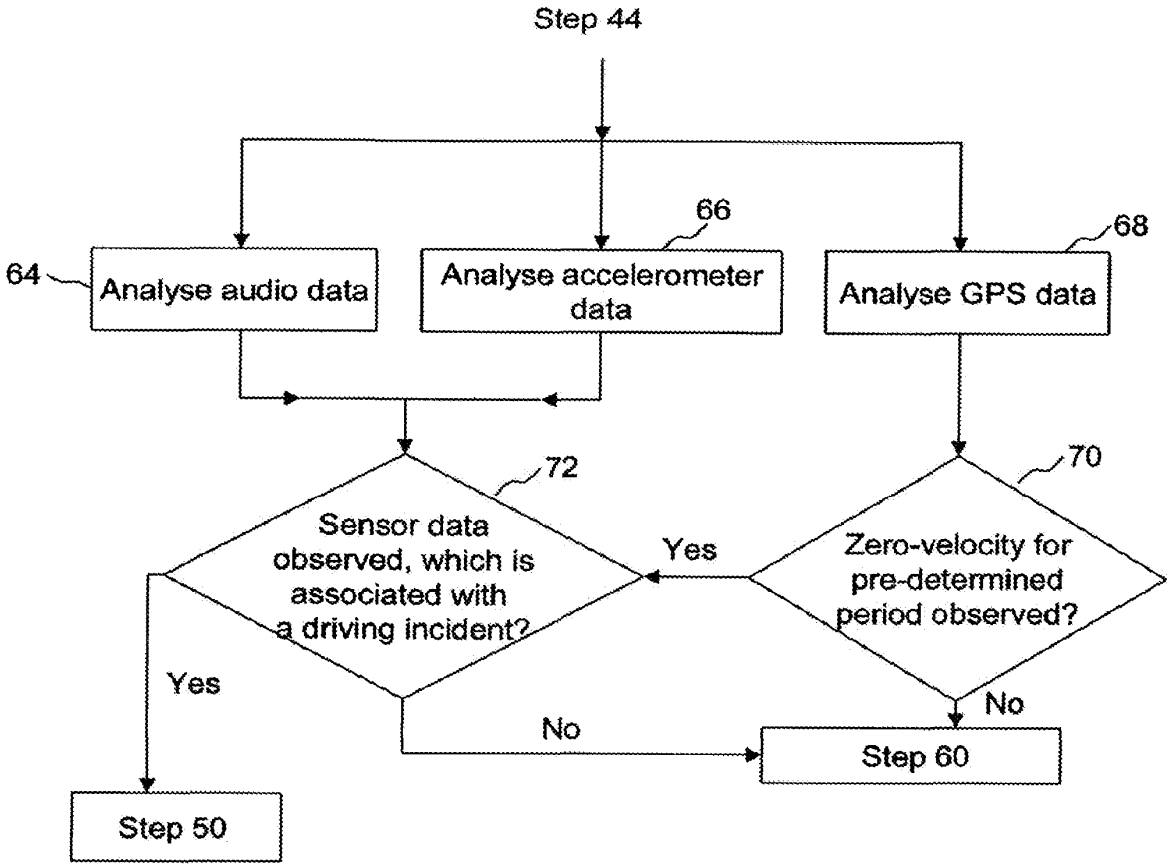

Step 44
64
Analyse audio data
66
Analyse accelerometer data
68
Analyse GPS data
72
Sensor data observed, which is associated with a driving incident?
70
Zero-velocity for pre-determined period observed?
Yes
Yes
No
No
Step 50
Step 60

Fig. 4b

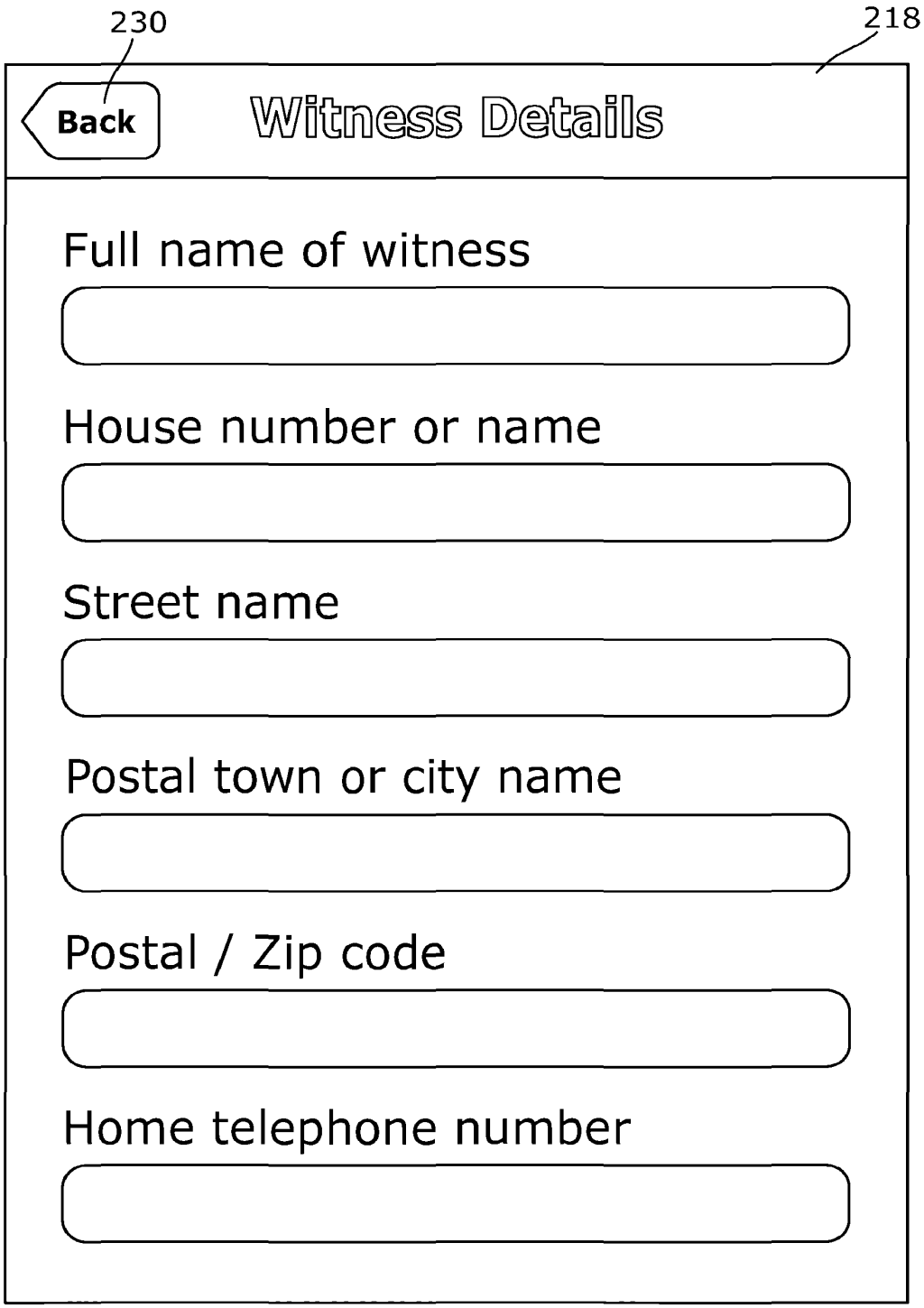

230
218
Back
Witness Details
Full name of witness
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number

Fig. 17

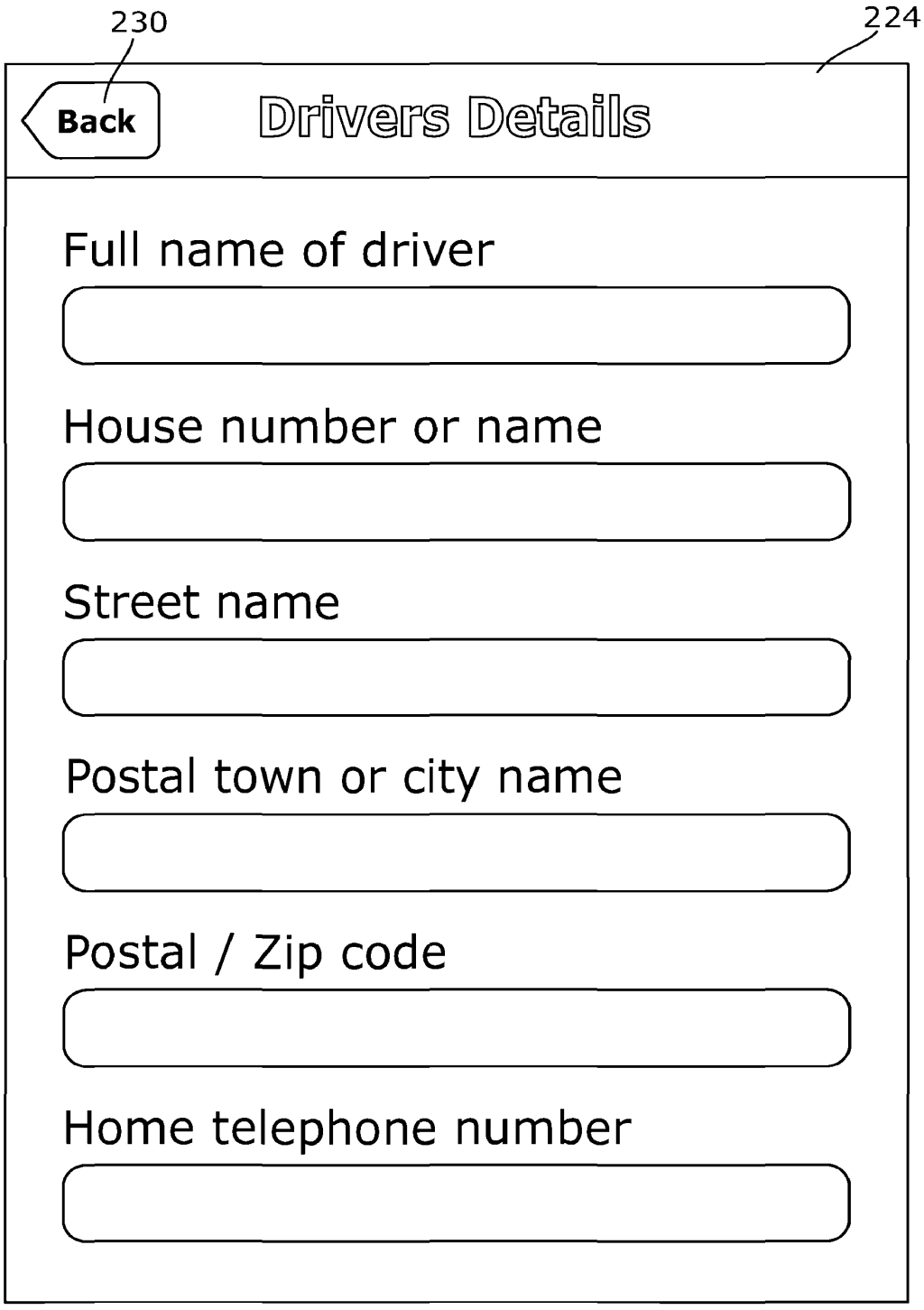

230
224
Back
Drivers Details
Full name of driver
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number

Fig. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	07/24/2013	Andrew William Wright	044228.010200	1621

30734 7590 01/04/2016

BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

EXAMINER
PAIGE, TYLER D

ART UNIT	PAPER NUMBER
3661	

NOTIFICATION DATE	DELIVERY MODE
01/04/2016	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):

eofficemonitor@bakerlaw.com
edervis@bakerlaw.com
patents@bakerlaw.com

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 13994455
Applicant : Wright
Filing Date : 07/24/2013
Date Mailed : 01/04/2016

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

/Kam Sin/
Publication Branch
Office of Data Management
(571) 272-4200

Application No. 13994455 **Drawings filed: 06/14/2013**

IDENTIFICATION OF DRAWING DEFICIENCIES

- [ ] There is a hole or the image thereof within the illustration. FIG(s)
- [ ] The illustration is penetrated or traversed by a solid or broken line that is not intended to be part of the drawing, such as a dark line caused by a flaw in the copying process. FIG(s)
- [ ] An ink stamp or the image thereof obscures part of the illustration. FIG(s)
- [ ] The drawing is marred by black smudges, obliterations, or fax/copier marks (for example, speckles or dots in a substantial portion of the drawing). FIG(s)
- [X] Figure numbers are duplicated or missing. FIG(s) 4b missing
- [ ] Drawing sheet or figure is missing. FIG(s)
- [ ] Numbers, letters, or reference characters in the drawing have been crossed out or are illegibly handwritten. FIG(s)
- [ ] The character of the lines, numbers, and letters is poor. FIG(s)
- [ ] The drawing's background shows that the original drawing was made on graph paper or other paper with a pattern or decoration. FIG(s)
- [ ] The FIG. number label is placed in a location that causes the drawing to be read upside down. FIG(s)
- [X] Data, a reference number, or part of the drawing is truncated or missing, or a lead line has no reference number. FIG(s) 17, 18
- [ ] The drawing and/or the FIG. label contain(s) foreign language. FIG(s)
- [ ] This utility application contains a photograph of a view that is capable of being illustrated as a line drawing. FIG(s)
- [ ] A petition under 37 CFR 1.84(a)(2) to accept color drawings has been granted, but the brief description of the drawings in the specification does not contain (or has not been amended to contain) the paragraph required by 37 CFR 1.84(a)(2)(iii).
- [ ] This reissue application contains added and/or amended drawings that are not labeled as “New” or “Amended” or “Canceled” as required by 37 CFR 1.173(b)(3). FIG(s)
- [ ] This Design reissue application contains a drawing that is labeled as “Canceled” but is not surrounded by brackets, or a drawing that is surrounded by brackets but is not labeled as “Canceled.” See 37 CFR 1.173(b)(3). FIG(s)
- [ ] OTHER:
- [ ] COMMENTS:

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

30734 7590 12/15/2015

BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

EXAMINER
PAIGE, TYLER D

ART UNIT	PAPER NUMBER
3661	

DATE MAILED: 12/15/2015

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	07/24/2013	Andrew William Wright	044228.010200	1621

TITLE OF INVENTION: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/15/2016

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 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity 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 and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

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

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

PART B - FEE(S) TRANSMITTAL

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

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

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

30734 7590 12/15/2015
BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

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

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

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	07/24/2013	Andrew William Wright	044228.010200	1621

TITLE OF INVENTION: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/15/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
PAIGE, TYLER D	3661	701-033400

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
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 has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

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

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

4a. The following fee(s) are submitted:
❑ Issue Fee
❑ Publication Fee (No small entity discount permitted)
❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)
❑ A check is enclosed.
❑ Payment by credit card. Form PTO-2038 is attached.
❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
❑ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

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

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	07/24/2013	Andrew William Wright	044228.010200	1621

30734 7590 12/15/2015

BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

EXAMINER	
PAIGE, TYLER D	

ART UNIT	PAPER NUMBER
3661	

DATE MAILED: 12/15/2015

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.

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 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. 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. 13/994,455	Applicant(s) WRIGHT, ANDREW WILLIAM	
	Examiner TYLER PAIGE	Art Unit 3661	AIA (First Inventor to File) Status No

-- 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 *11/23/2015*.
   ☐ 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 *3-7,18 and 19*. 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 *attached claims*.

/T. P./ Examiner, Art Unit 3661	/Thomas G Black/ Supervisory Patent Examiner, Art Unit 3661

DETAILED ACTION

Examiner's Amendment/ Reason's for Allowance

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee. The claim numbers are the final claim numbers, and not the originals. The previous amendments from 11/23/2015 are incorporated. The applicant stated in the response that claim 17 was cancelled, however, applicant also included the claim as "Previously Presented" in the listing of the claims. It appears applicant intended to cancel the claim, no arguments were directed to the claim, therefore the amendment below seeks to clarify the record.

Examiner's Amendment

2. Claim 17 has been cancelled.

Allowable Subject Matter

3. The present application is being examined under the pre-AIA first to invent provisions.

4. Claims 3 - 7, 18 - 19 are allowed.

5. The following is an Examiner's Statement for reasons for allowance. None of the references of record either alone or in combination teaches or suggest the following limitations as claimed in claim 3, a mobile device that is removably attached to a vehicle that measures and records the driving period of a vehicle once it has crossed a threshold speed and occurs automatically. This limitation, in combination with the other elements of the claim, is not shown or suggested in the prior art of record.

6. None of the references of record either alone or in combination teaches or suggest the following limitations as claimed in claim 6, a mobile device that is removably attached to a vehicle that measures and records the driving period of a vehicle once it has crossed a threshold speed and occurs automatically, the application is downloadable and information is derived from data gathered from sensors other than the vehicles, and the data is compared from subsequent driving periods. This limitation, in combination with the other elements of the claim, is not shown or suggested in the prior art of record.

7. None of the references of record either alone or in combination teaches or suggest the following limitations as claimed in claim 18, a data logging system that records driving information from a remote mobile communication device, a database stores the unique information of the drivers and automobiles, the driving information is stored to each account with collection of information from sensors other than from the vehicle, and the driving information has a respective score covering a period where the

vehicle is traveling faster than a threshold speed. This limitation, in combination with the other elements of the claim, is not shown or suggested in the prior art of record.

8. None of the references of record either alone or in combination teaches or suggest the following limitations as claimed in claim 19, a data logging system that records driving information from a remote mobile communication device, a database stores the unique information of the drivers and automobiles, the driving information is stored to each account with collection of information from sensors other than from the vehicle, and the driving information has a respective score covering a period where the vehicle is traveling faster than a threshold speed, and the score is used to determine an insurance premium. This limitation, in combination with the other elements of the claim, is not shown or suggested in the prior art of record.

9. 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 submission 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 TYLER PAIGE whose telephone number is (571)270-5425. The examiner can normally be reached on 7:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Black can be reached on 571-272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/T. P./
Examiner, Art Unit 3661

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	Art Unit
	TYLER PAIGE	3661

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner
G07C5/008;G06Q40/08; G08G1/0175;		

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
701	33.4	03/18/2015	tdp
705	4	03/18/2015	tdp
434	65	03/18/2015	tdp

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Search	03/18/2015	tdp
East Search	03/18/2015	tdp
Plus Search	03/18/2015	tdp
NPL Search	03/18/2015	tdp

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
701	33.4	12/06/2015	tdp
705	4	12/06/2015	tdp
434	65	12/06/2015	tdp

/T.P./ Examiner.Art Unit 3661	

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Cancelled)

2. (Cancelled)

3. (Currently Amended) ~~A mobile telecommunications device according to claim 1~~A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;

a user interface;

a processor; and

a memory;

the mobile device configured to:

determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven;

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors; and,

wherein the mobile communications device is controlled by a downloaded application to control the mobile device to register the start of the driving period in response to an initialization input generated automatically in response to the sensor data having predetermined values, wherein the initialization input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.

4. (Currently Amended) A mobile telecommunications device according to claim [[1]] 3, wherein the mobile communications device is further configured to register the attachment of the mobile device to the vehicle and determine a match between a location of the mobile device and a location of the vehicle.

5. (Currently Amended) A mobile telecommunications device according to claim [[1]] 3, wherein the mobile communications device is controlled by a downloaded application to control the mobile device to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data at said second sampling rate.

6. (Currently Amended) ~~A mobile telecommunications device according to claim 1~~A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;

a user interface;

a processor; and

a memory;

the mobile device configured to:

determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven,

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors; and,

wherein the mobile communications device is controlled by a downloaded application to control the mobile device to process the sensor data from the sensor set during a plurality of

driving periods to derive driving information associated with how the vehicle is driven during the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

7. (Previously Presented) A mobile telecommunications device according to claim 6, wherein the mobile communications device is further configured to:

detect occurrence of a predetermined event by correlating the sensor data against at least one event indication model, the at least one event indication model comprising a set of predetermined data values that are compared against corresponding sensor data; and

modify the at least one event indication model in response to the benchmark.

8-16. (Cancelled)

17. (Previously Presented) A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts; and,

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors.

18. (Currently Amended) ~~A data-logging system according to claim 17,~~ A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts;

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors; and,

wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached to the vehicle being driven by the driver, the data logging system being further arranged to process the driving information logged to a corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver.

19. (Currently Amended) ~~A data-logging system according to claim 18,~~ A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts;

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors; and,

wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached to the vehicle being driven by the driver, the data logging system being further arranged to process the driving information logged to a corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver; and,

wherein the driving score is used to define an insurance premium associated with the account and the data logging system is further arranged to communicate to the remote mobile telecommunication device an insurance offer generated in response to the driving information received from the remote mobile telecommunications device.

20. (Cancelled)

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	Art Unit
	TYLER PAIGE	3661

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

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

CLAIM		DATE								
Final	Original	03/18/2015	09/14/2015	12/06/2015						
	1	✓	✓	-						
	2	✓	✓	-						
1	3	✓	O	=						
2	4	✓	O	=						
3	5	✓	O	=						
4	6	✓	O	=						
5	7	✓	O	=						
	8	✓	O	-						
	9	✓	O	-						
	10	✓	O	-						
	11	✓	O	-						
	12	✓	O	-						
	13	✓	O	-						
	14	✓	O	-						
	15	✓	O	-						
	16	✓	O	-						
	17	✓	✓	=						
6	18	✓	O	=						
7	19	✓	O	=						
	20	✓	✓	-						

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	**Art Unit**
	TYLER PAIGE	3661

CPC						
Symbol					**Type**	**Version**
G06F		17	/	00	F	2013-01-01
G07C		5	/	008	I	2013-01-01
G07C		5	/	0858	I	2013-01-01
G07C		5	/	0866	A	2013-01-01
H04M		1	/	72527	A	2013-01-01
G09B		19	/	14	I	2013-01-01
			/			
			/			
			/			
			/			
			/			
			/			
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			/			

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

/T.P./ Examiner.Art Unit 3661	12/06/2015	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	7	
/THOMAS G BLACK/ Supervisory Patent Examiner.Art Unit 3661	12/08/2015	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	3	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	**Art Unit**
	TYLER PAIGE	3661

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION														
CLASS	SUBCLASS	CLAIMED									NON-CLAIMED					
701	33.4	G	0	6	F	7 / 00 (2006.01.01)										
CROSS REFERENCE(S)		G	0	6	Q	40 / 00 (2012.01.01)										
		G	0	9	B	9 / 04 (2006.01.01)										
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)															
705	4															
434	65															

/T.P./ Examiner.Art Unit 3661 (Assistant Examiner)	12/06/2015 (Date)	**Total Claims Allowed:** 7	
/THOMAS G BLACK/ Supervisory Patent Examiner.Art Unit 3661 (Primary Examiner)	12/08/2015 (Date)	O.G. Print Claim(s) 3	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	**Art Unit**
	TYLER PAIGE	3661

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

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	-	17												
-	2	6	18												
1	3	7	19												
2	4	-	20												
3	5														
4	6														
5	7														
-	8														
-	9														
-	10														
-	11														
-	12														
-	13														
-	14														
-	15														
-	16														

/T.P./ Examiner.Art Unit 3661	12/06/2015	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	7	
/THOMAS G BLACK/ Supervisory Patent Examiner.Art Unit 3661	12/08/2015	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	3	1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: **Andrew William Wright**	**Confirmation No.: 1621**
Application No.: 13/994,455	**Group Art Unit: 3661**
Filing Date: July 24, 2013	**Examiner: Paige, Tyler D.**

For: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

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

Dear Commissioner:

REPLY PURSUANT TO 37 CFR § 1.116

In response to the Official Action dated **September 23, 2015**, reconsideration is respectfully requested in view of the amendments and/or remarks as indicated below:

☐ **Amendments to the Specification** begin on page of this paper.

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

☐ **Amendments to the Drawings** begin on page of this paper and include an attached replacement sheet.

☒ **Remarks** begin on page 7 of this paper.

☒ The Commissioner is hereby authorized to charge any fee deficiency, charge any additional fees, or credit any overpayment of fees, associated with this application in connection with this filing, or any future filing, submitted to the U.S. Patent and Trademark Office during the pendency of this application, to Deposit Account No. 23-3050.

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Cancelled)

2. (Cancelled)

3. (Currently Amended) ~~A mobile telecommunications device according to claim 1~~A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;

a user interface;

a processor; and

a memory;

the mobile device configured to:

determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven;

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors; and,

wherein the mobile communications device is controlled by a downloaded application to control the mobile device to register the start of the driving period in response to an initialization input generated automatically in response to the sensor data having predetermined values, wherein the initialization input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.

4. (Currently Amended) A mobile telecommunications device according to claim [[1]] 3, wherein the mobile communications device is further configured to register the attachment of the mobile device to the vehicle and determine a match between a location of the mobile device and a location of the vehicle.

5. (Currently Amended) A mobile telecommunications device according to claim [[1]] 3, wherein the mobile communications device is controlled by a downloaded application to control the mobile device to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data at said second sampling rate.

6. (Currently Amended) ~~A mobile telecommunications device according to claim 1~~A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;

a user interface;

a processor; and

a memory;

the mobile device configured to:

determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven,

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors; and,

wherein the mobile communications device is controlled by a downloaded application to control the mobile device to process the sensor data from the sensor set during a plurality of

driving periods to derive driving information associated with how the vehicle is driven during the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

7. (Previously Presented) A mobile telecommunications device according to claim 6, wherein the mobile communications device is further configured to:

detect occurrence of a predetermined event by correlating the sensor data against at least one event indication model, the at least one event indication model comprising a set of predetermined data values that are compared against corresponding sensor data; and

modify the at least one event indication model in response to the benchmark.

8-16. (Cancelled)

17. (Previously Presented) A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts; and,

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors.

18. (Currently Amended) ~~A data-logging system according to claim 17,~~ A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts;

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors; and,

wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached to the vehicle being driven by the driver, the data logging system being further arranged to process the driving information logged to a corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver.

19. (Currently Amended) ~~A data-logging system according to claim 18,~~ A data-logging system for logging driving information received from a remote mobile telecommunications device, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts;

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors; and,

wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached to the vehicle being driven by the driver, the data logging system being further arranged to process the driving information logged to a corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver; and,

wherein the driving score is used to define an insurance premium associated with the account and the data logging system is further arranged to communicate to the remote mobile telecommunication device an insurance offer generated in response to the driving information received from the remote mobile telecommunications device.

20. (Cancelled)

REMARKS

Claim Rejections

Claims 1, 2, 17, and 20 have been cancelled.

ALLOWABLE SUBJECT MATTER

Claims 3-16, 18, and 19 were identified as being allowable if rewritten in independent form including all of the limitations of the case claim and any intervening claims. Claim 3 has been amended to include the limitations of claim 1. Claims 4, 5, 6, 8, and 13 have been amended to depend from claim 3 instead of claim 1. Claims 18 and 19 have been amended to include the limitations of intervening claims.

Date: November 23, 2015

/Mark H. Krietzman/
Mark H. Krietzman
Registration No. 41,128

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600 Anton Blvd., Suite 900
Costa Mesa, CA 92626
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Facsimile: (714) 754-6611

Electronic Acknowledgement Receipt

EFS ID:	24166651
Application Number:	13994455
International Application Number:	
Confirmation Number:	1621
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Customer Number:	30734
Filer:	Mark Krietzman H/Kate Duttera
Filer Authorized By:	Mark Krietzman H
Attorney Docket Number:	044228.010200
Receipt Date:	23-NOV-2015
Filing Date:	24-JUL-2013
Time Stamp:	16:49:38
Application Type:	U.S. National Stage under 35 USC 371

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		044228_010200_Response_to_Final_AsFiled.PDF	103895 70962f2be6064f7cb2fd9e7f2bc5e0cc8f9e0dc2	yes	7

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	7
Warnings:			
Information:			
	Total Files Size (in bytes):	103895	

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/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 13/994,455	Filing Date 07/24/2013	☐ 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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $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

AMENDMENT 11/23/2015	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 8	Minus	** 20	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 5	Minus	***3	= 2	X $210 =	420
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	**420**

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/TARA WASHINGTON/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	07/24/2013	Andrew William Wright	044228.010200	1621

30734 7590 09/23/2015

BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

EXAMINER	
PAIGE, TYLER D	

ART UNIT	PAPER NUMBER
3661	

NOTIFICATION DATE	DELIVERY MODE
09/23/2015	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):

eofficemonitor@bakerlaw.com
edervis@bakerlaw.com
patents@bakerlaw.com

Office Action Summary	Application No. 13/994,455	Applicant(s) WRIGHT, ANDREW WILLIAM	
	Examiner TYLER PAIGE	Art Unit 3661	AIA (First Inventor to File) Status No

-- 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 *07/27/2015*.

☐ 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) *1-20* is/are pending in the application.

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

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1,2,17 and 20* is/are rejected.

8)☒ Claim(s) *3-16,18 and 19* 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 *06/14/2013* 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: _____.

DETAILED ACTION

The present application is being examined under the pre-AIA first to invent provisions. This office action is in response to an amendment/argument submitted on 07/27/2015. The applicant amends numerous claims and does not submit a new Information Disclosure Statement.

Claim Rejections - 35 USC § 102

1. 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.

2. The following is a quotation of the appropriate paragraphs of pre-AIA 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 –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (**pre-AIPA** 35 U.S.C. 102(e)).

3. Claims 1, 2, and 17 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Ling US 8,140,358.

4. As per claim 1, A mobile telecommunications device configured to log driving information associated with a vehicle the mobile device comprising:

a sensor set comprising an image sensor, an audio sensor, an accelerometer or a positioning module, or a combination thereof; (Col 35 lines 25 – 36)

a user interface; (Col 5 lines 14 – 15)

a processor; and (Col 35 lines 25 – 36)

a memory the mobile device configured to:

determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use; (Col 16 lines 43 – 64 discloses the start of a trip) and (Abstract lines two and three disclose the device may be removable or portable.)

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; (Col 16 lines 43 – 64) and

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors. (Col 1 lines 35 – 49)

5. As per claim 2, A mobile telecommunications device according to claim 1, comprising an adapter arranged to hold the device securely to the vehicle. (Col 5 lines 14 – 16)

6. As per claim 17, A data-logging system for logging driving information received from a remote mobile telecommunications device the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver; (Col 31 lines 29 – 45)

a communications interface arranged to communicate with the remote mobile telecommunications device and receive therefrom: (Col 1 lines 44 – 47)

a unique identifier for association of the remote mobile telecommunications (Col 8 lines 41 – 43)

device with a corresponding one of the plurality of accounts; (Col 25 lines 48 – 50) and,

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors. (Col 16 lines 43 – 64 discloses the start of a trip)

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

A person shall be entitled to a patent unless –

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

8. Claim 20 is rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Hardy US 2007/0150139.

9. As per claim 20, A method of logging, by a mobile device comprising a processor, memory, a user interface, and a sensor set, driving information associated with a vehicle when driven, the method comprising: (paragraph 0010

determining, by the mobile device based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is being operated by a driver, the sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof; (paragraphs 0010, 0021 discloses , "The vehicle travel tracking system may be configured as a user portable electronic device and/or integrated into a vehicle electronic system.", 0021 discloses , "In addition, the vehicle travel tracking system is capable of receiving travel verification data from cameras, scanners, voice recorders, and bio-metric sensors, and the like."

processing sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and, (abstract discloses a trip which is the period of travel, paragraph 0026 discloses the processor)

storing a selection of the driving information to the memory of the mobile device, wherein the driving information is derived without data from vehicle sensors.(paragraphs 0021 discloses the sensors and 0026 discloses the memory.)

Allowable Subject Matter

10. Claims 3 – 16, 18, and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

11. Applicant's arguments filed 07/27/2015 have been fully considered but they are not persuasive. The applicant amends the claim to which they are broader. The art of record anticipates the independent claims as written, however, the dependent claims have features that if incorporated into the claims would overcome the art of record.

12. Specifically Independent claim 1, is anticipated by the art of record ling. Ling discloses, a telecommunications device that logs the driving information of a user. It further discloses a sensor set, a user interface, a processor, memory, it sets a start driving period, for which the device is removabley attached. Ling further discloses the features of a processor processing the sensor set during the driving period and stores the selected driving information, wherein the vehicle data is gathered. The claim does not identify further features or possess functional language for which to distinguish from the art of Ling. The device is essentially a handheld device that is able to record the driving operation of vehicle without specific features as to what information is gathered

through those sensors. Each specific feature of Ling what is disclosed is identified in the office action.

13. With respect to independent claim 20, the claim is heavily amended that precipitated new art applied in order to make an appropriate rejection. The discloses the active steps of determining a start period of operation of a vehicle on a trip based upon sensor information as the claim uses the conjunctive or, only one such sensor information is identified. Furthermore, the processing sensor data and storing data are disclosed in the art of record. The respective features of the art of record are identified in the office action.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TYLER PAIGE whose telephone number is (571)270-5425. The examiner can normally be reached on 7:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Black can be reached on 571-272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/T. P./
Examiner, Art Unit 3661

/Thomas G Black/
Supervisory Patent Examiner, Art Unit 3661

Notice of References Cited	Application/Control No. 13/994,455	Applicant(s)/Patent Under Reexamination WRIGHT, ANDREW WILLIAM	
	Examiner TYLER PAIGE	Art Unit 3661	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-4,992,943 A	02-1991	McCracken; Jack J.	G07C5/085	340/436
*	B	US-5,638,273 A	06-1997	Coiner; Ronald W.	G07C5/085	360/5
*	C	US-2006/0103513 A1	05-2006	Ihara; Toru	H04M1/04	340/435
*	D	US-2007/0135979 A1	06-2007	Plante; James	G07C5/008	701/33.4
*	E	US-2007/0150139 A1	06-2007	Hardy; Cynthia	G01C22/02	701/521
*	F	US-2007/0208503 A1	09-2007	Harnsberger; James	G06Q10/06	701/532
*	G	US-2009/0109037 A1	04-2009	FARMER; Bennie L.	G06Q20/102	340/576
*	H	US-2010/0131307 A1	05-2010	Collopy; Fred	G06Q30/0224	705/4
*	I	US-2010/0157061 A1	06-2010	Katsman; Igor	G07C5/0866	348/149
*	J	US-7,765,058 B2	07-2010	Doering; Jeff	B60R16/0236	340/425.5
*	K	US-7,908,191 B1	03-2011	Dinamani; Vidya	G01C22/02	340/988
*	L	US-2011/0112717 A1	05-2011	Resner; Benjamin	G07C5/008	701/31.4
*	M	US-2011/0117856 A1	05-2011	Veluppillai; Mahinthan	H04W36/32	455/67.11

FOREIGN PATENT DOCUMENTS

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

Notice of References Cited	Application/Control No. 13/994,455	Applicant(s)/Patent Under Reexamination WRIGHT, ANDREW WILLIAM	
	Examiner TYLER PAIGE	Art Unit 3661	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-8,140,358 B1	03-2012	Ling; Raymond Scott	G06Q40/08	340/439
*	B	US-2012/0072244 A1	03-2012	Collins; Dean	G06Q40/08	705/4
*	C	US-2013/0060583 A1	03-2013	Collins; Dean M.	G06Q40/08	705/4
*	D	US-2013/0302758 A1	11-2013	Wright; Andrew William	G07C5/008	434/65
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

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	S					
	T					

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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	Art Unit
	TYLER PAIGE	3661

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner
G07C5/008;G06Q40/08; G08G1/0175;		

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
701	33.4	03/18/2015	tdp

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Search	03/18/2015	tdp
East Search	03/18/2015	tdp
Plus Search	03/18/2015	tdp
NPL Search	03/18/2015	tdp

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	Art Unit
	TYLER PAIGE	3661

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

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

CLAIM		DATE								
Final	Original	03/18/2015	09/14/2015							
	1	✓	✓							
	2	✓	✓							
	3	✓	O							
	4	✓	O							
	5	✓	O							
	6	✓	O							
	7	✓	O							
	8	✓	O							
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	11	✓	O							
	12	✓	O							
	13	✓	O							
	14	✓	O							
	15	✓	O							
	16	✓	O							
	17	✓	✓							
	18	✓	O							
	19	✓	O							
	20	✓	✓							

DOCKET NO.: 044228.010200 **PATENT**
Application No.: 13/994,455
Office Action Dated: March 27, 2015

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
Andrew William Wright	**Confirmation No.: 1621**
Application No.: 13/994,455	**Group Art Unit: 3661**
Filing Date: July 24, 2013	**Examiner: Tyler D. Paige**

For: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

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

Dear Commissioner:

REPLY PURSUANT TO 37 CFR § 1.111

In response to the Official Action dated **March 27, 2015**, reconsideration is respectfully requested in view of the amendments and/or remarks as indicated below:

☐ **Amendments to the Specification** begin on page of this paper.

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

☐ **Amendments to the Drawings** begin on page of this paper and include an attached replacement sheet.

☒ **Remarks** begin on page 8 of this paper.

☒ The Commissioner is hereby authorized to charge any fee deficiency, charge any additional fees, or credit any overpayment of fees, associated with this application in connection with this filing, or any future filing, submitted to the U.S. Patent and Trademark Office during the pendency of this application, to Deposit Account No. 50-2036.

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A mobile telecommunications device ~~adapted for installation to a vehicle and~~ configured to log driving information associated with [[the]] a vehicle ~~when driven~~, the mobile device comprising:

a sensor set comprising ~~at least one of~~ an image sensor, an audio sensor, an accelerometer, [[and]] or a positioning module, or a combination thereof;

a user interface;

a processor; and

~~for processing sensor data from the sensor set to derive said driving information;~~

a memory ~~for storing said derived driving information~~; [[and]]

the mobile device configured to:

~~a wireless telecommunications module operable to download an application; the mobile device being arranged to execute the downloaded application to control the mobile device to:~~

~~register the~~ determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is ~~installed~~ removably attached to the vehicle and the vehicle is in use ~~being driven by a driver~~;

process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

store a selection of the driving information to the memory, wherein the driving information is derived without data from vehicle sensors.

2. (Original) A mobile telecommunications device according to claim 1, comprising an adapter arranged to hold the device securely to the vehicle.

3. (Currently Amended) A mobile telecommunications device according to claim 1, wherein the mobile communications device is controlled by a downloaded application to control the mobile device ~~the executed application~~ to register the start of [[a]] the driving period in response to an initialization input generated automatically in response to the sensor data having

predetermined values, wherein the initialization input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.

4. (Currently Amended) A mobile telecommunications device according to claim 1, ~~comprising a registration module~~ wherein the mobile communications device is further configured to register the attachment ~~installation~~ of the mobile device to the vehicle~~, wherein the registration module is arranged to~~ and determine a match between [[the]] a location of the mobile device and [[the]] a location of the vehicle.

5. (Currently Amended) A mobile telecommunications device according to claim 1, wherein the mobile communications device is controlled by a downloaded application to control the mobile device ~~the executed application~~ to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data ~~as driving information~~ at said second sampling rate.

6. (Currently Amended) A mobile telecommunications device according to claim 1, wherein the mobile communications device is controlled by a downloaded application to control the mobile device ~~the executed application~~ to process the sensor data from the sensor set during a plurality of driving periods to derive driving information associated with how the vehicle is driven during ~~for each of~~ the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

7. (Currently Amended) A mobile telecommunications device according to claim 6, wherein the mobile communications device is further configured to: ~~comprising an event detector for~~

detect~~ing the~~ occurrence of a predetermined event by correlating the sensor data against at least one event indication model, the at least one event indication model comprising a set of predetermined data values that ~~the event detector is arranged to~~ are compared against corresponding sensor data[[,]]; and

~~wherein the mobile telecommunications device is controlled by the executed application to~~ modify the at least one event indication model in response to the benchmark.

8. (Currently Amended) A mobile telecommunications device according to claim 1, wherein the mobile communications device is controlled by a downloaded application to control the mobile device ~~the executed application~~ to detect [[the]] occurrence of a predetermined event of significance~~, such as a crash~~, and in response take at least one predetermined action.

9. (Currently Amended) A mobile telecommunication device according to claim 8, wherein the ~~at least one~~ predetermined action is at least one of storing driving information associated with that event to the memory, storing driving information captured at a higher sampling rate than when an event is not detected, and transmitting driving information via a [[the]] wireless telecommunication module of the mobile telecommunication device to a remote system.

10. (Currently Amended) A mobile telecommunications device according to claim 8, wherein the ~~at least one~~ predetermined action comprises providing feedback to a user to indicate that an event has been detected, the mobile telecommunications device being configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback.

11. (Previously Presented) A mobile telecommunications device according to claim 10, wherein the feedback comprises notifying a user that a further action has been scheduled, and will be taken within a predetermined period, the mobile telecommunications device being further configured to receive a user interaction to confirm or deny whether the further scheduled action should be taken within a predetermined period.

12. (Currently Amended) A mobile telecommunications device according to claim 8, wherein the ~~at least one~~ predetermined action comprises communicating to a remote system that an event has been detected, the mobile telecommunications device being further configured to receive from the remote system a request to transmit to the remote system selected portions of the driving information associated with the detected event~~, and operate the wireless telecommunication module to transmit the requested driving information~~.

13. (Currently Amended) A mobile telecommunications device according claim 1, wherein the memory comprises a long term memory for persistently storing driving information and a short term memory for transiently storing driving information, wherein the short term memory ~~being arranged to~~ receives driving information at a higher update rate than the long term memory, the mobile telecommunications device being further configured ~~controlled by the executed application~~ to:

write driving information to the short term memory at a predetermined update rate during the driving period in a predetermined sequence[[,]]; and ~~the mobile device being further controlled to~~

overwrite the driving information previously written to the short term memory in accordance with the predetermined sequence.

14. (Currently Amended) A mobile telecommunications device according to claim 13, wherein the mobile communications device is controlled by a downloaded application to control the mobile device ~~the executed application~~ to detect [[the]] an occurrence of a predetermined event ~~of significance, such as a crash~~, and in response take at least one predetermined action[[,]] including transferring data from the short term memory to the long term memory.

15. (Currently Amended) A mobile telecommunications device according to claim 1, further ~~arranged~~ configured to:

interface with an external device~~, such as an engine management system~~, the external device having access to external driving information associated with a condition of the vehicle[[,]]:

~~the mobile device being arranged to~~ receive at least a portion of the external driving information from the external device.

16. (Currently Amended) A mobile telecommunications device according to claim 1, wherein the mobile communications device is controlled by a downloaded application to control the mobile device ~~the executed application~~ to process the driving information to generate a driving

score[[,]] associated with a particular driver~~, to be transmitted via the wireless telecommunication of the mobile device to a remote system~~.

17. (Currently Amended) A data-logging system for logging driving information received from a remote mobile telecommunications device ~~according to claim 1~~, the data-logging system comprising a processor and memory, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device ~~according to claim 1~~, and receive therefrom:

a unique identifier for association of the remote mobile telecommunications device with a corresponding one of the plurality of accounts; and,

driving information to be logged to that corresponding account, the driving information derived based on inputs received by a user interface of the remote mobile telecommunications device and sensor data from a sensor set of the remote mobile telecommunications device, the driving information derived without data from vehicle sensors.

18. (Currently Amended) A data-logging system according to claim 17, wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the remote mobile telecommunications device during a driving period during which the remote mobile telecommunications device is removably attached ~~installed~~ to [[a]] the vehicle being driven by [[a]] the driver, the data logging system being further arranged to process the driving information logged to [[the]] a corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver.

19. (Currently Amended) A data logging system according to claim 18, wherein the driving score is used to define an insurance premium associated with the account and the data logging system is further arranged to communicate to the remote mobile telecommunication device an

insurance offer generated in response to the driving information received from the remote mobile telecommunications device.

20. (Currently Amended) A method of logging, by a mobile device comprising a processor, memory, a user interface, and a sensor set, driving information associated with a vehicle when driven, the method comprising:

~~adapting and installing a mobile device to the vehicle, the mobile device comprising a memory;~~

determining, by the mobile device based on inputs received by the user interface and sensor data from the sensor set, ~~registering the~~ a start of a driving period during which the mobile device is removably attached ~~installed~~ to the vehicle and the vehicle is being ~~driven~~ operated by a driver, the sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;

processing sensor data from [[a]] the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and,

storing a selection of the driving information to the memory of the mobile device, wherein the driving information is derived without data from vehicle sensors.

REMARKS

Claims 1-20 are pending in the present application. Claims 1-20 stand rejected. No new matter has been added. Further examination of the present application in view of the following remarks is hereby requested.

Claim Rejections – 35 U.S.C. § 102

Claims 1-20 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Ling et al., U.S. Patent No. 8,140,358, hereinafter Ling. *Office Action*, at 3. Applicant respectfully requests reconsideration.

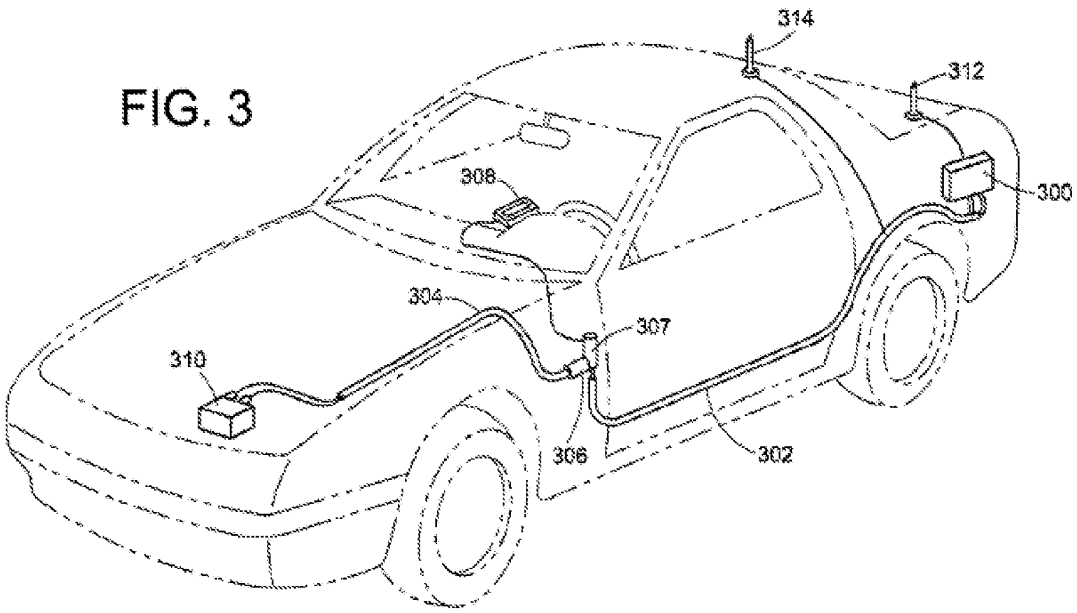
Claim 1 is amended to recite in part:

> A mobile telecommunications device configured to log driving information associated with a vehicle, the mobile device comprising:
>
> a sensor set comprising an image sensor, an audio sensor, an accelerometer, or a positioning module, or a combination thereof;
>
> a user interface;
>
> a processor; and
>
> a memory;
>
> the mobile device configured to:
>
> determine, based on inputs received by the user interface and sensor data from the sensor set, a start of a driving period during which the mobile device is removably attached to the vehicle and the vehicle is in use;
>
> process the sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and
>
> store a selection of the driving information to the memory, wherein *the driving information is derived without data from vehicle sensors*

(emphasis added).

In contrast to claim 1, Ling describes a data logging device that processes information from on-board vehicle systems:

FIG. 3



As described further in Ling col. 4 lines 21-39, the disclosed portable mobile device 300 monitors and records output of diverse sensors and operator actions from various on-board systems.

However Ling does not disclose that "the driving information is derived without data from vehicle sensors" as recited in claim 1. As discussed in paragraphs [0008]-[0010] of Applicant's published application, the use of a mobile telecommunication device that does not require integration with on-board systems enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle, and also allow for upgrades and changes without modifying on-board systems. Furthermore, as discussed in paragraph [0012] of Applicant's published application, such use of a mobile telecommunication device may be counter-intuitive, highlighting the inventiveness of Applicant's claims over the disclosure and teaching of Ling.

For at least the above reasons, Applicant submits that independent claim 1, as well as independent claims 17 and 20, which recite similar features as claim 1, are not anticipated by

Ling. Accordingly, withdrawal of the rejection of independent claims 1, 17, and 20 and their dependent claims 2-16, 18, and 19 is respectfully requested.

CONCLUSION

Based on the foregoing remarks and amendments, Applicant respectfully requests withdrawal of the rejection and the issuance of a notice of allowance. If, for any reason, the Examiner feels that the claims are not in a condition for allowance, Applicant encourages the Examiner to contact Applicant's undersigned attorney in order to resolve any remaining issues.

Respectfully submitted,

Date: July 27, 2015

/Han Gim/
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Document Description: Transmittal Letter

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	14

Application Number	13/994,455
Filing Date	July 24, 2013
First Named Inventor	Andrew William Wright
Art Unit	3661
Examiner Name	Tyler D. Paige
Attorney Docket Number	044228.010200

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☑ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☑ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) _____
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) (please Identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Baker & Hostetler LLP		
Signature	/hgim/		
Printed name	Han Gim		
Date	July 27, 2015	Reg. No.	62,953

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Typed or printed name		Date	

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

Electronic Patent Application Fee Transmittal	
Application Number:	13994455
Filing Date:	24-Jul-2013
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Filer:	Han Gim/Danielle Hoffman
Attorney Docket Number:	044228.010200
Filed as Small Entity	

Filing Fees for U.S. National Stage under 35 USC 371

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($)
Extension - 1 month with $0 paid	2251	1	100	100
Miscellaneous:				
		Total in USD ($)		**100**

Electronic Acknowledgement Receipt	
EFS ID:	23037525
Application Number:	13994455
International Application Number:	
Confirmation Number:	1621
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Customer Number:	30734
Filer:	Han Gim/Danielle Hoffman
Filer Authorized By:	Han Gim
Attorney Docket Number:	044228.010200
Receipt Date:	27-JUL-2015
Filing Date:	24-JUL-2013
Time Stamp:	19:44:32
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$100
RAM confirmation Number	18135
Deposit Account	502036
Authorized User	BAKER HOSTETLER
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Extension of Time	044228010200_EOT_Resp_to_NFOA_filed_07-27-15.PDF	163648 c49fcbc06123fa6a8250aaaa41b727607a7546de	no	2
Warnings:					
Information:					
2		044228010200_Resp_to_NFOA_filed_07-27-15.PDF	156941 19f9af09233ace8179636c5c4eb6fb52d88dccb1	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	7
	Applicant Arguments/Remarks Made in an Amendment	8	10

Warnings:					
Information:					
3	Transmittal Letter	044228010200_Transmittal_Resp_to_NFOA_filed_07-27-15.PDF	262244 99b9378ee90cc1be16f81489380b8ec204384797	no	2
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30859 2317b68ebace256f7036e5adfb75fc8b0652cf0e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	613692		

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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.

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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/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) 044228.010200
Application Number 13/994,455	Filed July 24, 2013
For METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR	
Art Unit 3661	Examiner Tyler D. Paige

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☑	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 100
☐	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☐	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 502036.

☐ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 62,953.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/hgim/	July 27, 2015
Signature	Date
Han Gim	206-903-2474
Typed or printed name	Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 6 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/994,455	07/24/2013	Andrew William Wright	044228.010200	1621

30734 7590 03/27/2015

BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

EXAMINER	
PAIGE, TYLER D	

ART UNIT	PAPER NUMBER
3661	

NOTIFICATION DATE	DELIVERY MODE
03/27/2015	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):

patents@bakerlaw.com
eofficemonitor@bakerlaw.com

Office Action Summary	Application No. 13/994,455	Applicant(s) WRIGHT, ANDREW WILLIAM	
	Examiner TYLER PAIGE	Art Unit 3661	AIA (First Inventor to File) Status No

-- 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 *06/14/2013*.

☐ 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) *1-20* is/are pending in the application.

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

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ 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 *06/14/2013* 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 *06/14/2013*.

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

4) ☐ Other: _____.

DETAILED ACTION

The present application is being examined under the pre-AIA first to invent provisions. This office action is in response to an application filed on 06/14/2013. The applicant claims Foreign priority to an application filed on 12/15/2011.

Claim Rejections - 35 USC § 102

1. 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.

2. The following is a quotation of the appropriate paragraphs of pre-AIA 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 –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (**pre-AIPA** 35 U.S.C. 102(e)).

3. Claims 1-20 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Ling US 8,140,358.

4. As per claim 1, A mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising:

a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; (Col 35 lines 25 – 36)

a processor for processing sensor data from the sensor set to derive said driving information; (Col 35 lines 25 – 36 The clause does not specify how the data is to be processed)

a memory for storing said derived driving information; and (Col 35 lines 25 – 36)

a wireless telecommunications module operable to download an application; (Col 4 lines 40 – 56, and Col 35 lines 37 – 61)

the mobile device being arranged to execute the downloaded application to control the mobile device to: (Col 19 lines 39 – 53)

register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; (Col 16 lines 43 – 64)

process sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and store a selection of the driving information to the memory. (Col 16 lines 43 – 64)

5. As per claim 2, A mobile telecommunications device according to claim 1, comprising an adapter arranged to hold the device securely to the vehicle. (Col 19 lines 39 – 53)

6. As per claim 3, A mobile telecommunications device according to claim 1, controlled by the executed application to register the start of a driving period in response to an initialization input generated automatically in response to the sensor data having predetermined values, wherein the initialization input is generated in response to sensor data reflecting a detected speed above a predetermined threshold. (Col 16 lines 43 – 64) and (Col 19 lines 39 – 53)

7. As per claim 4, A mobile telecommunications device according to claim 1, comprising a registration module configured to register the installation of the mobile device to the vehicle, wherein the registration module is arranged to determine a match between the location of the mobile device and the location of the vehicle. (Col 16 lines 65 – 67, Col 17 lines 1 – 25)

8. As per claim 5, A mobile telecommunications device according to claim 1, controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate. (Col 33 lines 29 – 67 and Col 34 lines 1 -17)

9. As per claim 6, A mobile telecommunications device according to claim 1, controlled by the executed application to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with how the vehicle is driven for each of the driving periods, the sensor data being processed during

a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods. (Col 16 lines 4 – 24)

10. As per claim 7, A mobile telecommunications device according to claim 6, comprising an event detector for detecting the occurrence of a predetermined event by correlating the sensor data against at least one event indication model, the at least one event indication model comprising a set of predetermined data values that the event detector is arranged to compare against corresponding sensor data, wherein the mobile telecommunications device is controlled by the executed application to modify the at least one event indication model in response to the benchmark. (Col 15 lines 61 - 67 and Col 16 lines 1 - 24)

11. As per claim 8, A mobile telecommunications device according to claim 1, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response take at least one predetermined action. (Col 10 lines 52 – 67)

12. As per claim 9, A mobile telecommunication device according to claim 8, wherein the at least one predetermined action is at least one of storing driving information associated with that event to the memory, storing driving information captured at a higher sampling rate than when an event is not detected, and transmitting driving information via the wireless telecommunication module of the mobile telecommunication device to a remote system. (Col 35 lines 25 – 36)

13. As per claim 10, A mobile telecommunications device according to claim 8, wherein the at least one predetermined action comprises providing feedback to a user

to indicate that an event has been detected, the mobile telecommunications device being configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback. (Col 6 lines 46 – 62 and Col 10 lines 52 – 67)

14. As per claim 11, A mobile telecommunications device according to claim 10, wherein the feedback comprises notifying a user that a further action has been scheduled, and will be taken within a predetermined period, the mobile telecommunications device being further configured to receive a user interaction to confirm or deny whether the further scheduled action should be taken within a predetermined period. (Col 6 lines 46 – 62 and Col 10 lines 52 – 67 The art of record discloses various aspects of the claim and one skilled in the art would recognize programming the system to perform the claimed functions)

15. As per claim 12, A mobile telecommunications device according to claim 8, wherein the at least one predetermined action comprises communicating to a remote system that an event has been detected, the mobile telecommunications device being further configured to receive from the remote system a request to transmit to the remote system selected portions of the driving information associated with the detected event, and operate the wireless telecommunication module to transmit the requested driving information. (Col 6 lines 46 – 62 and Col 10 lines 52 – 67)

16. As per claim 13, A mobile telecommunications device according claim 1, wherein the memory comprises a long term memory for persistently storing driving information and a short term memory for transiently storing driving information, the short term

memory being arranged to receive driving information at a higher update rate than the long term memory, the mobile telecommunications device being controlled by the executed application to write driving information to the short term memory at a predetermined update rate during the driving period in a predetermined sequence, the mobile device being further controlled to overwrite the driving information previously written to the short term memory in accordance with the predetermined sequence. (abstract and Col 1 lines 33 - 56 the art of record discloses a first and second memory but their operation and function is equivalent as that claimed by the applicant)

17. As per claim 14, A mobile telecommunications device according to claim 13, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response take at least one predetermined action, including transferring data from the short term memory to the long term memory. (abstract and Col 1 lines 33 – 56, Col 6 lines 46 – 62 and Col 10 lines 52 – 67)

18. As per claim 15, A mobile telecommunications device according to claim 1, further arranged to interface with an external device, such as an engine management system, the external device having access to external driving information associated with a condition of the vehicle, the mobile device being arranged to receive at least a portion of the external driving information from the external device. (Col 38 lines 26 – 45)

19. As per claim 16, A mobile telecommunications device according to claim 1, controlled by the executed application to process the driving information to generate a

driving score, associated with a particular driver, to be transmitted via the wireless telecommunication of the mobile device to a remote system. (Col 3 lines 63 – 67)

20. As per claim 17, A data-logging system for logging driving information from a remote mobile telecommunications device according to claim 1, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver; (Col 12 lines 40 – 46 and Col 14 lines 38 - 47)

a communications interface arranged to communicate with the remote mobile telecommunications device according to claim 1, and receive therefrom: a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and, driving information to be logged to that corresponding account. (Col 12 lines 29 – 33)

21. As per claim 18, A data-logging system according to claim 17, wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver, the data logging system being further arranged to process the driving information logged to the corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver. (Col 12 lines 29 – 46 and Col 14 lines 38 – 47 and Col 16 lines 43 – 64 and Col 19 lines 39 – 53 and Col 35 lines 25 – 36)

22. As per claim 19, A data logging system according to claim 18, wherein the driving score is used to define an insurance premium associated with the account and the data logging system is further arranged to communicate to the mobile telecommunication device an insurance offer generated in response to the driving information received from the mobile device. (Col 10 lines 52 – 67 and Col 12 lines 29 – 46)

23. As per claim 20, A method of logging driving information associated with a vehicle when driven, the method comprising: adapting and installing a mobile device to the vehicle, the mobile device comprising a memory; registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; processing sensor data from a sensor set during the driving period to derive driving information associated with how the vehicle is driven; and, storing a selection of the driving information to the memory of the mobile device.(Col 3 lines 56 – 67 and Col 19 lines 39 – 53)

Examiner Request

The examiner requests, in response to this office action, support must be shown for language added to any original claims on amendment and any new claims. That is, indicate support for newly added claim language by specifically pointing to page(s) and line number(s) in the specification and/or drawing figure(s). This will assist the examiner in prosecuting the application. When responding to this office action, applicant is advised to clearly point out the patentable novelty which he or she thinks the claims present, in view of the state of art disclosed by the references cited or the objections made. He or she must also show how the amendments avoid such references or

objections. In amending in reply to a rejection of claims in an application or patent under reexamination, the applicant or patent owner must clearly point out the patentable novelty which he or she thinks the claims present in view the state of the art disclosed by the references cited or the objections made. The applicant or patent owner must also show how the amendments avoid such references or objections.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TYLER PAIGE whose telephone number is (571)270-5425. The examiner can normally be reached on 7:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Black can be reached on 571-272-6956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/T. P./
Examiner, Art Unit 3661

Notice of References Cited	Application/Control No. 13/994,455	Applicant(s)/Patent Under Reexamination WRIGHT, ANDREW WILLIAM	
	Examiner TYLER PAIGE	Art Unit 3661	Page 1 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,992,943 A	02-1991	McCracken, Jack J.	701/33.4
*	B	US-5,638,273 A	06-1997	Coiner et al.	701/33.4
*	C	US-2006/0103513 A1	05-2006	Ihara et al.	340/435
*	D	US-2007/0135979 A1	06-2007	Plante, James	701/035
*	E	US-2007/0208503 A1	09-2007	Harnsberger, James	701/208
*	F	US-2009/0109037 A1	04-2009	FARMER, Bennie L.	340/576
*	G	US-2010/0131307 A1	05-2010	Collopy et al.	705/4
*	H	US-2010/0157061 A1	06-2010	Katsman et al.	348/149
*	I	US-7,765,058 B2	07-2010	Doering, Jeff	701/123
*	J	US-7,908,191 B1	03-2011	Dinamani et al.	705/31
*	K	US-2012/0072244 A1	03-2012	Collins et al.	705/4
*	L	US-8,140,358 B1	03-2012	Ling et al.	705/4
*	M	US-2013/0060583 A1	03-2013	Collins et al.	705/4

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	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.

Notice of References Cited	Application/Control No. 13/994,455	Applicant(s)/Patent Under Reexamination WRIGHT, ANDREW WILLIAM	
	Examiner TYLER PAIGE	Art Unit 3661	Page 2 of 2

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2013/0302758 A1	11-2013	Wright, Andrew William	434/65
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	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.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	27	("20050030224" | "20060103513" | "20070208503" | "20100157061" | "5638273" | "7756617" | "7908191").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/03/18 10:55
L5	0	701/33.44.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/03/18 10:56
L6	1730	701/33.4.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/03/18 10:56
L7	108	(record$3 or collect$3 or log$3 or learn$3) near3 (driving) same history and (speed same threshold)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/18 11:06
L8	5	6 and L7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/03/18 11:06
L9	414	((Andrew) near2 (Wright)).INV.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/03/18 11:06
S1	496	(record or collect or log) near3 (driving) same history	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/16 20:11
S2	95	(record$3 or collect$3 or log$3) near3 (driving) same history and (speed same threshold)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2015/03/16 20:12

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S3	108	(record$3 or collect$3 or log$3 or learn$3) near3 (driving) same history and (speed same threshold)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/16 20:12
S4	49	(record$3 or collect$3 or log$3 or learn$3) near3 (driving) same history and (speed same threshold) and (insurance)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/16 20:13
S5	27	(record$3 or collect$3 or log$3 or learn$3) near3 (driving) same history and (speed same threshold) and (insurance same offer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/16 20:13
S6	27	(record$3 or collect$3 or log$3 or learn$3 or safe$3) near3 (driving) same history and (speed same threshold) and (insurance same offer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/16 20:13
S7	17	(record$3 or collect$3 or log$3 or learn$3 or safe$3) near3 (driving) same history and (speed same threshold) and (insurance near5 offer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/16 20:13
S8	7	("2012/0072244").URPN.	USPAT	OR	OFF	2015/03/16 20:15
S9	50	(US-20130302758-$ or US-20140067156-$).did. or (US-3596746-$ or US-3625608-$ or US-3639823-$ or US-3649071-$ or US-3666178-$ or US-3731044-$ or US-3759334-$ or US-3800420-$ or US-3812929-$ or US-3839885-$ or US-3937076-$ or US-3986031-$ or US-4050540-$ or US-4085345-$ or US-4122974-$ or US-4144628-$ or US-4145868-$ or US-4189021-$ or US-4258499-$ or US-4372548-$ or US-4496107-$ or US-4534548-$ or US-4561691-$ or US-4604043-$ or US-4691805-$ or US-4693149-$).did. or (US-4694539-$ or US-4736826-$ or US-4745253-$ or US-4755080-$ or US-4790896-$ or US-4890189-$ or US-4913489-$ or US-4931127-$ or US-5047998-$ or US-5133726-$ or US-5153434-$ or US-5170953-$ or US-5203540-$ or US-5254917-$ or US-5426961-$ or US-5476227-$ or US-5479848-$ or US-	US-PGPUB; USPAT	OR	OFF	2015/03/17 14:56

		RE35421-$ or US-5622322-$ or US-5756884-$ or US-5790510-$).did.				
S10	49	(US-4995542-$ or US-5444191-$ or US-4283628-$ or US-4432355-$ or US-4479440-$ or US-4629953-$ or US-4817445-$ or US-4947503-$ or US-4968204-$ or US-5007351-$ or US-5255960-$ or US-5340130-$ or US-5349261-$ or US-5375952-$ or US-5451284-$ or US-5478249-$ or US-5502963-$ or US-5547084-$ or US-5565853-$ or US-5575537-$ or US-5769494-$ or US-5915492-$ or US-6166726-$ or US-6188315-$ or US-6198931-$ or US-6215757-$).did. or (US-3590879-$ or US-3576218-$ or US-3693743-$ or US-3639823-$ or US-3924701-$ or US-3915209-$ or US-3910556-$ or US-3890515-$ or US-3851485-$ or US-3841222-$ or US-3827371-$ or US-3827365-$ or US-3825260-$ or US-3800420-$ or US-3788452-$ or US-3785082-$ or US-4133572-$ or US-4138873-$ or US-4139067-$ or US-4145868-$ or US-4147075-$ or US-4150563-$ or US-4153312-$).did.	USPAT	OR	OFF	2015/03/17 14:56
S11	93	S9 or S10	USPAT	OR	OFF	2015/03/17 14:56
S12	49	(record$3 or collect$3 or log$3 or learn$3) near3 (driving) same history and (speed same threshold) and (insurance)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 14:57
S13	0	S11 and S12	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 14:57
S14	0	S11 and insurance and threshold	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 14:57
S15	1	S11 and insurance	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 14:57
S16	64	(record$3 or collect$3 or log$3 or learn$3 or safe$3) near3 (driving) and (speed same threshold) and (insurance near5 offer)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2015/03/17 15:00

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S17	59	(record$3 or collect$3 or log$3 or learn$3 or safe$3) near3 (driving or driver) and (speed same threshold) and (insurance near5 offer) and (mobile near3 device or smart$1phone or smart adj phone or cell adj phone or cell$1phone or mobile adj phone)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 15:01
S18	57	(record$3 or collect$3 or log$3 or learn$3 or safe$3) near3 (driving or driver) and (speed same threshold) and (insurance near5 offer) and (mobile near3 device or smart$1phone or smart adj phone or cell adj phone or cell$1phone or mobile adj phone) and database	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 15:01
S19	17	(record$3 or collect$3 or log$3 or learn$3 or safe$3) near3 (driving or driver) and (speed same threshold) and (insurance near5 offer) and (mobile near3 device or smart$1phone or smart adj phone or cell adj phone or cell$1phone or mobile adj phone) and database and @pd<"20111215"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 15:05
S20	45	(record$3 or collect$3 or log$3 or learn$3 or safe$3) near3 (driving or driver) and (speed same threshold) and (insurance near5 offer) and (mobile near3 device or smart$1phone or smart adj phone or cell adj phone or cell$1phone or mobile adj phone) and database and @pd<"20131215"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 15:05
S21	45	S19 or S20	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/17 15:05

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	13/994/455
Filing Date	June 14, 2013
First Named Inventor	Andrew William Wright
Art Unit	Not yet assigned
Examiner Name	not yet assigned
Attorney Docket Number	044228.010200

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 2010/039254	02/18/2010	Cooper, Marcus Donald	Claims 1-47
		US- 2007/219685	09/20/2007	Plante, James	Claims 1, 5-6, 11-32
		US- 2005/0030224 A1	02/10/2005	Koch, Robert	
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		US- 7,756,617 B1	07/13/2010	Cluff, et al.	
		US- 7,908,191 B1	03/15/2011	Dinamani, et al.	
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
		WO 2006/075419 A1	07/20/2006	Omotaya, et al.		
		WO 2007/067775 A2	12/07/2006	Plante, James		
		EP 1615178 A2	01/11/2006	Bellin, et al.		
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		JP 2008244674 A	10/09/2008	Takahashi, Naota		
		WO 2006/127534	11/30/2006	Siemens VDO Automotive		

Examiner Signature	/Tyler Paige/	Date Considered	03/18/2015

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.P./

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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:

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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.

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	Art Unit
	TYLER PAIGE	3661

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner
G07C5/008;G06Q40/08; G08G1/0175;		

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
701	33.4	03/18/2015	tdp

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Search	03/18/2015	tdp
East Search	03/18/2015	tdp
Plus Search	03/18/2015	tdp
NPL Search	03/18/2015	tdp

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/T.P./ Examiner.Art Unit 3661	

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13994455	WRIGHT, ANDREW WILLIAM
	Examiner	**Art Unit**
	TYLER PAIGE	3661

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

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

CLAIM		DATE								
Final	Original	03/18/2015								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
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	17	✓								
	18	✓								
	19	✓								
	20	✓								

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BIB DATA SHEET

CONFIRMATION NO. 1621

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/994,455	07/24/2013 RULE	701	3661	044228.010200

APPLICANTS

INVENTORS

Andrew William Wright, Surrey, UNITED KINGDOM;

**** CONTINUING DATA ***************************

This application is a 371 of PCT/GB11/52491 12/15/2011

**** FOREIGN APPLICATIONS ***************************

UNITED KINGDOM 1021292.6 12/15/2010
UNITED KINGDOM 1101259.8 01/25/2011
UNITED KINGDOM 1109759.9 06/10/2011
UNITED KINGDOM 1118777.0 10/31/2011

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
08/05/2013

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/TYLER D PAIGE/ Examiner's Signature	☐ tdp Initials	UNITED KINGDOM	25	20	2

ADDRESS

BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304
UNITED STATES

TITLE

METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

FILING FEE RECEIVED		
870	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

PLUS Search Results for S/N 13994455, Searched Tue Mar 17 09:35:37 EDT 2015

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

4995542 99
5444191 99
4283628 96
4432355 96
4479440 96
4629953 96
4817445 96
4947503 96
4968204 96
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PLUS Search Results for S/N 13994455, Searched Tue Mar 17 09:35:41 EDT 2015

The Patent Linguistics Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to the present PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

20130302758 86
20140067156 72
3596746 65
3625608 65
3639823 65
3649071 65
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5622322 65
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5790510 65

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/994,455	07/24/2013	Andrew William Wright	044228.010200

CONFIRMATION NO. 1621

30734
BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

PUBLICATION NOTICE

OC000000064983783

Title:METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

Publication No.US-2013-0302758-A1
Publication Date:11/14/2013

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 Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

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

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 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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U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
13/994,455	Andrew William Wright	044228.010200

30734
BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
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WASHINGTON, DC 20036-5304

INTERNATIONAL APPLICATION NO.	
PCT/GB11/52491	
I.A. FILING DATE	PRIORITY DATE
12/15/2011	12/15/2010

CONFIRMATION NO. 1621
371 ACCEPTANCE LETTER

OC000000063034661

Date Mailed: 08/07/2013

NOTICE OF ACCEPTANCE OF APPLICATION UNDER 35 U.S.C 371 AND 37 CFR 1.495

The applicant is hereby advised that the United States Patent and Trademark Office in its capacity as a Designated / Elected Office (37 CFR 1.495), has determined that the above identified international application has met the requirements of 35 U.S.C. 371, and is ACCEPTED for national patentability examination in the United States Patent and Trademark Office.

The United States Application Number assigned to the application is shown above and the relevant dates are:

07/24/2013	07/24/2013
DATE OF RECEIPT OF 35 U.S.C. 371(c)(1), (c)(2) and (c)(4) REQUIREMENTS	DATE OF COMPLETION OF ALL 35 U.S.C. 371 REQUIREMENTS

A Filing Receipt (PTO-103X) will be issued for the present application in due course. **THE DATE APPEARING ON THE FILING RECEIPT AS THE " FILING DATE" IS THE DATE ON WHICH THE LAST OF THE 35 U.S.C. 371 (c)(1), (c)(2) and (c)(4) REQUIREMENTS HAS BEEN RECEIVED IN THE OFFICE. THIS DATE IS SHOWN ABOVE.** *The filing date of the above identified application is the international filing date of the international application (Article 11(3) and 35 U.S.C. 363).* Once the Filing Receipt has been received, send all correspondence to the Group Art Unit designated thereon.

The following items have been received:

- Indication of Small Entity Status
- Copy of the International Application filed on 06/14/2013
- Preliminary Amendments filed on 06/14/2013
- Information Disclosure Statements filed on 06/14/2013
- Oath or Declaration filed on 07/24/2013
- Small Entity Statement filed on 06/14/2013
- Request for Immediate Examination filed on 06/14/2013
- U.S. Basic National Fees filed on 06/14/2013
- Substitute Specification filed on 06/14/2013
- Priority Documents filed on 06/14/2013
- Power of Attorney filed on 07/24/2013
- Specification filed on 06/14/2013
- Claims filed on 06/14/2013
- Abstracts filed on 06/14/2013
- Drawings filed on 06/14/2013
- Authorization to Permit Access filed on 06/14/2013

FORM PCT/DO/EO/903 (371 Acceptance Notice)

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

LAMONT M HUNTER

Telephone: (571) 272-0308

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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
13/994,455	07/24/2013		870	044228.010200	20	2

CONFIRMATION NO. 1621

30734
BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

FILING RECEIPT

OC000000063034660

Date Mailed: 08/07/2013

Receipt is acknowledged of this non-provisional 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 APPLICANT, 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 Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections 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**

Inventor(s)

Andrew William Wright, Surrey, UNITED KINGDOM;

Applicant(s)

Andrew William Wright, Surrey, UNITED KINGDOM;

Power of Attorney: The patent practitioners associated with Customer Number 30734

Domestic Priority data as claimed by applicant

This application is a 371 of PCT/GB11/52491 12/15/2011

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
UNITED KINGDOM 1021292.6 12/15/2010 No Access Code Provided
UNITED KINGDOM 1101259.8 01/25/2011 No Access Code Provided
UNITED KINGDOM 1109759.9 06/10/2011 No Access Code Provided
UNITED KINGDOM 1118777.0 10/31/2011 No Access Code Provided

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If Required, Foreign Filing License Granted: 08/05/2013
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/994,455**
Projected Publication Date: 11/14/2013
Non-Publication Request: No
Early Publication Request: No

**** SMALL ENTITY ****
Title

METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

Preliminary Class

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

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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).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/994,455

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	140		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x 210 =	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	800		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	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. 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.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

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 13/994,455

filed on June 14, 2013.

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: Andrew William Wright Date (Optional): 23/7/2013

Signature: AWWright

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.

Privacy Act Statement

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

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

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

Electronic Patent Application Fee Transmittal

Application Number:	13994455
Filing Date:	
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Filer:	Mark Krietzman H/Tonya Mertens
Attorney Docket Number:	044228.010200

Filed as Small Entity

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Oath/Decl > 30 Mos From 371 commencement	2617	1	70	70
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**70**

Electronic Acknowledgement Receipt	
EFS ID:	16400666
Application Number:	13994455
International Application Number:	
Confirmation Number:	1621
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Customer Number:	30734
Filer:	Mark Krietzman H/Tonya Mertens
Filer Authorized By:	Mark Krietzman H
Attorney Docket Number:	044228.010200
Receipt Date:	24-JUL-2013
Filing Date:	
Time Stamp:	12:51:13
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$70
RAM confirmation Number	13040
Deposit Account	502036
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	044228_010200_Oath.pdf	629867 410b7d487e64ba49930300ba5d86e91030384167	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30347 284c239edfd0ea4f483b7e266524a015efcb265e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	660214		

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.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/994,455

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	140		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	300		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	360		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*	x 40 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x 210 =	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	800		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	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
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

U.S. APPLICATION NUMBER NO.	FIRST NAMED APPLICANT	ATTY. DOCKET NO.
13/994,455	Andrew William Wright	044228.010200

30734
BAKER & HOSTETLER LLP
WASHINGTON SQUARE, SUITE 1100
1050 CONNECTICUT AVE. N.W.
WASHINGTON, DC 20036-5304

INTERNATIONAL APPLICATION NO.	
PCT/GB11/52491	
I.A. FILING DATE	PRIORITY DATE
12/15/2011	12/15/2010

CONFIRMATION NO. 1621
371 FORMALITIES LETTER

OC00000062106165

Date Mailed: 06/21/2013

NOTIFICATION OF MISSING REQUIREMENTS UNDER 35 U.S.C. 371 IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)

The following items have been submitted by the applicant or the IB to the United States Patent and Trademark Office as a Designated Office (37 CFR 1.494):

- Indication of Small Entity Status
- Priority Document
- Copy of the International Application filed on 06/14/2013
- Preliminary Amendments filed on 06/14/2013
- Information Disclosure Statements filed on 06/14/2013
- Small Entity Statement filed on 06/14/2013
- Request for Immediate Examination filed on 06/14/2013
- U.S. Basic National Fees filed on 06/14/2013
- Substitute Specification filed on 06/14/2013
- Priority Documents filed on 06/14/2013
- Specification filed on 06/14/2013
- Claims filed on 06/14/2013
- Abstracts filed on 06/14/2013
- Drawings filed on 06/14/2013
- Authorization to Permit Access filed on 06/14/2013

The applicant needs to satisfy supplemental fees problems indicated below.

The following items **MUST** be furnished within the period set forth below in order to complete the requirements for acceptance under 35 U.S.C. 371:

- Oath or declaration of the inventors, in compliance with 37 CFR 1.497(a) and (b), identifying the application by the International application number and international filing date.
- To avoid abandonment, a surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.492(h) of $70 for a small entity in compliance with 37 CFR 1.27, must be submitted with the missing items identified in this letter.

SUMMARY OF FEES DUE:

Total additional fees required for this application is $**70** for a Small Entity:

- $**70** Surcharge.

FORM PCT/DO/EO/905 (371 Formalities Notice)

ALL OF THE ITEMS SET FORTH ABOVE MUST BE SUBMITTED WITHIN TWO (2) MONTHS FROM THE DATE OF THIS NOTICE OR BY 32 MONTHS FROM THE PRIORITY DATE FOR THE APPLICATION, WHICHEVER IS LATER. FAILURE TO PROPERLY RESPOND WILL RESULT IN ABANDONMENT.

The time period set above may be extended by filing a petition and fee for extension of time under the provisions of 37 CFR 1.136(a).

Applicant is reminded that any communications to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above (37 CFR 1.5)

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
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.

LAMONT M HUNTER

Telephone: (571) 272-0308

MULTIPLE DEPENDENT CLAIM FEE CALCULATION SHEET

Substitute for Form PTO-1360
(For use with Form PTO/SB/06)

Application Number	Filing Date
13994455	

Applicant(s) Andrew Wright

* May be used for additional claims or amendments

CLAIMS	AS FILED		AFTER FIRST AMENDMENT		AFTER SECOND AMENDMENT	
	Indep	Depend	Indep	Depend	Indep	Depend
1	1		1			
2		1		1		
3		2		1		
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38		(1)				
39		(1)				
40	1					
41		1				
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45		(1)				
46		(1)				
47	1					
48						
49						
50						
Total Indep	3		2		0	
Total Depend	47	↵	18	↵	0	↵
Total Claims	50		20		0	

	*		*		*	
	Indep	Depend	Indep	Depend	Indep	Depend
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PTO-1390 (03-13)
Approved for use through 4/30/2013. OMB 0651-0021
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.

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A SUBMISSION UNDER 35 U.S.C. 371

Attorney Docket No.: 044228.010200

U.S. Application No. (if known, see 37 CFR 1.5):

International Application No.	International Filing Date	Priority Date Claimed
PCT/GB2011/052491	December 15, 2011	December 15, 2010

Title of Invention: METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR

First Named Inventor: Andrew William WRIGHT

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. [✓] This is an express request to begin national examination procedures (35 U.S.C. 371(f)). NOTE: The express request under 35 U.S.C. 371(f) will not be effective unless the requirements under 35 U.S.C. 371(c)(1), (2), and (4) for payment of the basic national fee, copy of the International Application and English translation thereof (if required), and the oath or declaration of the inventor(s) have been received.
2. [✓] A copy of the International Application (35 U.S.C. 371(c)(2)) is attached hereto (not required if the International Application was previously communicated by the International Bureau or was filed in the United States Receiving Office (RO/US)).
3. An English language translation of the International Application (35 U.S.C. 371(c)(2))
   a. [✓] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
4. An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4))
   a. [ ] is attached.
   b. [✓] was previously filed in the international phase under PCT Rule 4.17(iv).

Items 5 to 8 below concern amendments made in the international phase.

PCT Article 19 and 34 amendments

5. [ ] Amendments to the claims under PCT Article 19 are attached (not required if communicated by the International Bureau) (35 U.S.C. 371(c)(3)).
6. [ ] English translation of the PCT Article 19 amendment is attached (35 U.S.C. 371(c)(3)).
7. [ ] English translation of annexes (Article 19 and/or 34 amendments only) of the International Preliminary Examination Report is attached (35 U.S.C. 371(c)(5)).

Cancellation of amendments made in the international phase

8a. [ ] Do not enter the amendment made in the international phase under PCT Article 19.

8b. [ ] Do not enter the amendment made in the international phase under PCT Article 34.

NOTE: A proper amendment made in English under Article 19 or 34 will be entered in the U.S. national phase application absent a clear instruction from applicant not to enter the amendment(s).

The following items 9 to 17 concern a document(s) or information included.

9. [✓] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
10. [✓] A preliminary amendment.
11. [✓] An Application Data Sheet under 37 CFR 1.76.
12. [✓] A substitute specification. NOTE: A substitute specification cannot include claims. See 37 CFR 1.125(b).
13. [ ] A power of attorney and/or change of address letter.
14. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13*ter*.3 and 37 CFR 1.821-1.825.
15. [ ] Assignment papers *(cover sheet and document(s))*. Name of Assignee: _____
16. [ ] _____ 37 CFR 3.73(c) Statement *(when there is an Assignee)*.

This collection of information is required by 37 CFR 1.414 and 1.491-1.492. 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 15 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: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

U.S. APPLN. No. (if known – see 37 CFR 1.5)	INTERNATIONAL APPLICATION No.	ATTORNEY DOCKET No.
	PCT/GB2011/052491	044228.010200

17. ☐ Other items or information:

The following fees have been submitted.	CALCULATIONS	PTO USE ONLY
18. ☑ Basic national fee (37 CFR 1.492(a)) **$280**	$ 280	
19. ☑ Examination fee (37 CFR 1.492(c)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) ..... **$0** All other situations **$720**	$ 720	
20. ☑ Search fee (37 CFR 1.492(b)) If the written opinion prepared by ISA/US or the international preliminary examination report prepared by IPEA/US indicates all claims satisfy provisions of PCT Article 33(1)-(4) ..... **$0** Search fee (37 CFR 1.445(a)(2)) has been paid on the international application to the USPTO as an International Searching Authority ..... **$120** International Search Report prepared by an ISA other than the US and provided to the Office or previously communicated to the US by the IB ..... **$480** All other situations **$600**	$ 600	
TOTAL OF 18, 19, and 20 =	$ 1600	
☐ Additional fee for specification and drawings filed in paper over 100 sheets (excluding sequence listing in compliance with 37 CFR 1.821(c) or (e) in an electronic medium or computer program listing in an electronic medium) (37 CFR 1.492(j)). Fee for each additional 50 sheets of paper or fraction thereof **$400**		

Total Sheets	Extra Sheets	Number of each addition 50 or fraction thereof (round **up** to a whole number)	RATE	
- 100 =	/ 50 =		x **$400**	$

Surcharge of **$140.00** for furnishing any of the search fee, examination fee, or the oath or declaration after the date of commencement of the national stage (37 CFR 1.492(h)).	$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	19 - 20 =	0	x **$80**	$	
Independent claims	2 - 3 =	0	x **$420**	$ 0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable) No			+ **$780**	$	
Processing fee of **$140.00** for furnishing the English translation later than 30 months from the earliest claimed priority date (37 CFR 1.492(i)). +				$	
TOTAL OF ABOVE CALCULATIONS =				$ 1600	
☐ **Applicant asserts small entity status.** See 37 CFR 1.27. Fees above are reduced by ½.					
☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Fees above are reduced by ¾. Applicant must attach form PTO/SB/15A or B or equivalent.					
TOTAL NATIONAL FEE =				$ 1600	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property. +				$	
TOTAL FEES ENCLOSED =				$ 1600	
				Amount to be refunded:	$
				Amount to be charged:	$

a. ☐ A check in the amount of $_____ to cover the above fees is enclosed.

b. ☑ Please charge my Deposit Account No. 50-2036 in the amount of $ 1600.00 to cover the above fees.

c. ☑ The Director is hereby authorized to charge additional fees which may be required, or credit any overpayment, to Deposit Account No. 50-2036 as follows:

i. ☑ any required fee.

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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: A U.S. national stage application may not claim priority to the international application of which it is the national phase. The filing date of a U.S. national stage application is the international filing date. See 35 U.S.C. 363.

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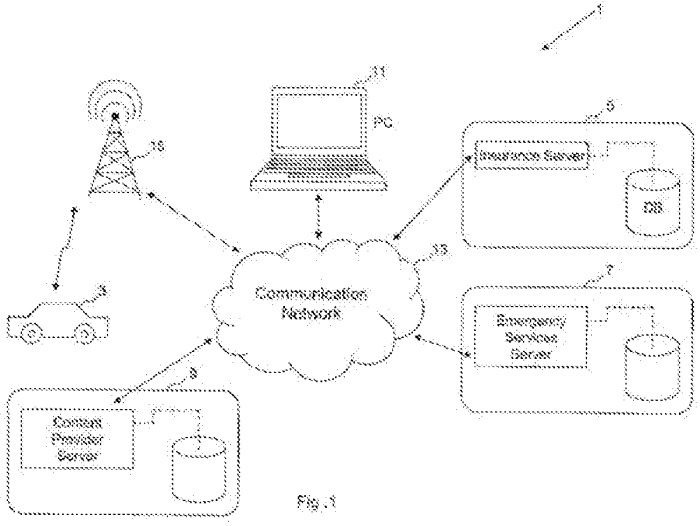


Fig. 1

(57) Abstract: Methods and systems for logging driving information associated with a vehicle when driven are disclosed. In one aspect, a mobile telecommunications device is provided that is adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven. The mobile device is arranged to register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. The mobile device is also arranged to process sensor data during the driving period to derive driving information associated with how the vehicle is driven. The mobile device is also arranged to store a selection of the driving information to a memory.

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Method and system for logging vehicle behaviour

Field of the invention

The present invention relates to methods and systems for logging driving information associated with vehicle behaviour. Moreover, the present invention relates to a mobile device adapted for installation to a vehicle and configured to log such driving information, for example, video footage associated with how the vehicle is driven. Such driving information may subsequently be utilised to determine the cause of an event such as an accident, to modify driver behaviour and/or to determine insurance premiums.

Background

Data logging devices are commonly installed on aircraft that log data about events associated with the behaviour of the aircraft and also the crew controlling the aircraft. Such data logging devices are commonly termed "black boxes" and are very useful for determining the cause of problems that have effected the aircraft, especially when no other record of a significant event such as a crash exists.

Similar data logging devices exist for road vehicles, and can be used to realise similar advantages. Vehicle users as well as authorities can use such devices to determine the cause of traffic accidents or other vehicle-related events, whether these stem from a vehicle malfunction or driver negligence. For example, the data logged by these devices can be used as evidence for insurance claims and so potentially to determine insurance premiums.

Some of these data logging devices can be integrated with the car data network, and so may take inputs from sensors integrated with the vehicle, such as those measuring the speed of the vehicle. However, these can be difficult and costly to install. Others having their own internal sensor set are more readily retrofitted to a vehicle. Nonetheless, such data logging devices for road vehicles are less prevalent perhaps due to their unjustifiable expense. Accordingly the uptake of data logging devices that can be retrofitted to road vehicles, as are known in the art, has been minimal.

It is the object of the present invention to alleviate the above-mentioned problems, at least in part.

Summary of the invention

According to a first aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from the sensor set to derive said driving information; a memory for storing said derived driving information; and a wireless telecommunications module operable to download an application; the mobile device being arranged to execute the downloaded application to control the mobile device to: register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; process sensor data from the sensor set during the driving period to

derive driving information associated with how the vehicle is driven; and store a selection of the driving information to the memory.

Advantageously, the use of a mobile telecommunication device enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle. Mobile telecommunication devices such as "smart-phones" are becoming increasingly widespread, and these devices tend to have the requisite sensor sets to capture data concerning vehicle behaviour. Thus, a generic mobile telecommunication device already owned by a driver of the vehicle can be loaded with the application to provide such data logging functionality that would otherwise necessitate a dedicated black-box. Thus, the functionality of a black-box can be realised without additional expense.

Following on from this, it will be appreciated that the mobile device is ideally a portable mobile telecommunication device. Ideally, the mobile device is a hand-portable mobile device. Advantageously, the portability permits the mobile device to be conveniently fitted to and removed from the vehicle.

Furthermore, such a mobile telecommunication device presents additional advantages over known dedicated black-box systems as the data logging functionality of the mobile telecommunication device can be continually refined. This can be achieved without physically upgrading the hardware of the device, and also without significant user intervention. Specifically, the application may be arranged to determine whether a software update exists and if so, control the mobile device to download at least portions of an improved version of the application. Conveniently, downloading may be via the wireless telecommunication module. Said downloading may be automatic, or may be user-confirmed. For the avoidance of doubt, the application will typically be stored on a portion of the memory of the mobile device and executed therefrom, as is known in the art. Also, it will be appreciated that the application, or portion thereof may be downloaded via the wireless telecommunication module and/or via an intermediary device. For example the application may be side-loaded to the mobile device from an intermediary computing device.

The application may be sourced from an application store and/or content provider. For example, the content provider may comprise the Apple® Appstore®. The content provider may comprise a cloud computing provider.

It will be appreciated that the use of such a generic mobile device in this context may be counter-intuitive to a person skilled in the art - such generic devices are not designed to withstand events such as catastrophic crashes. Furthermore, such generic devices are usually not necessarily configured to appropriately detect conditions that may need to be recorded. Such devices are usually kept in a user's pocket or bag, and so are not best placed to generate sensor data associated with the behaviour of a vehicle. However, the inventor of the present invention has realised that such a mobile device that is adapted for installation to the vehicle can overcome such drawbacks and fulfil a role similar to a black box. To this end, the mobile telecommunication device may comprise an adapter arranged to hold the device securely to the vehicle.

Advantageously, as well as protecting the device from damage, the adapter improves the suitability and reliability of the sensor data and so the driving information associated with when and/or how the vehicle is being driven. For example, if the sensor set comprises an

accelerometer, the acceleration of the vehicle can be more accurately measured due to the mobile device being firmly attached to the vehicle. Similarly, if the sensor set comprises an image sensor, for example, for capturing video footage of the road ahead, better footage can be obtained as the mobile device can be held in the correct position and orientation relative to the vehicle. In particular, the mobile device may be positioned by the adapter so that its image sensor views the road ahead through a windshield of the vehicle.

As mentioned, the device is arranged to log driving information associated with the vehicle, when that vehicle is being driven. This is realised by registering the start of the driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by the driver. Advantageously, this prevents driving information from being needlessly recorded. As will be appreciated the mobile device has only a finite storage capacity and so registering the start of the driving period is useful for minimising the unnecessary usage of memory. In particular, where the mobile device comprises an image sensor, and the sensor data comprises a sequence of images (e.g. a video) the storage space can be very quickly filled by the memory.

To this end, it is preferred that when the application is executed, it controls the mobile device to register the start of a driving period in response to an initialisation input. The initialisation input may comprise a user input - for example, the user manually executing the application on the mobile device. The initialisation input may also or instead be generated automatically in response to the mobile device being installed to the vehicle and/or the vehicle being driven. The initialisation input may be generated automatically in response to the sensor data having predetermined values. For example, if the sensor data reflects a detected speed above a predetermined threshold – for example, 20 kilometres per hour – then this can be used to trigger the start of the driving period. Similarly, if the sensor data reflects that the mobile device is held securely to the vehicle in a predetermined position (for example, via the adapter) this can also be used to trigger the start of the driving period. To this end, the adapter and/or the mobile device may comprise a registration module configured to register the installation of the mobile device to the vehicle and/or the adapter. The registration module may comprise a proximity sensor to detect the proximity of the mobile device to the vehicle. The registration module may comprise a NFC (near field communication) device. The registration module may be arranged to determine a match between the location of the mobile device and the location of the vehicle. The match may be performed by receiving and comparing a first positioning input associated with the position of the vehicle and a second positioning input associated with the position of the mobile device. The registration module and/or adapter may be a smart holster.

Preferably, the executed application controls the mobile device to manage voice-calls incoming to the mobile device during a driving period. For example, said voice-call management may comprise temporarily disabling and/or diverting voice-calls incoming to the mobile device during a driving period. Advantageously, this safety feature discourages users from making or receiving phone calls whilst driving. It will be appreciated that a driver is less able to control a vehicle effectively whilst also manipulating a mobile device, and in many countries doing so is illegal. However, the provision of a 'hands-free' mode or accessory – as are well known in the art - may obviate the need for a user to manipulate the mobile device. Accordingly, the executed

application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the detection of a hands-free accessory or hands-free mode enabled on the mobile device.

Furthermore, the executed application may be arranged to control the mobile device to enable a hands-free mode of operation on detection of a driving period. For example, the enabled hands-free mode of operation may comprise enabling voice-activated commands. In light of this, it is preferred that the adapter is configured to hold the mobile device in a way that facilitates reception of voice commands from the user. In particular, the mobile device may be held in a position relative to the user to permit clear reception of the users voice. Typically, this position is about the dashboard in a vehicle such as car or van. Furthermore, the adapter is configured with an opening through which an audio sensor of the mobile device is able to receive the user's voice.

Also, even though a drivers control of a vehicle may be affected by manipulating the mobile device, under certain circumstances, this may not be objectionable – for example, when the vehicle is stationary. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the driving information – for example, the speed and location of the vehicle.

Furthermore, it will be appreciated that the driver may not be the only user within the vehicle, and so disabling functions of the mobile device may not be appropriate under all circumstances, as a passenger of the vehicle may want to use the mobile device whilst the driver is driving. Under these circumstances, the executed application is arranged to control the mobile device to register the presence of a non-driver (for example, via image recognition, or entry of an unlock code) and unlock, or retain the original functionality of the mobile device. Furthermore, the executed application may be arranged to run in the background. Accordingly, the mobile device may be used for other purposes, such as making or receiving a telephone call.

It is advantageous to store only selected driving information for the purpose of logging how a vehicle is being driven during the driving period. Whilst it may be possible to sample and process sensor data at a relatively high rate (i.e. many times a second), continually storing driving information derived from that sensor data at such a high rate can use up a lot of storage space on the mobile device, the majority of which is likely to be redundant. Therefore, by being selective about the driving information that is stored, storage utilisation can be made more efficient.

In particular, the executed application may control the mobile device to store a summary of the driving period. The summary may comprise compressed and/or summarised driving information. For example, the sensor data can be processed at a first sampling rate and then down-sampled to a fraction of the first sampling rate for storage as driving information. Put another way, the mobile device can be controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate. Advantageously, this retains a snapshot of when and/or how the vehicle is being driven, but with fewer data points, and so requiring less storage space.

Nonetheless, under certain circumstances, it is more useful to retain information at higher or the highest possible sampling rates. In particular, it is more important to have detailed

information associated with the behaviour of a vehicle during a crash than when the vehicle is being driven normally.

Accordingly, the executed application may be arranged to control the mobile device to detect the occurrence of a predetermined event of significance (such as a crash) and in response store driving information associated with that event to the memory. Preferably, said driving information associated with that event comprises driving information in the lead up to and immediately following the event. In particular, detailed driving information in the lead up to, and immediately following a predetermined event of significance is preferably stored. It will be understood that the driving information associated with the detected event may be transmitted via the wireless telecommunication module in addition to, or instead of storing said data. Said transmitted driving information may be transmitted to a remote data logging system.

To this end the mobile device may comprise an event detector for detecting the occurrence of an event.

Preferably, the event detector is arranged to detect the occurrence of a predetermined event by correlating data, such as sensor data, against an event indication model. The application may comprise the event indication model.

Preferably, the event indication model comprises a set of predetermined data values corresponding to a predetermined event. Accordingly, the event detector is arranged to compare the set of predetermined data values against corresponding sensor data to determine whether the predetermined event has occurred.

For example, the event indication model may indicate that a serious crash has occurred if values returned by an accelerometer sensor exceed predetermined data values of the event indication model, thereby representing a sustained vehicle deceleration beyond a threshold level. Following on from this, it will be appreciated that detection of an event may be dependent on matching a sequence of data values that have occurred over time. Moreover, the event indication model may comprise a sequence of predetermined data values, the sequence being associated by a function of time. Thus, the event detector may be arranged to compare the sequence of predetermined data values against corresponding sensor data that have been generated over a given time period. Put another way, the event detector and event indication model are arranged to indicate the occurrence of an event in dependence on the correlation between a set of predetermined data values occurring over time. Thus, a set of values returned from sensor data over a period of time are compared against a corresponding sequence of predetermined data values of the event indication model. Typically, this is to determine a rate of change of variables associated with a sensor set.

It will be understood that an event indication model may comprise a plurality of sets of predetermined data values, each set corresponding to different sensor data. For example, an event indication model associated with a serious accident event may contain data values corresponding to both the deceleration of the vehicle, and the orientation of the vehicle. Thus, if a vehicle is involved in a serious impact, and overturns, this is represented by the model, and so can be detected by the event detector.

Preferably, the event indication model comprises a pattern of predetermined data values. Preferably, the event detector is arranged to detect the occurrence of an event by carrying out pattern recognition by matching sensor data values to the pattern of predetermined data values of the event indication model. Preferably, there are a plurality of event indication models. Each event indication model may be associated with a separate predetermined event.

Preferably, the executed application may be arranged to control the mobile device to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with when and/or how the vehicle is driven for each of the driving periods. Preferably, sensor data processed during a first set of driving periods define a benchmark against which sensor data is compared during subsequent sets of driving periods. In particular, the executed application may be arranged to control the mobile to modify one or more event indication models in response to the benchmark. Advantageously, such a benchmark ensures that the event indication models may be tailored to the standard behaviour of a particular vehicle. As will be appreciated, different sensor types, mobile devices, mounting positions, vehicles, drivers and road conditions may generate different sets of sensor data for driving behaviour that is considered standard or safe. Accordingly, the benchmark allows the mobile device to account for variable driving conditions.

Preferably, a plurality of benchmarks may be defined. A benchmark may be defined for each driver. A benchmark may be defined for each vehicle to which the mobile device is to be installed. Ideally, a benchmark is defined for each driver-vehicle pair. To this end, the mobile device may be arranged to receive an input to specify a driver, a vehicle or a driver-vehicle pair. Advantageously, this ensures that different drivers and vehicles do not disrupt the accurate event detecting capabilities of the event detector.

Once a predetermined event has been detected by the event detector, it is desirable to take an appropriate action in response to that detected event. Accordingly, the executed application may be arranged to control the mobile device to take at least one predetermined action in response to a detected event. The action taken may comprise transmitting driving information and/or sensor data, via the wireless telecommunication module of the mobile device, to a remote system. Advantageously, this enables a remote system to be notified of the occurrence of a particular event, and the details associated with that event. For example, the remote system may be arranged to deploy emergency services based on a transmitted notification concerning the occurrence of a crash, and also the location of the mobile device (and so the vehicle) are also included in the transmitted information. A further advantage of transmitting driving information and/or sensor data to a remote system is that such data then does not need to be stored on or processed by the mobile device. Thus, this can free the storage space on the mobile device, and also allow the processor of the mobile device to carry out other tasks. A remote system may comprise or be interfaced with an insurance company database.

A further advantage associated with sending driving information to a remote system is that the driving information can be assessed remotely. This assessment can be performed automatically or manually - either way it advantageously removes the processing burden from the mobile device. Alternatively, if transmission bandwidths are small, the processing can be

executed automatically on the processing device. In this case, the use of virtual neural networks can be used to determine whether the driving information represents acceptable or unacceptable driving patterns.

The action taken may comprise storing data captured at a higher (or the highest possible) sampling rate than when an event is not detected. Thus, as described above, this may involve preventing the down-sampling of sensor data. Furthermore, the action taken may comprise protecting said driving information from being overwritten.

The action taken may comprise providing feedback to a user to indicate that an event has been detected. Preferably, the mobile device is configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback. Advantageously, such user feedback can be used to modify event indication models thereby to refine the effectiveness of the event detector. The mobile device may comprise a speaker. Accordingly, such feedback may be provided via an audio prompt. The mobile device may comprise a display screen. Accordingly, such feedback may be provided via a visual prompt. The feedback may comprise notifying a user that a further action has been scheduled, and will be taken within a predetermined period. For example, the feedback may indicate to a user that an event such as a serious crash has been detected, and so the next action to be taken will be to contact emergency services within 10 seconds. Preferably, the feedback includes a prompt to receive a user input. For example, the prompt may be arranged to receive a user input to cancel a subsequently scheduled action. Advantageously, this prevents actions being taken needlessly as a result of an incorrect determination of an event.

The feedback may provide reassurance and/or guidance to a user. For example, a user may be provided with an important checklist of things to do following an accident or incident. For example, the user may be guided to use a camera (image sensor) on the mobile device to take photographs of the vehicles involved in the incident, including the number plates of those vehicles. The user may be guided to use a text input device on the mobile device to note the name, address, insurance details etc of third parties involved in incident.

The action taken may comprise communicating to a remote system associated with an insurance company that an incident has been detected (e.g. via a low bandwidth data connection or via text message). If appropriate – or in response to a request from a communication to the mobile device from the remote system – the action taken may comprise transmitting all or selected portions of the driving information associated with the detected event.

Preferably, the executed application is arranged to control the mobile device to prioritise essential communications, such as calls to the emergency services.

Preferably, the memory comprises a long term memory for persistently storing driving information and/or sensor data. Preferably the memory comprises a buffer. The buffer may comprise a short term memory for transiently storing driving information and/or sensor data. Preferably, the short term memory is arranged to receive driving information and/or sensor data at a higher update rate than the long term memory. Preferably, the long term memory has a larger capacity than the short term memory.

Preferably, the executed application controls the mobile device to write driving information and/or sensor data to the short term memory at a predetermined update rate during the driving period. Ideally, the driving information and/or sensor data is written to the short term memory in a predetermined sequence, ideally a chronological sequence. Preferably, the executed application controls the mobile device to overwrite driving information and/or sensor data previously written to the short term memory. Advantageously, this ensures that recording of sensor data and/or driving information, especially data that is recorded at a relatively high update rate, is not prevented during the driving period due to the short term memory becoming full.

Preferably, the driving information and/or sensor data is overwritten in accordance with the predetermined sequence. Advantageously, this can ensure that the most relevant, up-to-date data is retained in the short term memory.

Preferably, the action taken in response to a detected event comprises transferring data from the short term memory to the long term memory. Advantageously, this can ensure that the most recent information associated with an event is persistently stored in the long term memory, and is not overwritten.

Preferably, the sensor set comprises an accelerometer for detecting the acceleration of the mobile device. Accordingly, the corresponding sensor data may comprise acceleration data generated by the accelerometer. The accelerometer may be a single axis or dual axis accelerometer. However, it is preferable that the accelerometer is a three-axis accelerometer so that movement of the vehicle may be determined in three-dimensional space. Furthermore, as the mobile device may be mounted by a user in one of a number of different orientations relative to the vehicle, a three-axis accelerometer ensures that acceleration along the axis aligned with the general forward movement of the vehicle may be effectively detected. This is particularly important to determine an event such as heavy braking of the vehicle and/or a crash.

Preferably, the sensor set comprises an image sensor such as a camera. Accordingly, the corresponding sensor data may comprise images and/or a sequence of images generated from the image sensor. Said sequence of images may be processed and/or stored in the form of a video. Advantageously, this can improve the space utilisation of the sequence of images. Preferably, the mobile device is arranged to receive a user input to store a user-selected image or sequence of images to the memory. The image sensor data may be processed to determine safety information and feedback said safety information to the driver. For example, the mobile device may be controlled to determine the proximity of the mobile device to other vehicles. Said determination may be via comparing the apparent size of the number plate of other vehicles in an image with a known size of a standard number-plate, and from that the distance to those other vehicles. Thus, the mobile device can make a determination that another vehicle is too close, and issue a warning to the driver to slow down to avoid a collision. Similarly, images of the road ahead may be processed to determine whether a vehicle is drifting out of lane (e.g. because the driver is falling asleep). In response to such a determination, an alert can be issued. Similarly, images of road signs may be processed to assess driver behaviour.

It will be appreciated that the mobile device may comprise a plurality of image sensors. For example, the mobile device may have a forward-facing camera and a rear-facing camera.

Accordingly, it may be possible to view images of the road ahead, external to the vehicle, and also from inside the vehicle. In particular, the mobile device may be arranged to capture images or a sequence of images of the driver. Images of the driver may be processed to make a safety determination. For example, the images may be processed to detect whether the driver is falling asleep. In particular, a blink rate of the driver may be detected by processing the image data. Similarly, a determination may be made whether the driver has their eyes closed. In response to such a determination that a driver is falling asleep, the mobile device may be arranged to issue an alert so as to wake the driver.

Preferably, the sensor set comprises an audio sensor such as a microphone. Accordingly, the corresponding sensor data may comprise audio data.

Advantageously, an image sensor and/or an audio sensor can provide an important record of an event such as a crash.

Preferably, the sensor set comprises a positioning module arranged to determine the position of the mobile device. The positioning module may comprise a GPS module. The positioning module may be arranged to utilise the wireless telecommunication module to self-localise, for example by determining a position relative to one or more mobile telecommunication cell towers. Advantageously, the positioning module can allow the mobile device to determine its position (and so the position of the vehicle) over time. Accordingly, the positioning module can thus determine the speed of the mobile device and vehicle. Thus, the corresponding sensor data may comprise latitude, longitude, elevation, speed and other data obtainable from positioning modules such as GPS modules as is known in the art.

Preferably, the sensor set comprises an orientation sensor for determining the orientation of the mobile device. Said orientation sensor may comprise an electronic compass for determining a bearing, and so the direction in which the mobile device is facing. Accordingly, the corresponding sensor data may comprise orientation and bearing data. Advantageously, such data can be used to augment the data of the positioning module. Furthermore, the executed application may be arranged to use the data from the orientation sensor to determine whether the mobile device has been fitted to vehicle, and whether the mobile device has been fitted in the correct orientation. Advantageously, the data from the orientation sensor may also be used to determine whether a significant event has occurred, such as the vehicle overturning.

Preferably, the sensor set comprises a user-input device arranged to receive an input from a user. The user input device may comprise at least one of buttons and a touch-sensitive display screen. Advantageously, this allows a user to input data to the mobile device.

Preferably, the mobile device comprises a timer. Preferably, the executed application is arranged to control the mobile device to record sensor data and/or driving information against time as determined by the timer. Accordingly, the timer can be used to time-synchronise sensor data and/or driving information.

Preferably, the executed application is arranged to encrypt the driving information stored on the memory. Advantageously, this reduces the possibility of said driving information being modified without authorisation. This is an important consideration when such driving data may be used as evidence, for example, when determining the cause of an accident.

Preferably, the mobile device is arranged to interface with an external device to receive external driving information from said external device. It will be appreciated that the sensor set onboard the mobile device may be supplemented by a sensor set external to the mobile device. For example, the external device may be an engine management system of the vehicle and/or the external device may be arranged to connect to the on-car data network of the vehicle. Thus, the external device may have access to information associated with the behaviour of the vehicle (for example, the speed of the vehicle, how much the brake pedal is being pressed, etc). Such driving information can be processed and/or stored by the mobile device under control of the executed application in a manner similar to driving information derived from sensor data internal to the mobile device.

Preferably, the mobile device is arranged to interface with an external device wirelessly, for example via a Bluetooth® connection. Advantageously, this removes the need for the mobile device to be physically connected to the external device. As will be appreciated, following a driving period, a user may want to leave the vehicle and so take a personal mobile telecommunication device with them, and so a wireless interface with such an external device obviates the inconvenience of physically detaching and then subsequently re-attaching the mobile device.

Preferably, the mobile device is further controlled by the application to determine a unique identifier associated with the mobile device and retrieve from the memory and transmit via the wireless telecommunication module to a remote system said driving information paired with said unique identifier.

Advantageously, by pairing an identifier uniquely associated with the mobile device enables the remote system to unambiguously determine the source of the driving information. Accordingly, said driving information can be matched to a particular driver and/or vehicle. This is particularly useful when assessing a risk profile of said driver.

Preferably, the mobile device is controlled by the executed application to process the driving information to generate a driving score. The driving information may comprise the driving score.

Preferably, the mobile device comprises a display screen. Preferably, the display screen is touch-sensitive. Advantageously, the display screen may thereby be user-interactable. Preferably, the mobile device comprises a graphical user interface (GUI). The graphical user interface comprise user-interactable artefacts such as buttons. Preferably, the user-interactable artefacts may be displayed on the screen and receive a user input for selection or control of those artefacts. The mobile device may be controlled to selectively hide those artefacts in dependence on the state of the mobile device.

Preferably, the mobile device is controlled by the application to provide feedback about the driving information and/or values of the sensor data. Ideally, such feedback is via the display screen. For example, a detected speed may be displayed, a time elapsed may be displayed, a bearing/heading may be displayed, a detected position may be displayed and/or a detected image or sequence of images may be displayed (e.g. via a video feed).

According to a second aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from at least the sensor set to derive said driving information; a memory for storing said derived driving information; a wireless telecommunications module operable to download a controlling application; and a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; wherein, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven and store a selection of the driving information to the memory.

According to a third aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor interface arranged to receive sensor data from a sensor set; a processor for processing the sensor data to derive said driving information; a memory for storing said derived driving information; a wireless telecommunications module operable to download a controlling application; and a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; wherein, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven and store a selection of the driving information to the memory.

Preferably, the sensor interface is arranged to receive sensor data from a sensor set external to the mobile device. Preferably, the sensor interface is arranged to interface with an external device as described in relation to the first aspect of the present invention. Advantageously, this enables a mobile device to utilise a richer or better equipped sensor set than that local to the mobile device.

According to a fourth aspect of the present invention there is provided a mobile device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven. Preferably, the mobile device comprises a sensor interface arranged to receive sensor data from an external sensor set. The mobile device may comprise an internal sensor set. Preferably, the mobile device comprises a processor for processing the sensor data to derive said driving information. Preferably, the mobile device comprises a memory for storing said derived driving information. Preferably, the mobile device is a mobile telecommunication device, comprising a wireless telecommunications module. Preferably, the wireless telecommunications module is operable to download an application. Preferably, the mobile device comprises a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. Preferably, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven. Preferably, the mobile device is arranged to store a selection of the driving information to the memory. Preferably, the mobile

device is arranged to transmit a selection of the driving information via the wireless telecommunication module. The mobile device may be arranged to transmit a selection of the driving information via the wireless telecommunication module to a remote system such as a remote data-logging system. Advantageously, transmitting (rather than storing) selected driving information prevents storage space local to the mobile device being used up.

According to a fifth aspect of the present invention there is provided a method of logging driving information associated with a vehicle when driven, the method comprising: adapting and installing a mobile device to the vehicle, the mobile device comprising a memory; registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; processing sensor data from a sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven; and storing a selection of the driving information to the memory of the mobile device.

According to a sixth aspect of the present invention there is provided a data-logging system for logging driving information comprising: a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver; a communications interface arranged to communicate with a remote mobile device, and receive therefrom: a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and driving information to be logged to that corresponding account.

The remote mobile device may be a mobile device in accordance with one of the first to fourth aspects of the present invention.

Preferably, the driving information comprises a driving score. Preferably, the driving information comprises sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver.

Preferably, the system is arranged to process the driving information logged to the corresponding account to generate a driving score. The driving score may be used to determine a risk profile for at least one of the vehicle and driver. The driving score may be used to define an insurance premium associated with the account.

Preferably, the system is further arranged to communicate to a mobile device an insurance offer generated in response to the driving information received from the mobile device. The data logging system may be further arranged to receive from the mobile device a user-acceptance of the insurance offer.

The mobile device may be arranged to generate an insurance offer in response to a predetermined set of conditions being met. For example, driving information over a plurality of driving period adhering to predetermined models. Such models may comprise safe driving parameters and/or thresholds.

For brevity, it will be understood that features, functions and advantages of different aspects of the present invention may be combined or substituted where context allows. For example, features, functions or advantages of the mobile device described in relation to the first to fourth aspects of the present invention may be provided as method steps in the method of logging driving information according to the fifth aspect of the present invention.

Brief Description of the Drawings

In order that the invention may be more readily understood, reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a schematic illustration of a system within which the mobile device of various embodiments of the present invention may be used;

Figure 2 is an illustration of the automobile of Figure 1 configured with a mobile device in accordance various embodiments of the present invention;

Figure 3 is a schematic illustration of the functional components of the mobile device of Figure 2;

Figure 4a is a process flow chart, illustrating method steps executable by the mobile device of Figures 2 and 3;

Figure 4b is a more detailed process flow chart, providing an example of how a driving incident or event may be detected in accordance with embodiments of the present invention; and

Figures 5 to 24 illustrate a graphical user interface of the mobile device according to Figures 1 to 4b.

Detailed Description of the Embodiments

Specific embodiments are now described with reference to the appended figures.

A preferred embodiment of the present invention relates to a mobile telecommunications device for recording events associated with a vehicle, such as a car. In particular, the mobile telecommunications device is loaded with an application – a 'mobile app' – which is arranged to record and document the events surrounding an incident involving the vehicle (a 'driving incident'), such as a vehicle collision. The mobile application may be referred to as the 'Witness' application in the ensuing description.

Figure 1 illustrates a system 1 within which a vehicle, such as an automobile 3 configured with a mobile telecommunications device executing the Witness application, may communicate with one or more remotely located devices or systems. Such devices may relate to one or more servers, such as an insurance server 5, an emergency services server 7, a content provider server 9, and a personal computer 11. Communication between the automobile 3 and the one or more remotely located devices 5, 7, 9, 11 may be effected via a shared communication network 13. The shared communication network may relate to a wide area network (WAN) such as the Internet, and may also comprise telecommunications networks. For example, the mobile telecommunications device of the present embodiments may be arranged to communicate with any one of the remotely located devices 5, 7, 9, 11 via a mobile telecommunications base station 15, which is coupled to the shared mobile telecommunications network 13.

A main purpose of the mobile telecommunications device, when arranged within a vehicle in motion, such as the illustrated automobile 3, is to monitor and process sensor data captured by the mobile device, to derive driving information associated with the moving automobile 3. As mentioned previously, this driving information is subsequently used by the mobile device to determine if a driving incident or event has occurred. The term "driving incident" as used within

the present context may relate to an event such as a collision, a near-miss, dangerous driving, erratic driving or similar. Similarly, the driving information may be used as a means for monitoring a driver's driving performance, and determining a driving characteristic, or user profile for the subject driver. In other words, the sensor data and/or the driving information may be used to determine for example, if the driver is a cautious driver, or a reckless driver. This information may be used, for example by an insurance provider, to conduct a risk assessment and to tailor an insurance premium to the subject driver on the basis of a determined driving characteristic. Further details of this alternative embodiment are described below.

The mobile telecommunication device's functionality is provided by the Witness application, which is installed in the device's local non-volatile storage, and which is executed by the device's native processor. The application may be downloaded to the mobile device via the shared communications network 13 and telephone base station 15, from the content provider server 9.

In use (once the application has been configured for execution on the mobile telecommunications device), when a driving incident has been detected by the mobile telecommunications device, data, comprising one or more of mobile device sensor data, derived driving information, and captured image data may be automatically forwarded to one or more of the remotely located devices 5, 7, 9, 11. For example, the mobile device may be configured such that when a driving incident is detected, such as a collision involving an automobile 3, driving information (including image data captured by the mobile device) derived from the sensor data is automatically forwarded to the insurance server 5, via the base station 15 and shared communications network 13. In this way, data relating to the driving incident (a collision in this example), is automatically forwarded to the automobile user's insurance provider, for use in claim settlement, and/or to determine culpability.

Similarly, once a driving incident has been detected, data may also be automatically forwarded to the emergency services server 7. For example, such data may comprise the position information of the automobile 3, along with an automated S.O.S. message requesting assistance from the emergency services. Forwarded data may also comprise sensor data, and any relevant derived driving information, such as speed of impact, the g-forces the vehicle was subjected to during the collision, or any other information wherefrom the severity of the collision may be determined, and which may be used to assist the emergency services in coordinating the appropriate level of response.

Optionally, an electronic message may be sent to a personal contact preselected by the user. For example, an automated message, such as an e-mail, may be forwarded to the PC 11 of the user nominated personal contact, informing the personal contact that the user of the vehicle 3 has been involved in a driving incident. Similarly, and due to the mobile device's telecommunications functionality, an electronic text message, such as an SMS (Short Message Service) may be forwarded to the telephone of the user selected personal contact, informing the contact of the driving incident. The mobile device may be equally be arranged to communicate with a personal contact via any known electronic messaging service and/or instant messaging service too. For example, via Apple's® iMessage, or RIM's® BlackBerry Messenger (BBM) service.

This functionality of forwarding a message to a nominated contact, may also be of particular benefit for managing large fleets of vehicles. For example, a car hire service. In this way, if any of the vehicles comprised in the fleet are involved in a driving incident, the car hire service may be automatically notified of the identity of the specific vehicle involved in the driving incident. In such embodiments, the nominated personal contact would be preselected by the vehicle fleet manager. The option of providing a second user selected personal contact is also envisaged. In this way, a message may be forwarded to both the car hire service for example, and to the driver's selected personal contact.

In preferred embodiments the mobile telecommunications device relates to a mobile telephone having native processing functionality, and preferably relates to a smartphone. Preferably, the mobile telephone comprises a camera arranged to enable image capture, and preferably arranged to enable a sequence of images to be captured taken in temporal succession. In other words, in preferred embodiments the mobile telephone comprises a camera configured to enable video footage of a sequence of events to be captured.

Alternatively, the mobile telecommunications device may relate to a PDA, a notepad such as an iPad®, or any other mobile device comprising local processing means and means for communicating with a telecommunications network.

Figure 2 provides a more detailed view of the automobile 3 of Figure 1, and illustrates a preferred arrangement of the mobile telecommunications device 17 within the automobile 3. In the illustrated embodiment, the mobile telecommunications device 17 relates to a smartphone configured with an image capture device, such as a camera. Preferably, the device 17 is arranged within the vehicle, such that the camera has a clear line of sight of the road in the principle direction of travel of the automobile 3. For example, the device 17 may be attached to the windshield 19 of the automobile 3 in an adapter 21. The adapter 21 may comprise a flexible telescopic arm, configured with a suction cup at one end for affixing the adapter to the windshield 19, and a dock arranged at the opposite end for securely holding the telecommunications device 17 in place. The telescopic arm enables the position of the device 17 to be varied, such that a clear line of sight in the direction of travel may be obtained.

The details of the adapter 21 are irrelevant for present purposes, with the exception that it must enable a clear line of sight in the principle direction of travel of the vehicle to be obtained, and it must firmly affix the mobile to the vehicle. Affixing the mobile telecommunications device 17 to the automobile 3, ensures that the mobile device 17 is able to accurately capture the automobile's state of motion. By principle direction of travel is intended the main direction of travel of the vehicle when operated in a conventional way, indicated by the arrow **A** in Figure 2. In other words, the forward direction of travel. The skilled reader will appreciate that whilst most vehicles, such as an automobile, may have more than one direction of travel (e.g. travelling backwards when in reverse gear), the majority of vehicles have a primary direction of travel, which is the intended direction of travel for any transit of substantial length and/or distance. Arranging the telecommunications device 17 relative to the direction of principal travel, ensures that the camera (not shown) of the telecommunications device 17 is well placed to capture any image data which may be pertinent to a subsequently detected driving incident, such as a collision.

Figure 3 is a schematic of the modular components of the mobile telecommunications device 17 of Figure 2. Preferably the mobile telecommunications device 17 comprises: an image capture module 21, an accelerometer 23, a GPS receiver 25, an audio capture module 27, a communications module 29, a processor module 31 and a storage module 33. The image capture module 21, accelerometer 23, GPS receiver 25, and audio capture module 27 form a sensor set and are generically referred to as data capture modules in the ensuing description, and are differentiated from the communications module 29, processor module 31 and storage module 33, in that they comprise sensors for sampling physical data.

This sampled physical data, which is also referred to as sensor data, is subsequently processed by the processor module 31 and stored in the storage module 33.

The image capture module 21 may relate to any image capture device, such as an integrated camera commonly found in smartphones or similar mobile devices. As mentioned previously, the image capture module 21 is preferably configured to capture a plurality of images taken in temporal succession, such as provided by a video camera.

The accelerometer 23 is arranged to provide information regarding the motion of the automobile 3 along all three dimensional axes. For example, the accelerometer 23 provides information regarding the pitch, yaw and roll of the automobile 3. Sensor data captured from the accelerometer 23 may be used to determine the g-forces the automobile has been subjected to. This is particularly useful in determining the severity of a collision. In general, the greater the g-forces experienced in a collision, the greater the risk of serious injury to the passengers of the vehicle. This information may assist the emergency services in forming an initial assessment of the severity of a collision. Furthermore, this type of data may also assist the emergency services and/or insurance provider to obtain a better understanding of the driving incident. For example, in the event of a collision, this data may assist the emergency services and/or insurance provider to obtain a better understanding of how the collision occurred. This information may subsequently be used for dispute resolution, and/or for determining culpability.

The GPS receiver 25 is arranged to provide location information, such as positional coordinates, and can also provide velocity information. When combined with the accelerometer sensor data, the GPS receiver data can be used to provide a very accurate model of a driving incident, such as a collision. In particular, the GPS sensor data provides velocity data, such as the velocity of impact. The velocity data enables one to determine if a vehicle was being driven at speeds greater than the legally permitted maximum speeds.

The audio capture module 27 provides means, such as a microphone, for recording audio data, which might be generated by a driving incident. This includes any sounds generated externally to the vehicle, for example the sound of an impact, or the sound of the crumple zone being crushed. Additionally, sounds generated internally to the vehicle are also recorded. Such audio data may also help to recreate a driving incident, and understanding the causes of the incident.

The communication module 29 provides the mobile telecommunications device 17 with functionality for communicating with the remotely located devices 5, 7, 9, 11 of Figure 1. The communication module 29 comprises a wireless telecommunications sub-module 31 enabling

communication over a telecommunications network. An optional wi-fi communication sub-module is also envisaged. Similarly, the presence of wired communication modules are also envisaged, such as a USB port and/or an IEEE 1394 interface (more commonly known as FireWire™) to support wired communication with a remote device, such as a personal computer or similar. Such a connection may be useful for the purposes of side-loading the application to the mobile device.

As mentioned previously, sensor data captured from any one of the aforementioned data capture modules 21, 23, 25, 27 is processed by the processor module 33, to generate driving information. By driving information is intended any data which may be derived from raw sensor data captured by any one of the aforementioned modules 21, 23, 25, 27. For example, g-force data is driving information which is derived from the sensor data sampled by the accelerometer 23. The skilled reader will be familiar with the plurality of types of driving information that may be derived from sensor data sampled by the aforementioned modules, and accordingly a complete list of the different types of driving information that may be derived from sampled sensor data is omitted for brevity.

The processor module 33 is also configured to analyse sampled sensor data and generated driving information to determine if a driving incident has occurred (described in more detail below).

Sampled sensor data is stored in storage 34, which is operatively coupled to the processor module 33, along with any generated driving information. The storage 34 is preferably configured with a FIFO (First In First Out) storage buffer 34a, and a permanent storage component 34b. In preferred embodiments, the data capture modules are configured to sample data at periodic intervals. Preferably, these intervals are sufficiently small, of the order of milliseconds, such that for practical purposes the data capture modules may be considered to sample data continuously. The sampled data, along with any derived driving information is preferably stored in the storage buffer 34a, unless a driving incident has been identified, in which case the associated sensor data and driving information is stored in the permanent storage component 34b to avoid undesirable overwriting.

In preferred embodiments, the FIFO storage buffer 34a is provided with a finite amount of storage space. Nonetheless, said storage space may be predefined by the user as will be described below. In any case, once this storage space has been exhausted, the oldest recorded data is overwritten by newly sampled data, and this cycle of overwriting older data with newly sampled data is continuously carried out during operation of the telecommunications device 17, unless a driving incident has been detected, in which case, and as mentioned previously, all data related to the driving incident is stored in a long term protected storage 34b to safeguard it from being overwritten by newer data.

In preferred embodiments, the mobile telecommunications device 17 may be configured with a data recording strategy by the user. This might define the frequency with which sensor data is sampled. In other words, how many measurements are made per unit of time. Furthermore, the recording strategy also defines how data is recorded. In preferred embodiments, sampled sensor data is stored in data files in the buffer 34a. Each data file represents a plurality of sequentially sampled sensor data, captured over a defined period of time, which will be referred to as a 'data

file period'. This is best illustrated by considering captured image data, such as video footage. A video period may be defined, which period defines the unit of physical time covered by captured video footage comprised in a single video data file – this is the data file period for image data. The video data file is subsequently stored in the buffer 34a. For example, a five minute video period setting, instructs the processor 33 to store all sequentially captured image data captured by the image capture module 21 over a period of five minutes, in a separate video data file. It is to be understood that whilst the image capture module 21 is continuously sampling image data (in other words, it is continuously capturing image data), this plurality of captured image data is grouped together for storage in video data files, each data file representing a five minute data file period.

Sampled sensor data and derived driving information is also continuously analysed by the processor module 33 for the purposes of detecting a driving incident. As soon as a driving incident is identified, the associated sensor data and derived driving information is stored in a data file in accordance with the data recording strategy. Returning to the example described in the preceding paragraph, this entails combining the video footage captured within a temporal window of five minutes leading up to the detected driving incident, in a single video file, and storing this data file in protected storage 34b. Whilst each different type of sensor data may be recorded in separate data files, in preferred embodiments all the different types of sensor data sampled by the mobile telecommunications device 17 are stored together in a single data file in accordance with the user selected data recording strategy. This means that the five minute data file referred to above, preferably also comprises GPS data, accelerometer data, and audio data sampled over the five minute time period.

Data files are stored in the buffer 34a, unless they are associated with a driving incident, in which case they are then stored in protected storage 34b, which cannot be overwritten. Once the storage space comprised in the buffer 34a has been exhausted, the oldest data file is overwritten by a newer data file.

Data compression methods may also be used in conjunction with the present invention to improve the use of storage. For example, data comprised in data files which have not been associated with a driving incident may be compressed using compression techniques, which techniques will be known to the skilled reader. Similarly, within a data file associated with a driving incident, sensor data captured at time coordinates which are distant from the determined driving incident may be compressed. In this way, the resolution of sensor data which is directly pertinent to a driving incident is maintained, whilst sensor data which may be less relevant to the driving incident is maintained at a lower resolution.

Since the sensors of the mobile telecommunications device 17 are continuously recording sensor data, even when a driving incident is detected, the device 17 may be configured to comprise sensor data and/or driving information recorded/derived shortly after the driving incident in the same data file, since this data may also be relevant for understanding a driving incident. Furthermore, this also enables the mobile telecommunications device to record multiple driving incidents. For example, a multiple collision.

The processor module 33 may be configured with encryption means, enabling stored data files to be encrypted to prevent data tampering. Envisaged encryption means may comprise both

software solutions and hardware solutions. For example the processor module may comprise a cryptoprocessor, or the processor may be configured with code to carry out a cryptographic process.

Figure 4a is a flow chart outlining the method carried out by the mobile telecommunications device 17, to determine if a driving incident has occurred, in accordance with a preferred embodiment. An application is downloaded from the content provider server 9 of Figure 1, onto the mobile telecommunications device 17, at step 36, as previously described. This may be done over a telecommunications network. The application provides the mobile telecommunications device 17 with the previously described functionality, when executed on the device. The mobile telecommunications device is configured within the vehicle, at step 38. This may comprise affixing the mobile telecommunications device 17 to the vehicle via an adapter, as described previously.

The recording strategy is specified at step 40. As mentioned previously, this comprises setting the period of time that each recorded data file represents. Furthermore, it may also comprise defining the size of the buffer 34a and/or the number of data files that are to be stored within the buffer. Preferably, the recording strategy is specified only once, upon first use of the mobile telecommunications device 17. Where the recording strategy has already been defined, method step 40 is skipped, and the method continues with step 42.

The start of a driving period is registered, at step 42. The start of the driving period determines when the recording of sampled sensor data begins. The start of a driving period may be manually entered by the user via the application's graphical user interface (GUI). Alternatively, the start of the driving period may be automated. For example, the mobile device 17 may be configured to initiate the driving period once sensor data above a minimum threshold value is recorded, indicative of the vehicle being in motion. For example, once a velocity greater than 20 kilometres per hour is detected.

Alternatively, the start of the driving period may be initiated once the application determines that the mobile telecommunications device 17 has been affixed to the vehicle. For example, the adapter 21 may comprise a registration module (not shown) arranged to register the installation and fixation of the mobile device to the vehicle and/or adapter. The registration module may comprise an NFC device. When the mobile device is brought into close proximity with the registration module, a driving period is initiated.

Once the driving period has been initiated, sensor data is sampled and recorded in storage 34, at step 44. Additionally, the sampled sensor data is used to generate driving information by the processor module 33. The sampled sensor data and the driving information is continuously analysed by the processor module 33, at step 46.

The processor module 33 determines if a driving incident has been detected, at step 48. This is determined on the basis of the analysis carried out at step 46. If a driving incident has been detected, all the sensor data and driving information associated with the data file period, is stored in a data file in protected storage 34b, at step 50.

There are several ways in which a driving incident may be detected. Preferably, this is an automated process, wherein the processor module 33 determines a driving incident has occurred

on the basis of an observed marked variation in sensor data and/or driving information. The term 'marked variation' is to be understood to relate to a significant change in sensor data and/or driving information occurring over a very short time period. In other words, a detected impulse in recorded sensor data and/or driving information, indicative of a significant change in the state of motion of the vehicle occurring over a short time period. For example, a sudden increase in the g-forces the vehicle is subjected to, may be indicative of a collision and if observed, result in a driving incident being determined to have occurred by the processor module 33.

Predefined threshold values may also be used to automate the detection of a driving incident. For example, each data type and/or derived driving information (e.g. acceleration, velocity, g-force, pitch, roll, yaw etc.) may be associated with a threshold value. When any one of these threshold values is exceeded, the processor module 33 may be configured to determine that a driving incident has occurred. Similarly, the automated detection of a driving incident may require that a threshold condition associated with a combination of predefined threshold values, each threshold value being associated with a different data type and/or type of driving information, must be exceeded, in order for the processor module 33 to automatically determine that a driving incident has occurred. For example, in the event of a collision, it is reasonable to expect to observe a marked variation in g-force, accompanied by a marked variation in velocity. Accordingly, the threshold condition may require that in order for a collision to be automatically detected, both a marked variation in g-force and a marked variation in speed, in excess of predefined threshold values must be observed.

Similarly, the occurrence of a driving incident may also be recorded manually by the user via the application GUI. This may be beneficial for the purposes of documenting data associated with a low velocity collision - colloquially referred to as a 'fender-bender' - which may not result in any marked variations in sampled sensor data, and therefore may not be automatically detected.

Once a driving incident, such as a collision, has been detected, and the data file comprising the associated sensor data and driving information has been securely stored in protected storage 34b, the data file is transmitted to the insurance server 5 of Figure 1, at step 52. The data file informs the insurance provider that a driving incident has occurred and provides the insurance provider with the sensor data and derived driving information. This data assists the insurance provider in better understanding the collision, in addition to assisting with determining culpability, where more than one vehicle are involved.

Similarly, once a driving incident has been detected, an S.O.S. message may be automatically forwarded from the mobile telecommunications device 17 to the emergency services server 7, at step 54. The S.O.S. message may also comprise sensor data and derived driving information, which may assist the emergency services in coordinating their response.

As mentioned previously, the mobile telecommunications device 17 will continue to sample and record sensor data even once a driving incident has been detected, unless the mobile telecommunications device 17 detects that the driving period has terminated, at step 56. If the driving period has terminated, the present method is terminated and the device stops recording sensor data. The end of a driving period may be automatically detected by the processor module 33, if certain conditions are met. For example, if the measured velocity of the vehicle remains zero

for a predetermined period of time, the processor module 33 may infer that the vehicle is stationary and no longer being driven, and accordingly ceases recording sensor data, and the method is terminated. If instead the processor determines that the driving period has not yet terminated, a new data file period is initiated, at step 58, and steps 44 through 62 are repeated.

Where a driving incident is not detected at step 48, the processor module 33 will determine if the data file period has expired, at step 60. If the data file period has expired, then the sensor data and the derived driving information generated during the data file period is combined and stored in a single data file, for storage in the buffer 34b, at step 62. The processor 3 then determines, at step 56, if the driving period has terminated. If the driving period has not terminated, a new data file period is initiated, at step 58. The mobile telecommunications device 17 continues to sample sensor data, to derive driving information, and steps 44 through 62 are repeated, until the driving period is determined to have terminated.

Figure 4b provides more detail regarding how a driving incident may be automatically detected (i.e. steps 46 and 48 of Figure 4a) in a preferred embodiment, where the mobile telecommunications device 17 is configured to sample audio data, accelerometer data, and GPS data only. Each one of these types of data is analysed in turn, at steps 64, 66 and 68. The analysis may comprise comparing measured sensor data and/or derived driving information with a data model. The model may comprise defined threshold values for different data types. Sampled sensor data and/or driving information may be compared with the data model to determine if a driving incident has occurred.

For example, the analysis of sampled audio data, at step 64, may comprise comparing the recorded audio data with predetermined audio data models representing specific sounds. Such sounds may relate to the sound of tyre squeals, the sound of deforming metal, the sound of breaking glass, passenger screaming and/or shouting, the sound of airbag deployment, and any other sound which may be associated with a driving incident. Effectively, this may be considered audio fingerprinting, which serves to identify specific sounds associated with a driving incident by carrying out a signal profile analyses of the audio signal captured by the audio capture module 27. To achieve this, the storage device 34 may comprise a database of prestored audio sound files. The audio sound files represent sounds associated with a driving incident. The captured audio signal is compared with the sound files comprised in the database, to identify matches between the captured audio signal and the database of sound files. This facilitates the audio fingerprinting of specific sounds, indicative of a driving incident, present within the captured audio data signal captured by the audio capture module 27.

Similarly, the analysis of sampled accelerometer data, at step 66, may comprise comparing the sampled data with predetermined accelerometer data models. The data models represent specific states of motion of the vehicle. For example, this might comprise defining threshold values for yaw, pitch and roll, which if exceeded, indicate a state of motion of the vehicle indicative of a driving incident. For example, a measured yaw value above a predetermined threshold value may be indicative of the vehicle having lost traction and is fishtailing and/or skidding. Similarly, a roll and/or pitch value above a predetermined threshold value may be indicative of the vehicle having overturned.

Accelerometer sensor data is also used for deriving driving information such as g-forces. Analysis of g-force data is also used to determine if a driving incident has occurred. For example, approximate g-force values for detecting certain driving incidents are as follows:

- Harsh braking -- a deceleration of greater than 2.5 m/s^2 or forward G-force of greater than 0.7G for more than 400msec.
- Harsh acceleration -- from stationary, an acceleration greater than 2.5 m/s^2 or backward G-force of greater than 0.7G for more than 800msec.
- Harsh swerving - lateral G-forces greater than 0.7G for more than 400msec.

The data models are preferably preconfigured and are comprised within the application executed on the mobile telecommunications device. Different data models are used depending on the type of vehicle the telecommunications device is being used with. Different vehicle types will experience different states of motion during regular operation, which must be considered in determining if a driving incident has occurred. For example, a motorcycle will display more roll and/or pitch than an automobile during regular operation. Accordingly, different data models and/or threshold values must be used to automate the identification of a driving incident for different vehicle types. The specific data models used may be selected during an initial configuration of the mobile telecommunications device, by indicating the type of vehicle the device is being used with.

On the basis of the audio data analysis and the accelerometer data analysis, the mobile telecommunications device determines, at step 72, if a driving incident has occurred. If it is determined that a driving incident has occurred, then the telecommunications device proceeds with step 50 of Figure 4a. If instead a driving incident is not detected, the telecommunications device proceeds with step 60 of Figure 4a.

The GPS data analysis, at step 68, comprises analysing positional data and velocity data for any anomalous readings. For example, a sudden deceleration followed by a zero-velocity reading lasting a predetermined period of time, may be indicative of a collision. If such a zero-velocity reading is observed at step 70, in conjunction with anomalous audio and/or accelerometer sensor at step 72, then a driving incident is determined and the mobile telecommunications device proceeds with step 50 of Figure 4a. This is a further example of a threshold condition, discussed previously.

The previously described mobile telecommunications device and method may also be used to monitor and generate a driver profile. The driver profile may be indicative of the type of driver a user is. For example, this may comprise determining if a user is a calm and patient driver, or an aggressive driver. Also, this may comprise determining whether a user regularly flouts speed limits, and/or ignores safety distances. This type of information may be used by an insurance provider to conduct a personalised risk assessment for individual users. Insurance premium rates may then be tailored to the specific user on the basis of the personalised risk assessment.

For example, analysis of captured image data, such as video footage, may be used to determine if a user regularly flouts safety distances. In preferred embodiments, the mobile telecommunications device is arranged within the subject vehicle to have a clear line of sight of

the road in the direction of principle motion. Accordingly, the number plate of any vehicle preceding the subject vehicle will be captured by the image capture module. Since the physical dimensions of number plates are standardised and known in each country, they may be used as a metric to scale the captured image. When combined with the known optical characteristics of the image capture module, this enables the distance of the image capture module from the image object (i.e. the preceding vehicle) to be determined at the time of image capture. This information may then be used to see if a user adheres to recommended safety distances. A user that is observed to regularly flout recommended safety distances, may be considered to represent a greater risk, and accordingly may be required to pay a greater insurance premium than a user who regularly respects recommended safety distances.

Image analysis can also be used to determine driving conditions and the driving environments. For example, image processing can detect road signs, such as stop signs or traffic lights. Furthermore, driving conditions, as affected by the weather can be determined. For example, if the windscreen wipers are detected to be in motion, it can be inferred to be raining. Once the driving conditions are so determined, an assessment of the driving performance of a user can be made by determining whether the user reacts or behaves appropriately to the driving conditions. For example, if the driver is seen to be jumping red lights, or driving dangerously in rain or snow, then a higher risk profile may be assigned to that driver.

Similarly, accelerometer and g-force data may be used to determine if a user has an erratic driving style. For example, a user that generates sharp variations in g-force data and accelerometer data during regular operation of a vehicle, may be considered to drive erratically, and therefore at greater risk of being involved in an accident, and insurance premium rates for the user may be tailored accordingly.

The mobile telecommunications device may also be configured to interface and communicate directly with a vehicles native telemetry systems. For example, the majority of modern cars have inbuilt electronic control systems or engine management systems, arranged to collect data regarding vehicle system performance. This data may be communicated to the mobile telecommunications device either via a wired physical connection, such as USB (Universal Serial Bus), or via a wireless communication protocol such as Bluetooth®. This data may subsequently be used by the mobile telecommunications device to complement sensor data captured directly by the telecommunications device. In this way a more accurate model of a driving incident, and/or of a user profile may be generated. For example, native vehicle telemetric systems may comprise electronic tyre pressure sensors, and are able to detect if a tyre is under and/or over-inflated. This information may be communicated to the mobile telecommunications device and may help to explain the causes for a driving incident, such as a sudden loss of traction resulting from a burst tyre.

Further features of the Witness application, are set out below.

Benchmarking

It will be appreciated that different sensor types, phones, mounting positions, vehicles, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

- During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.
    - Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of driving incident.
- There is preferably an option to notify the Witness application of a change in parameters (e.g. different driver, driving off-road etc). Thus a number of 'profiles' may be set up. Each profile may require an independent training mode period.
- If the Witness application incorrectly detects that a driving incident has occurred, it can receive feedback from the user to modify its sensitivities. E.g. a more aggressive driver is actually driving.

Crash/Collision Management

- On detection of a crash (or other driving incident) the Witness application is arranged to take one or more of the following actions:
    - Announce that it has detected an accident (audio/screen prompt)
    - Call the emergency services (with option to cancel) – e.g: Audio/screen prompt: 'Witness has detected that you have been involved in a (serious) accident and will call the emergency services. If this is not the case, please cancel within 10 seconds.'
    - Provide reassurance
    - Provide the user with a checklist of things to do:
        - Take photographs of vehicles involved in the incident (inc number plates)
        - Take down name, address, insurance details etc of 3rd parties involved in incident
    - Communicate to the insurance company that an incident has been detected (e.g. low bandwidth data or text message)
    - Protect the high quality recorded data so it is not overwritten
    - If appropriate – or in response to a request from a communication to the phone from the insurance company – transmit all or selected portions of the recorded data associated with the incident.
        - N.B. Use of the communication channels is controlled by the Witness application to prioritise essential communications such as calls to the emergency services.

- Note that data transmission from the mobile telephone to the insurance company may be automatic (for example, triggered by a detected incident) or manual (for example, in response to a request from the insurance company). In the latter case, the Witness application may include functionality to allow the insurance company to browse through the data files available on the mobile telephone so as to select one or more for transmission to the insurance company.

Data processing for generating a user profile

Further features of the user profile generation embodiment are summarised:

* If the Witness application incorrectly detects an event or incident of significance, and receives feedback that the vehicle was not involved in an accident (but was in a near miss) – this could alter the risk profile of the driver. For example – if this happens frequently, but no accident occurs over a given period, this could be an indicator that the driver is good at reacting to potential hazards.
* Erratic driving (e.g. jerky steering or braking detected by G-force sensor).
* Driving faster than the speed limit allocated to a given road (detected by GPS).

Further details regarding the features and functionality of the Witness application, in particular the graphical user interface of the Witness application, are now described.

Referring to Figure 5, a first page 80 of the Witness application user manual is shown in which an image of the Main Menu (the top-level menu) 82 is displayed. The Main Menu is displayed when a user first runs the application on a smart-phone, such as the iPhone® 4. The main menu includes the following user-selectable buttons:

* **Recording Screen** 84
* **File Management** 86
* **Settings** 88
* **Accident Management** 90
* **Information** 92 (displays up a manual, as shown in Figures 6 to 14).

Selecting the Recording Screen button 84 opens the Recording Screen 94 – the second image shown in Figure 5. The Recording Screen 94 contains a video feed 96 from the camera of the smart-phone, which occupies the majority of the visible screen area. Overlaid on to the video feed is the detected speed of the vehicle 98 (e.g. 0 mph), heading 100 (e.g. south by south-west) and the elapsed recorded time 102 (e.g. 00:00). Displayed in a left column of the Recording Screen are additional user selectable buttons:

* **Keep current video** 104 (pressing this button will automatically copy the current video - and the previous video segment - to the protected storage 34b, and prevents that

information from being overwritten. The user is advised to press this button in the event of a driving incident that needs to be recorded).

- **Take photo** 106 (captures a still photograph).
- **Exit Recorder** 108 (returns to main screen).
- **Start / Stop Recording** 110 (starts recording video footage - and other data).

Referring to Figure 6, a second page 112 of the Witness application user manual is shown, in which an image of the Recording Screen 114 is shown and described operating in a map-displaying mode rather than a video-feed mode.

During recording, (i.e. when the 'Start / Stop Recording' button 110 is pressed) the Exit Recorder button in the Recording Screen is substituted with a Map Display button 116. Pressing it will toggle between the modes showing the video feed and a map of the current location.

Referring to Figure 7, a third page 118 of the Witness application user manual is shown, in which the File Management Screen 120 is shown and described. The File Management Screen 120 can be accessed by pressing the File Management Button 86 in the Main Menu.

The File Management Screen 120 displays video and associated data (e.g. telemetry data) that has been previously recorded. The stored data is contained in either a protected area of storage or in a "Recording Stack". Data files in the protected area are saved and so not overwritten as part of a Recording Strategy. In contrast, data files in the Recording Stack may be overwritten as part of the Recording Strategy.

As illustrated in Figure 7, the bottom section of the list represents the "Kept" data files 122, whereas the top section of the list represents the "Recording Stack" 124. "Kept" data files 122 can be edited and deleted from the File Management Screen 120, whereas "Recording Stack" data files cannot. Editing "Kept" data files can involve renaming them.

The recorded data files are listed on screen along with the time and date of the recording and the electronic size of the data file. Accordingly, the user is provided with feedback about how big the data files are, and so if the smart-phone is low in storage, the user can elect to delete certain "Kept" data files. "Recording Stack" data files will be automatically overridden by the Recording Strategy.

The controls on the toolbar at the bottom of the recordings screen allow a user to change the selection mode of the video stack and includes:

- **Video** 126 (when highlighted, if a data file is selected, a video recording playback screen will be displayed).
- **Map** 128 (when highlighted, if a data file is selected, then a map will be displayed showing the area over which the recording was made).
- **Export** 130 (when highlighted, a selected data file will be passed to an Export Screen where export options will be provided).
- **Keep** 132 (when highlighted, if a "Recording Stack" data file is selected, then a user will be prompted to name it, and then it will be stored as a "Kept" data file).

The icons in the File Management Screen change in dependance on the selected mode. For example, Figure 20 shows the icons 134 displayed when the Video selection mode is highlighted; Figure 21 shows the icons 136 displayed when the Map selection mode is highlighted; Figure 22 shows the icons 138 displayed when the Export selection mode is highlighted and Figure 23 shows the icons 140 displayed when the Keep selection mode is highlighted. Advantageously, this provides improved feedback to a user about what selection mode is highlighted and so what action is likely from the selection of a data file.

Referring to Figure 8, a fourth page 142 of the Witness application user manual is shown, in which an image of a Recording Playback screen 144 is shown and described. The Recording Playback screen is invoked by highlighting the Video Mode 126 in the File Management Screen 120 and selecting an appropriate data file.

In the Recording Playback screen 144 it is possible to play back a pre-recorded video feed associated with a chosen data file. As well as playing back the recorded video feed, the Recording Playback screen also displays other associated data such as telemetry data 146. For example, date, time, speed, forward/backward G-forces, latitude, longitude and heading information is overlaid onto the video feed. As the video is played back, these values will typically change depending on the behaviour of the vehicle, as recorded by the mobile device.

Forward and backward G-forces are those that correspond to the forward and backward movement of the vehicle and are the primary metric for determining an event such as a crash. However, other G-forces (e.g. up/down and side-to-side) may also be measured by the device – even if they are not necessarily displayed on the mobile screen.

As recited in Figure 8, the Recording Playback screen provides further user controls in the form of:

- **Playback Position Scrub Bar** 148 (horizontal bar at bottom of screen)
- **Playback Speed Bar** 150 (vertical bar at left side of screen)
- **Pause** 152 (pauses playback)
- **Eject** 154 (return to previous screen)
- **Loop** 156 (plays the data file continuously)

The Playback Position Scrub Bar 148 allows a user to jump to different positions within the recording without necessarily needing to watch all of the recorded footage. Advantageously, this allows a user to more quickly locate a desired item of footage within a given data file. Also, the Playback Speed Bar 150 can be used to speed up or slow down the playback of the data file. This allows a desired item of footage to be found more quickly through sped-up playback, and also allows an item of footage to be more carefully analysed through slowed-down playback. Furthermore, it is possible to zoom in and out of a region of the video file using a 'pinch and zoom' movement as is standard with most multi-touch touch-screen devices.

Referring to Figure 9, a fifth page 158 of the Witness application user manual is shown, in which a different type of Recording Playback screen 160 is shown and described. Specifically, the image represents playback of a pre-recorded data file as can be invoked by highlighting the Map Mode 128 in the File Management Screen 120 and selecting an appropriate data file.

In contrast with the Video Mode playback, this Map Mode playback shows a map of the area 162 where the recording took place. A blue breadcrumb trail 164 is overlaid on to the map showing the extent of movement of the vehicle during the recorded period. A scrub slider 166 is shown, which is user-operable to adjust the time within the recorded period. As the slider is adjusted, a pin 168 moves along the blue breadcrumb 164 to show the position of the vehicle at the time as specified by the slider 166. Tapping the pin 168 displays associated telemetry data 170 at that position and time.

Referring to Figure 10, a sixth page 172 of the Witness application user manual is shown, in which an image of a Video Export Screen 174 is described. The Video Export Screen 174 may be invoked by highlighting the Export button 130 in the File Management Screen 120 and selecting an appropriate data file.

The Video Export Screen 174 allows the quality of the video associated with the selected data file to be adjusted, before that video is exported. Advantageously, this can allow the user to control the size of the data to be exported. Telemetry data (i.e. sensor data) is also exported, embedded within the video file. Video data can be exported with or without sound, depending on the permissions of the user. Export typically involves copying data files from the mobile device to a local computer (e.g. via a data cable) or a remote server (e g. via a wireless connection).

Referring to Figure 11, a seventh page 176 of the Witness application user manual is shown, in which an image of the Settings Screen 178 is displayed and described. The Settings Screen 178 allows the operation of the Recording Strategy to be controlled. Specifically, the Settings Screen allows a user to select the number of video segments that the application should store, and the size of those segments (i.e. a data file period). Accordingly, the user is able to set a limit to the storage usage of the Recording Stack (i.e. the size of the buffer 34a) part of the program. The user can also control the storage usage of the Recording Stack through the use of the video quality buttons.

Note that the Witness application may be arranged to calculate the remaining memory available on the smart-phone and suggest the appropriate settings automatically.

The Recording Strategy involves maintaining a user-controlled number of video segments. When a new video recording is initialised – instantiating a new segment – this is written over the oldest video segment. Thus only the most recently recorded videos are maintained in the Recording Stack.

Another setting that can be controlled in the Settings Screen 178 is the G-force threshold at which the Witness application will assume that a crash has taken place. It is expected that different vehicles and driving styles will need different G-force thresholds to be set to ensure a reasonable sensitivity to crash forces whilst also prevent crash detection false positives. It should be noted that although the manual recites "*Raise the sensitivity if you find that crash detection is triggered during normal driving…*" it is the sensitivity *threshold* that is to be raised, and not the sensitivity itself. A slider 180 allows the sensitivity threshold to be set via the touch-sensitive screen.

The Settings Screen 178 also has a button 182 to allow a user to define more settings via a More Settings Screen.

Referring to Figure 12, an eighth page 184 of the Witness application user manual is shown, in which an image of the More Settings Screen 186 is displayed and described. Here, it is possible for the user to select speed units 188 and also select whether the map should be displayed during recording 190, and at which speed it should be displayed in favour of the video feed. This is a safety feature of the Witness application that hides the video feed during recording when the vehicle is detected as travelling above a predetermined speed. The video feed is replaced by a map of the location of the vehicle – as is typical with in-vehicle GPS devices. Note that although the on-screen video feed is replaced with a map, video recording continues in the background.

In alternatives, the application may be arranged to detect the vehicle speed, and at a particular speed, switch off the screen entirely. It should be understood that the device will continue to record video, telemetry and other information even when the screen is switched off. Entirely switching off the screen of the device is advantageous as it significantly reduces the drain on the battery of the mobile device.

Note that the Witness application is also arranged to interface with the phone to detect low-light conditions and in response change the brightness of the screen to prevent the user/driver being dazzled. This can also save battery life.

The More Settings Screen 186 also includes a Personal Details button 192 which, when pressed invokes a Personal Details Screen.

Referring to Figure 13, a ninth page 194 of the Witness application user manual is shown, in which an image of the Personal Details Screen 196 is displayed and described.

Here, the name 198, vehicle registration number 200, mobile number 202 and email address 204 to be used in an emergency, can be specified by the user. In the event of a detected incident, these details, along with information regarding the detected incident (e.g. time of incident, location and optionally telemetry data) will be emailed to the specified email address automatically. This can ensure that the chosen recipient of that email will be informed immediately about the occurrence and nature of the detected incident.

This Personal Details Screen 196 also allows the user to set whether it is possible for the video stack to be deleted 206. A security PIN protects the changing of this option so that if a first user having the PIN (for example, a parent) can review the driving style and behaviour of a second user not having the PIN (for example, their son or daughter) by reviewing the Recording Stack – as the Recording Stack cannot be deleted by that second user. As shown in Figure 24, the PIN can be set for the first time by entering it twice into the appropriate PIN fields 208.

Referring to Figure 14, a tenth page 210 of the Witness application user manual is shown, in which images of an Accident Management Screen 212 and Witness Details Screen 214 are displayed and described.

The Accident Management Screen 212 can be invoked by the user selecting the accident management button 90 on the Main Menu , or can be automatically switched to after the Witness application has detected that there has been an incident (e.g. via G-forces exceeding a threshold level). Similarly, data can automatically be permanently stored as "Kept" and/or sent if high G-forces are detected.

As can be seen on the Accident Management Screen 212, there are the following user selectable buttons:

- **Accident Advice / What to do** 214

This option provides guidance as to what to do during an accident – see Figures 15 and 16 for the displayed Accident Advice Screens.

- **Witnesses** 216

This option invokes functionality to allow the collection of information from or about witnesses to an incident. An image of the Witnesses Detail information summary screen 214 is shown in Figure 14. Figure 17 shows the Witness Detail information collection screen 218. Voice notes can also be taken via the microphone of the smart-phone.

- **Photos** 220

This option enables the camera to allow a user to capture images associated with an incident.

- **Drivers** 222

This option invokes functionality to allow collection about the other drivers involved in an incident, such as their vehicle and insurance details. The Drivers Detail information collection screen 224 is shown in Figure 18.

- **Your Details** 226

This option provides a readily available store of the details of the user - as to be provided to other drivers – and can contain name, address and insurance details. The 'Your Details' screen 228 is shown in Figure 19.

Details recorded via the Accident Management Screen 212 are electronically authenticated and feature a time-stamp. In alternatives, this data may be encrypted to ensure the integrity of the stored data.

Furthermore, in alternatives, the exchange of the details of the drivers and witnesses can be conducted, at least in part, via Bluetooth® (for example, between mobile devices) – and/or via email. Relevant information associated with the driver is pre-stored on the Witness application in a format that can be sent readily, via a communication channel such as Bluetooth® or email.

Finally, note that in each Screen or Menu, there is a button 230 provided to go back to the previous menu. Also, when certain actions are performed or selected by a user, the Witness application is arranged to provide an audible feedback signal (for example, a beep). For example, this could be in response to starting a recording, keeping a video segment and/or a stopped recording.

Alternatives and extensions

The Witness application can be extended to interface with remote users to allow them to control the operation of the application as well as view information logged by the application.

In particular, the present application can be extended to a scenario where the Witness application is under the control of an insurance company. Such an insurance company may provide insurance to the user, and so may have an interest in the behaviour of that user, and moreover, a vehicle under the control of that user, as described previously.

In such a scenario, the insurance company will maintain a device monitoring system that can interface with a mobile device running the Witness application. In fact, the device monitoring system may interface with a large number of mobile devices, each running an individual copy of the Witness application, logging respective user/vehicle behaviours. This could the insurance provider server 5 of Figure 1.

With such a monitoring system, it is unpractical to actively monitor each and every mobile device and receiving and handling the sheer quantity of data from each and every device would also be very difficult.

Consequently, the device monitoring system and the mobile devices are advantageously arranged to automatically and intelligently interface with one another in a way that minimises the computational and bandwidth burden on the device monitoring system.

In particular, each mobile device running the Witness application is arranged to make a determination as to whether there is a need to transfer data to the device monitoring system. For example, the Witness application may be arranged to automatically send data to the device monitoring system that only has high G-force activity associated with it, as this may be indicative of a crash or another driving incident. Alternatively, the Witness application may be arranged to send detailed or high-bandwidth information if a user indicates that an accident has occurred.

In either case, the video segments and associated sensor and/or derived driving information data associated with the relevant event will be sent. However, no other data (for example, from another date) will be sent.

Alternatively, less computationally or bandwidth intensive information may be sent on a periodic basis – for example, every day, week or month. Such general information may be sent to establish a profile of a particular user. For example, many high G-force related activities may indicate that the driver is driving aggressively. A determination about the profile can be made automatically by requesting and automatically analysing further data. For example, the location and speed information can be used to determine whether a vehicle is found to frequently break the speed limit. If this is the case, then the profile of the user can be set accordingly.

Such general and periodically obtained information can also be used to remotely adjust the settings of the application. For example, many high G-force related activities may instead indicate that the set up of the car is such that the mobile device is subjected to high G forces (rather than the driver driving aggressively). If the driving is determined to be safe, but the mobile device is setting off many false positives, then the device monitoring system can automatically adjust the settings of the application. For example, the G-force sensitivity threshold may be increased remotely.

Thus, the initial data that is automatically transmitted from the mobile device to the vehicle monitoring system is limited in bandwidth so as not to overload the vehicle monitoring system as a whole. However, after processing or analysis is performed on the initial data, further information may be requested. For example, further information may be requested automatically by the system or manually by a controller acting for the insurance company. Such further information may include high resolution video logs and sensor data and derived driving information such as G-force measurements.

It will be understood that the mobile device may also automatically keep certain data at random. Furthermore, the reason for keeping certain data may also be logged (e.g. logged as a result of a manual request by the user, or in response to a high G-force event).

The mobile device and device monitoring system may also be arranged to highlight detected transgressions. For example, driving during curfew hours, or driving at locations where insurance is not valid (e.g. other countries, off-road, race tracks etc).

As will be appreciated, the interaction of the mobile device and the device monitoring system has the advantage of actively improving user driving behaviour. That is, if the user knows that their logged driving behaviour may adversely effect their insurance policy, then it is likely that the user will be dissuaded from driving recklessly. In view of this, an insurance company may be able to incentivise users through lower insurance premiums.

However, so that users do not wrongfully benefit from such incentives, it is necessary to enforce the correct and consistent use of the Witness application.

It would not be beneficial from the perspective of the insurance company if the user could choose when to enable the application. For example, if a user could choose to disable the application when speeding then the effectiveness of the application would be reduced.

Accordingly, the application may include measures to guarantee that the application is enabled whenever a given insured vehicle is being driven.

Such measures may involve matching data recorded by the Witness application with that recorded independently by the vehicle. For example, the Witness application records the distance travelled during every journey. To ensure the summed distances of all journeys tracked by the Witness application tally with the total travelled distance of the vehicle, the user may be prompted to enter the odometer mileage periodically.

If the distance recorded by the Witness application does not correlate with the difference between odometer readings, then the discrepancy will be flagged to the user and/or the insurance company. A substantial discrepancy will typically indicate that the Witness application has not been monitoring all vehicle journeys and the appropriate action can be taken (e.g. the user can be warned, insurance premium may be raised etc).

It will be appreciated that such a tallying exercise depends on the Witness application being used every time one particular vehicle is driven. However, in alternatives, if the Witness application is used with different vehicles, the Witness application may be arranged to register the different vehicles so that their respective odometer readings can be tallied with distance recordings associated with each respective vehicle.

Other measures can be implemented in conjunction with the Witness application to guarantee that the application is enabled whenever a given vehicle is being driven. For example, the mobile device on which the Witness application is installed may comprise an NFC device, such as an RFID tag. The NFC device may be compatible with a complementary device on a so-called 'smart-holster' into which the mobile device may be fitted during operation.

The smart-holster interacts with the NFC device on the smart-phone to determine whether or not the smart-phone is inserted into the smart-holster. The smart-holster can then be interfaced

with the engine management system of the vehicle so that the vehicle may be activated and driven only when the mobile device is in place within the smart-holster.

It will be appreciated that the mobile device has so far been described in the context of a smart-phone. However, it will be appreciated by a person skilled in the art that other devices may also be suitable for performing the functions described in relation to the Witness application. For example, the Witness application may be adapted to run on a general purpose tablet-style computing device, such as an iPad®.

Furthermore, it will be understood that features, advantages and functionality of the different embodiments described herein may be combined where context allows. In addition, a skilled person will appreciated that the functionality described above may be implemented using the mobile device suitably programmed.

Having described several exemplary embodiments of the present invention and the implementation of different functions of the device in detail, it is to be appreciated that the skilled addressee will readily be able to adapt the basic configuration of the device to carry out described functionality without requiring detailed explanation of how this would be achieved. Therefore, in the present specification several functions of the device have been described in different places without an explanation of the required detailed implementation as this not necessary given the abilities of the skilled addressee to code functionality into the device.

Claims

1. A mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising:

a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module;

a processor for processing sensor data from the sensor set to derive said driving information;

a memory for storing said derived driving information; and

a wireless telecommunications module operable to download an application;

the mobile device being arranged to execute the downloaded application to control the mobile device to:

register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver;

process sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

store a selection of the driving information to the memory.

2. A mobile telecommunications device according to claim 1, comprising an adapter arranged to hold the device securely to the vehicle.

3. A mobile telecommunications device according to claim 1 or claim 2, controlled by the executed application to register the start of a driving period in response to an initialisation input generated automatically in response to the sensor data having predetermined values.

4. A mobile telecommunications device according to claim 3, wherein the initialisation input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.

5. A mobile telecommunications device according to any preceding claim, comprising a registration module configured to register the installation of the mobile device to the vehicle.

6. A mobile telecommunications device according to claim 5, wherein the registration module is arranged to determine a match between the location of the mobile device and the location of the vehicle.

7. A mobile telecommunications device according to any preceding claim, controlled by the executed application to manage voice-calls incoming to the mobile device during a driving period.

8. A mobile telecommunications device according to any preceding claim, controlled by the executed application to enable a hands-free mode of operation on detection of a driving period.

9. A mobile telecommunications device according to claim 8, wherein the hand-free mode of operation comprises enabling voice-activated commands on the mobile device.

10. A mobile telecommunications device according to any preceding claim, controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate.

11. A mobile telecommunications device according to any preceding claim, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response store driving information associated with that event to the memory.

12. A mobile telecommunications device according to any preceding claim, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response transmit driving information associated with that event via the wireless telecommunication module to a remote data-logging system.

13. A mobile telecommunications device according to any preceding claim, comprising an event detector for detecting the occurrence of a predetermined event by correlating the sensor data against an event indication model.

14. A mobile telecommunications device according to claim 13, wherein the event indication model comprises a set of predetermined data values that the event detector is arranged to compare against corresponding sensor data.

15. A mobile telecommunications device according to claim 14, wherein the event indication model comprises a sequence of predetermined data values, the sequence being associated by a function of time.

16. A mobile telecommunication device according to claim 13 or claim 14, wherein the event indication model comprises a pattern of predetermined data values and the event detector is arranged to detect the occurrence of an event by carrying out pattern recognition by matching sensor data values to the pattern of predetermined data values of the event indication model.

17. A mobile telecommunication device according to any one of claims 13 to 15, wherein there are a plurality of event indication models.

18. A mobile telecommunications device according to any preceding claim, controlled by the executed application to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with how the vehicle is driven for each of the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

19. A mobile telecommunications device according to claim 18 when dependent on claims 14 to 17, controlled by the executed application to modify one or more event indication models in response to the benchmark.

20. A mobile telecommunications device according to any one of claims 11 to 19, controlled by the executed application to take at least one predetermined action in response to a detected event.

21. A mobile telecommunications device according to claim 20, wherein the at least one predetermined action comprises transmitting driving information via the wireless telecommunication module of the mobile device, to a remote system.

22. A mobile telecommunications device according to claim 20 or claim 21, wherein the at least one predetermined action comprises storing driving information captured at a higher sampling rate than when an event is not detected.

23. A mobile telecommunications device according to any one of claims 20 to 22, wherein the at least one predetermined action comprises providing feedback to a user to indicate that an event has been detected.

24. A mobile telecommunications device according to claim 23, configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback.

25. A mobile telecommunications device according to claim 23 or claim 24, wherein the feedback comprises notifying a user that a further action has been scheduled, and will be taken within a predetermined period.

26. A mobile telecommunications device according to claim 25, configured to receive a user interaction to confirm or deny whether the further scheduled action should be taken within a predetermined period.

27. A mobile telecommunications device according to any one of claims 20 to 26, wherein the at least one predetermined action comprises providing the user with options to control the mobile device to take further actions.

28. A mobile telecommunications device according to any one of claims 20 to 27, wherein the at least one predetermined action comprises communicating to a remote system that an event has been detected.

29. A mobile telecommunications device according to claims 28, configured to receive from the remote system a request to transmit to the remote system selected portions of the driving information associated with the detected event, and operating the wireless telecommunication module to transmit the requested driving information.

30. A mobile telecommunications device according to any preceding claim, wherein the memory comprises a long term memory for persistently storing driving information and a short term memory for transiently storing driving information, the short term memory being arranged to receive driving information at a higher update rate than the long term memory.

31. A mobile telecommunications device according to claim 30, controlled by the executed application to write driving information to the short term memory at a predetermined update rate during the driving period in a predetermined sequence, the mobile device being further controlled to overwrite the driving information previously written to the short term memory in accordance with the predetermined sequence.

32. A mobile telecommunications device according to claim 30 or claim 31, when dependent on any one of claims 20 to 29, wherein the at least one predetermined action comprises transferring data from the short term memory to the long term memory.

33. A mobile telecommunications device according to any preceding claim, further arranged to interface with an external device having access to external driving information associated with the behaviour and/or condition of the vehicle, the mobile device being arranged to receive at least a portion of the external driving information from the external device.

34. A mobile telecommunications device according to claim 33, wherein the external device is an engine management system of the vehicle.

35. A mobile telecommunications device according to claim 33 or claim 34, further arranged to interface with the external device wirelessly.

36. A mobile telecommunications device according to any preceding claim, controlled by the executed application to determine a unique identifier associated with the mobile device and

retrieve from the memory and transmit via the wireless telecommunication module to a remote system said driving information paired with said unique identifier.

37. A mobile telecommunications device according to any preceding claim, controlled by the executed application to process the driving information to generate a driving score to be stored on the memory of the mobile device.

38. A mobile telecommunications device according to any preceding claim, controlled by the executed application to process the driving information to generate a driving score to be transmitted via the wireless telecommunication of the mobile device to a remote system.

39. A mobile telecommunications device according to claim 38 or claim 39, wherein the driving score is associated with a particular driver.

40. A data-logging system for logging driving information comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with a remote mobile device according to any preceding claim, and receive therefrom:

a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and

driving information to be logged to that corresponding account.

41. A data-logging system according to claim 40, wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver.

42. A data logging system according to claim 40 or 41, further arranged to process the driving information logged to the corresponding account to generate a driving score.

43. A data logging system according to claim 42, wherein the driving score is used to determine a risk profile for at least one of the vehicle and driver.

44. A data logging system according to any one of claims 42 to 44, wherein the driving score is used to define an insurance premium associated with the account.

45. A data logging system according to any one of claims 40 to 44, further arranged to communicate to a mobile device an insurance offer generated in response to the driving information received from the mobile device.

46. A data logging system according to claim 45, arranged to receive from the mobile device a user-acceptance of the insurance offer.

47. A method of logging driving information associated with a vehicle when driven, the method comprising:

adapting and installing a mobile device to the vehicle, the mobile device comprising a memory;

registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver;

processing sensor data from a sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

storing a selection of the driving information to the memory of the mobile device.

1
11
PC
15
5
Insurance Server
DB
13
Communication Network
3
7
Emergency Services Server
9
Content Provider Server

Fig .1

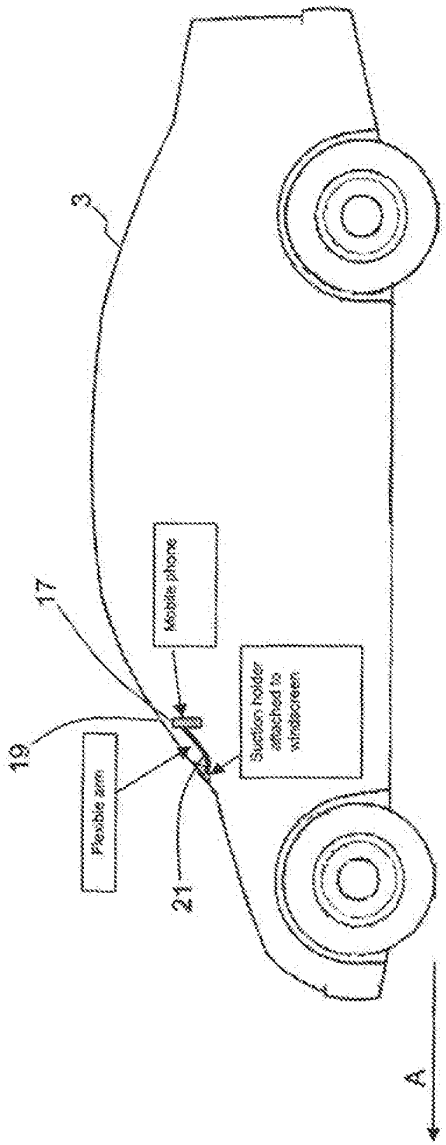

3
17
Mobile phone
19
Suction holder attached to windscreen
Flexible arm
21
A

Fig. 2

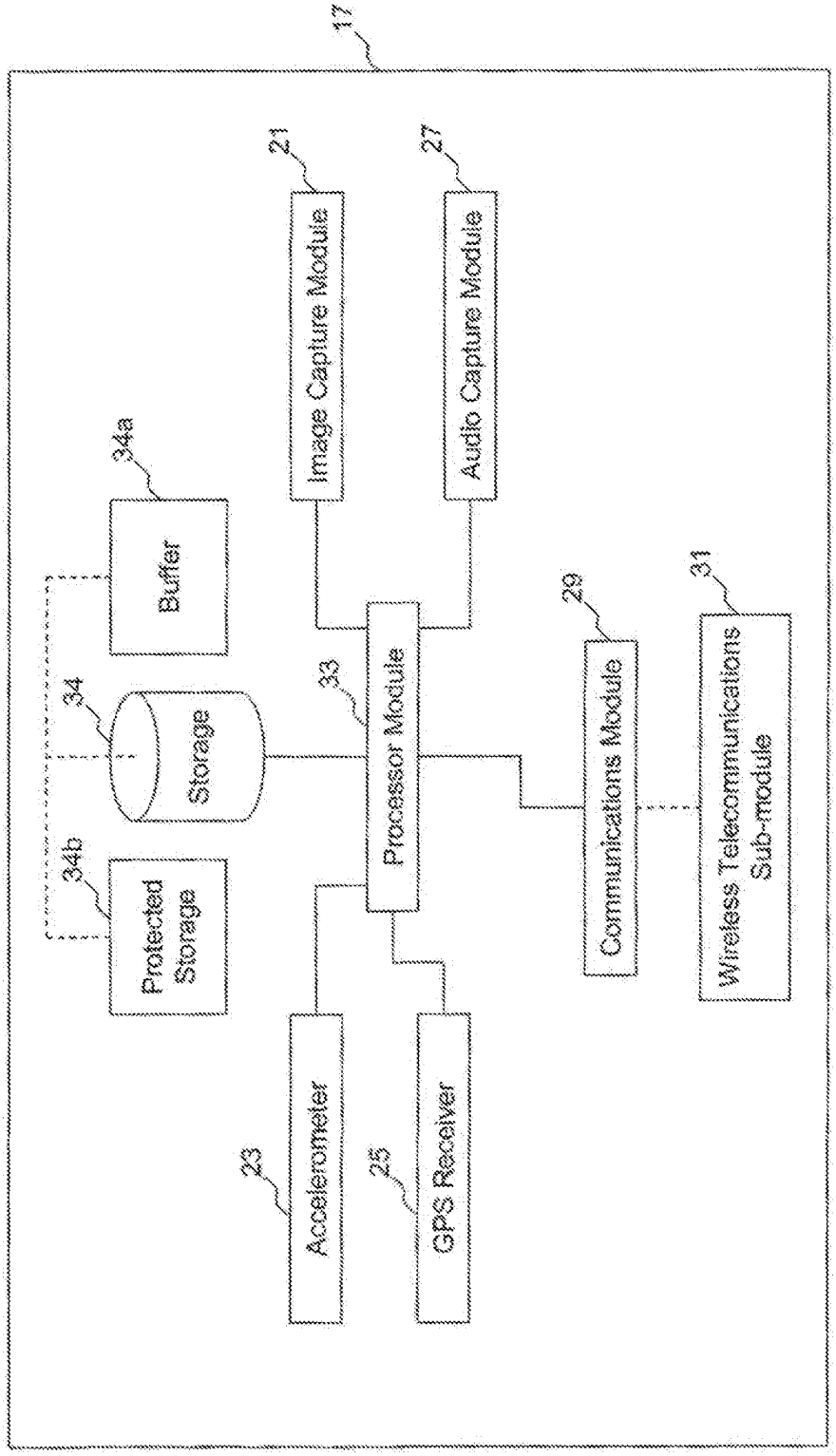

17
21
Image Capture Module
27
Audio Capture Module
34a
Buffer
34
Storage
33
Processor Module
29
Communications Module
31
Wireless Telecommunications Sub-module
34b
Protected Storage
23
Accelerometer
25
GPS Receiver

Fig .3

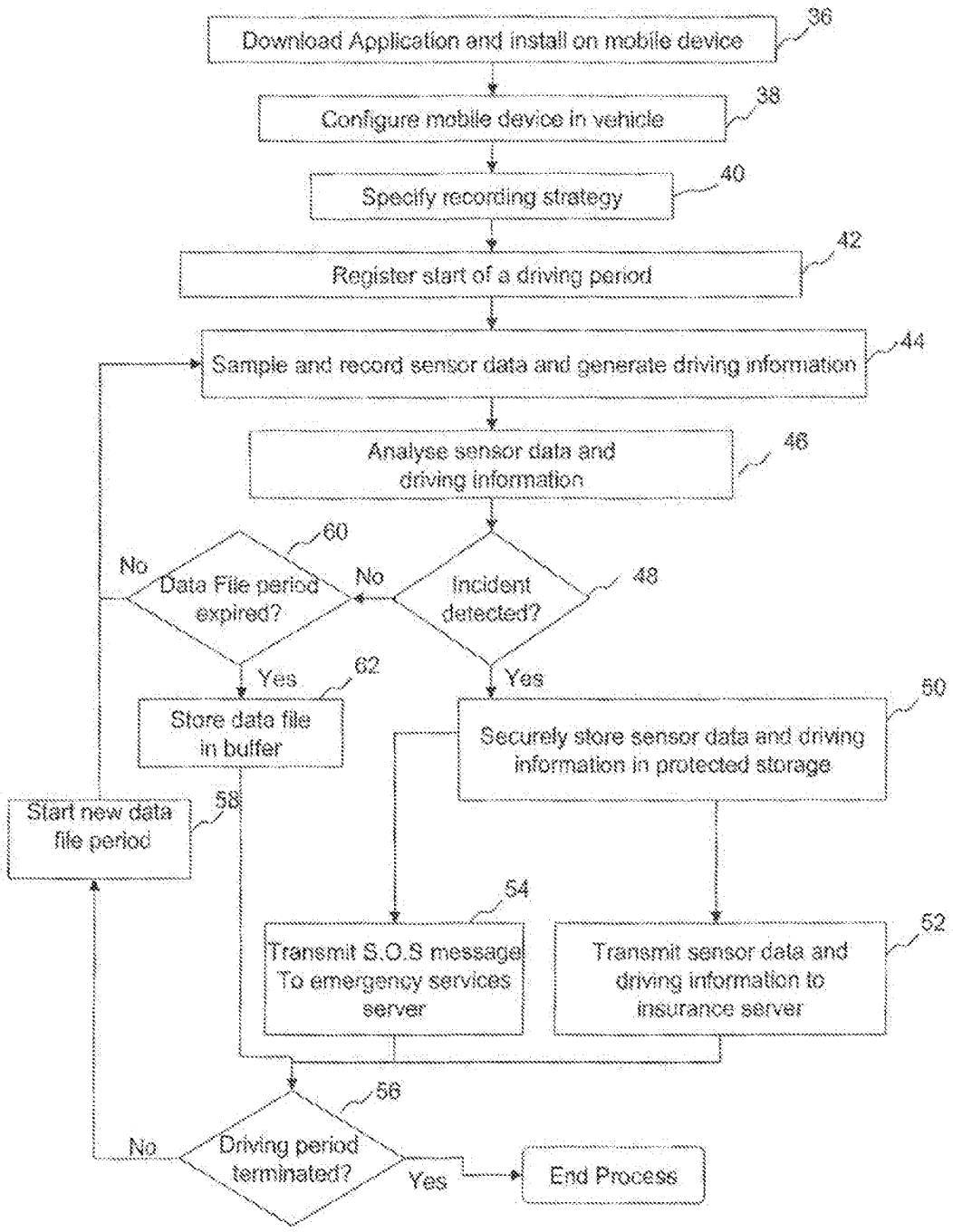
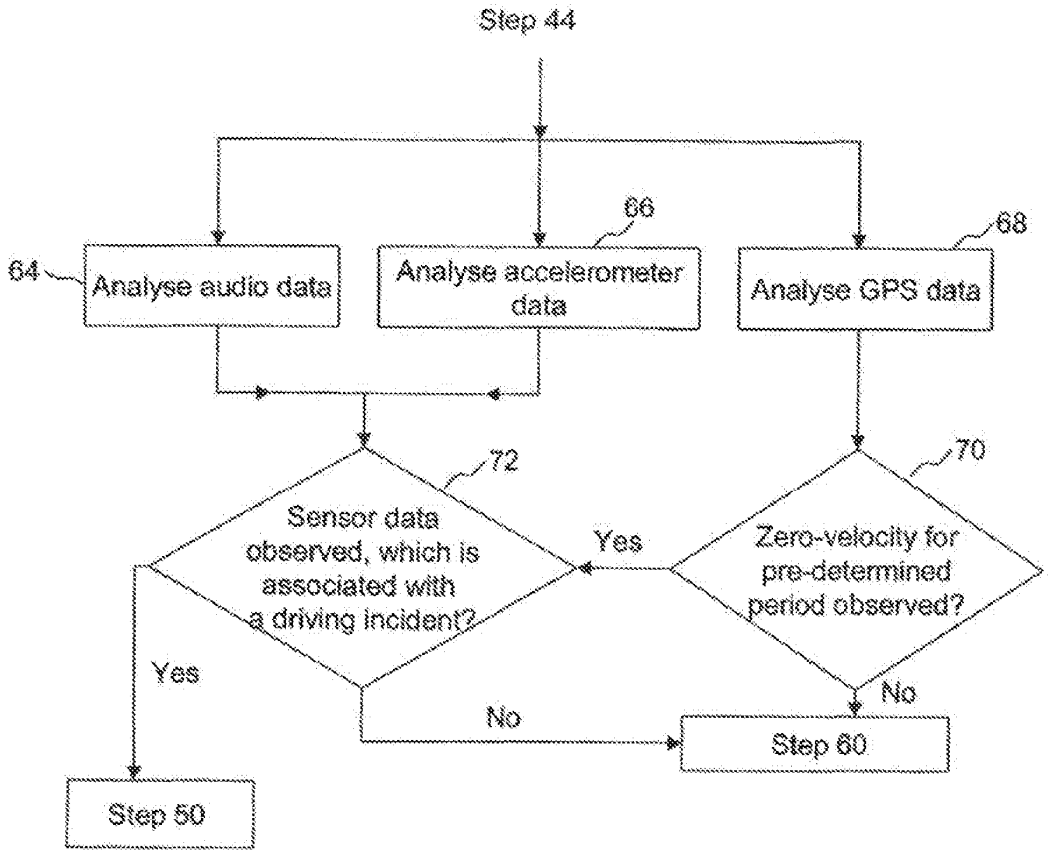

Download Application and install on mobile device
36
Configure mobile device in vehicle
38
Specify recording strategy
40
Register start of a driving period
42
Sample and record sensor data and generate driving information
44
Analyse sensor data and driving information
46
60
No
Data File period expired?
No
Incident detected?
48
Yes
62
Yes
Store data file in buffer
Securely store sensor data and driving information in protected storage
50
Start new data file period
58
54
Transmit S.O.S message To emergency services server
Transmit sensor data and driving information to insurance server
52
56
No
Driving period terminated?
Yes
End Process

Fig. 4a


Step 44
64
Analyse audio data
66
Analyse accelerometer data
68
Analyse GPS data
72
Sensor data observed, which is associated with a driving incident?
70
Zero-velocity for pre-determined period observed?
Yes
Yes
No
No
Step 50
Step 60

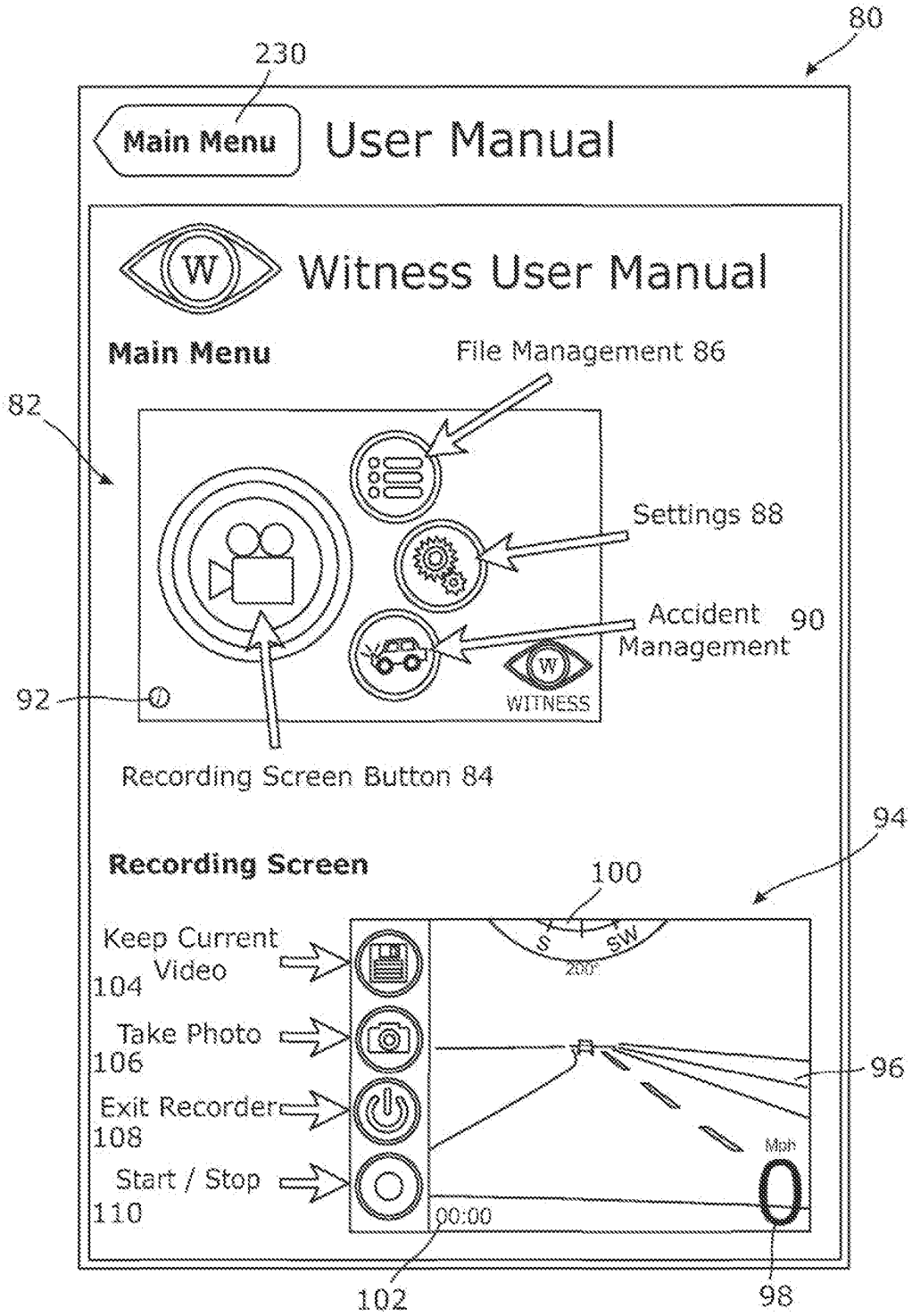

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230
Main Menu
User Manual
Witness User Manual
Main Menu
File Management 86
82
Settings 88
Accident Management 90
92
WITNESS
Recording Screen Button 84
94
Recording Screen
100
Keep Current Video 104
Take Photo 106
Exit Recorder 108
Start / Stop 110
96
Mph
00:00
102
98

Fig. 5

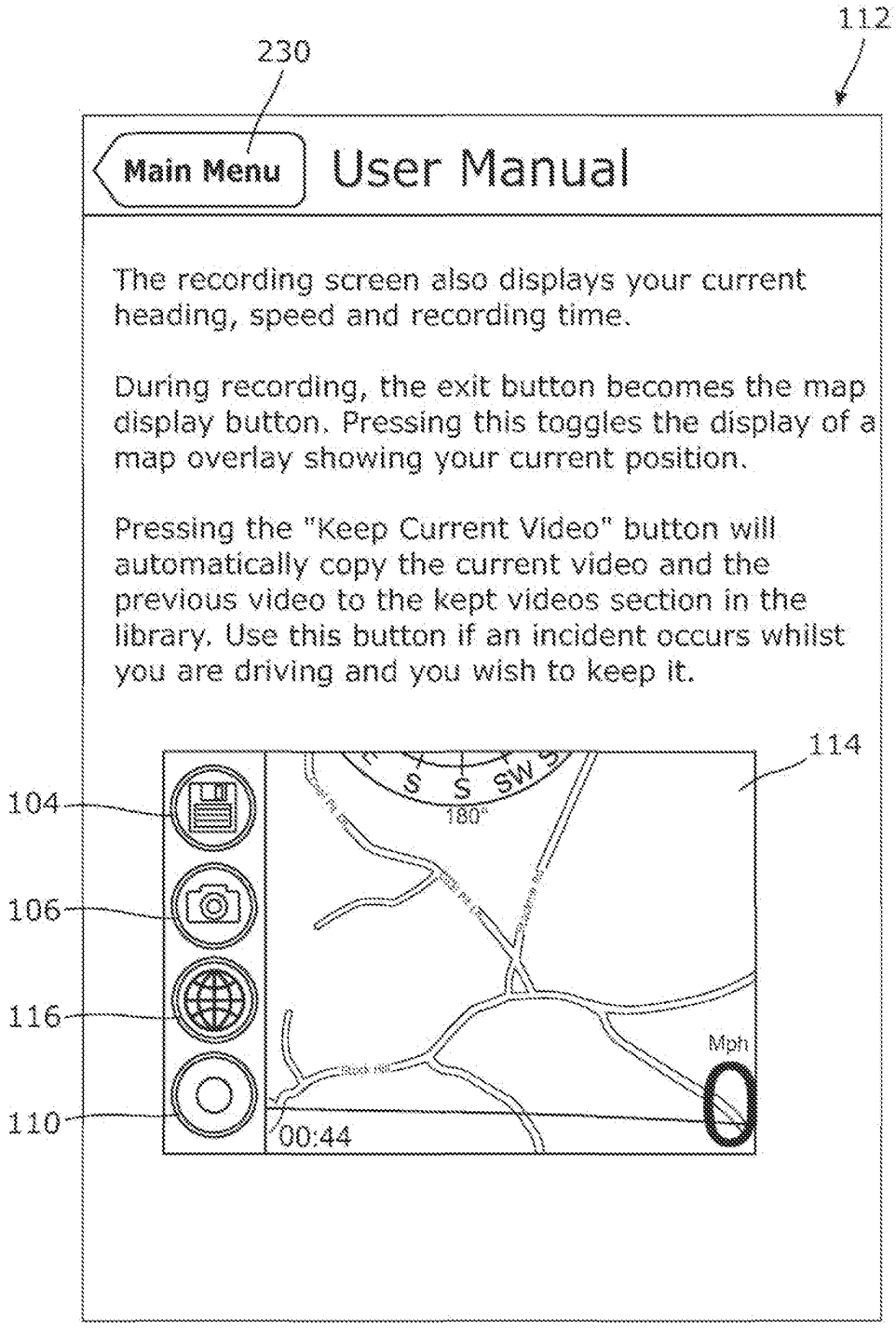

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Main Menu
User Manual
The recording screen also displays your current heading, speed and recording time.
During recording, the exit button becomes the map display button. Pressing this toggles the display of a map overlay showing your current position.
Pressing the "Keep Current Video" button will automatically copy the current video and the previous video to the kept videos section in the library. Use this button if an incident occurs whilst you are driving and you wish to keep it.
114
104
106
116
110
S
S
SW
180°
Mph
00:44

Fig. 6

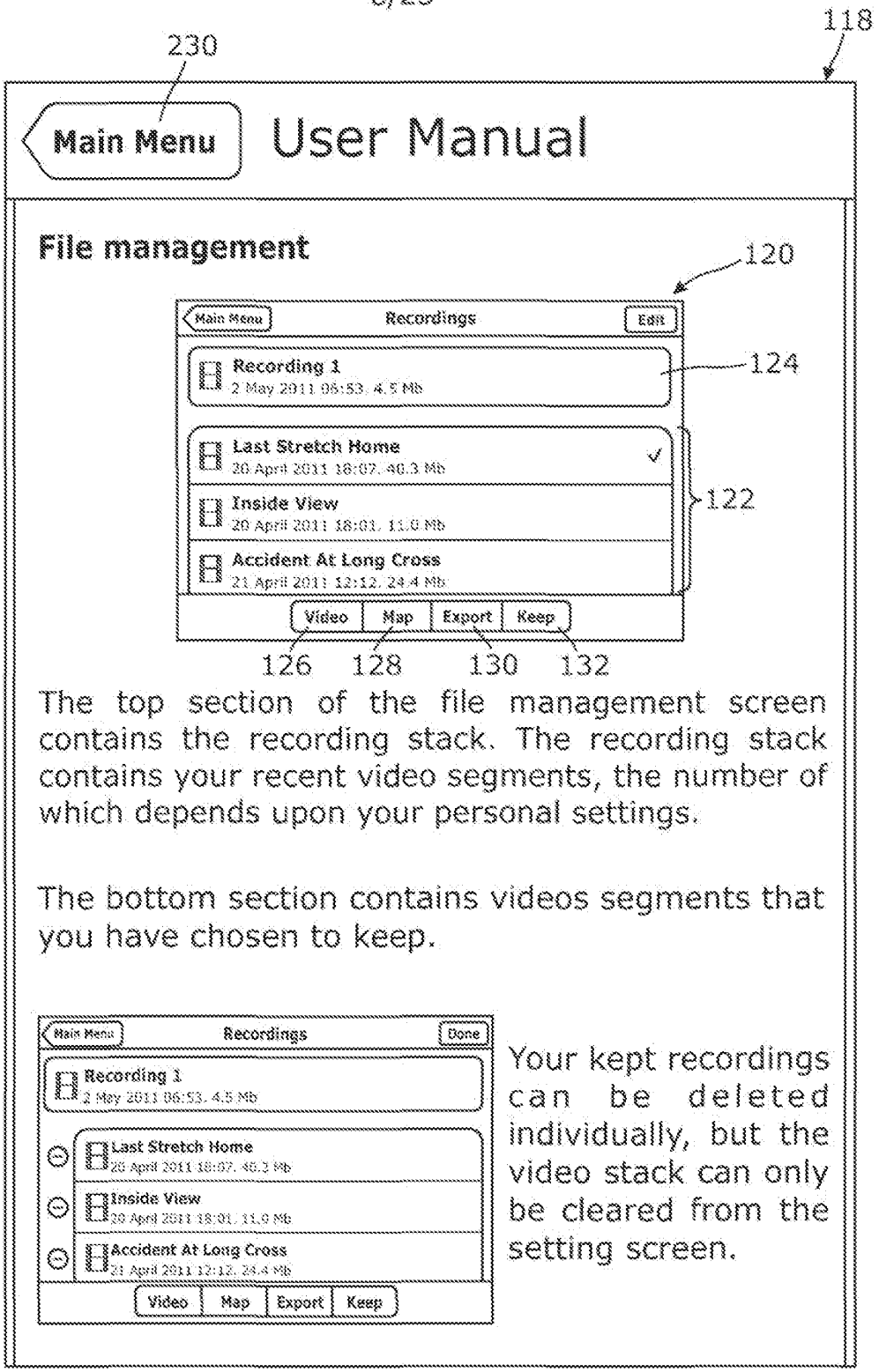

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118
Main Menu
User Manual
File management
120
Main Menu
Recordings
Edit
Recording 1
2 May 2011 06:53. 4.5 Mb
124
Last Stretch Home
20 April 2011 18:07. 46.3 Mb
Inside View
20 April 2011 18:01. 11.0 Mb
Accident At Long Cross
21 April 2011 12:12. 24.4 Mb
122
Video
Map
Export
Keep
126
128
130
132
The top section of the file management screen contains the recording stack. The recording stack contains your recent video segments, the number of which depends upon your personal settings.
The bottom section contains videos segments that you have chosen to keep.
Main Menu
Recordings
Done
Recording 1
2 May 2011 06:53. 4.5 Mb
Last Stretch Home
20 April 2011 18:07. 46.3 Mb
Inside View
20 April 2011 18:01. 11.0 Mb
Accident At Long Cross
21 April 2011 12:12. 24.4 Mb
Video
Map
Export
Keep
Your kept recordings can be deleted individually, but the video stack can only be cleared from the setting screen.

Fig. 7

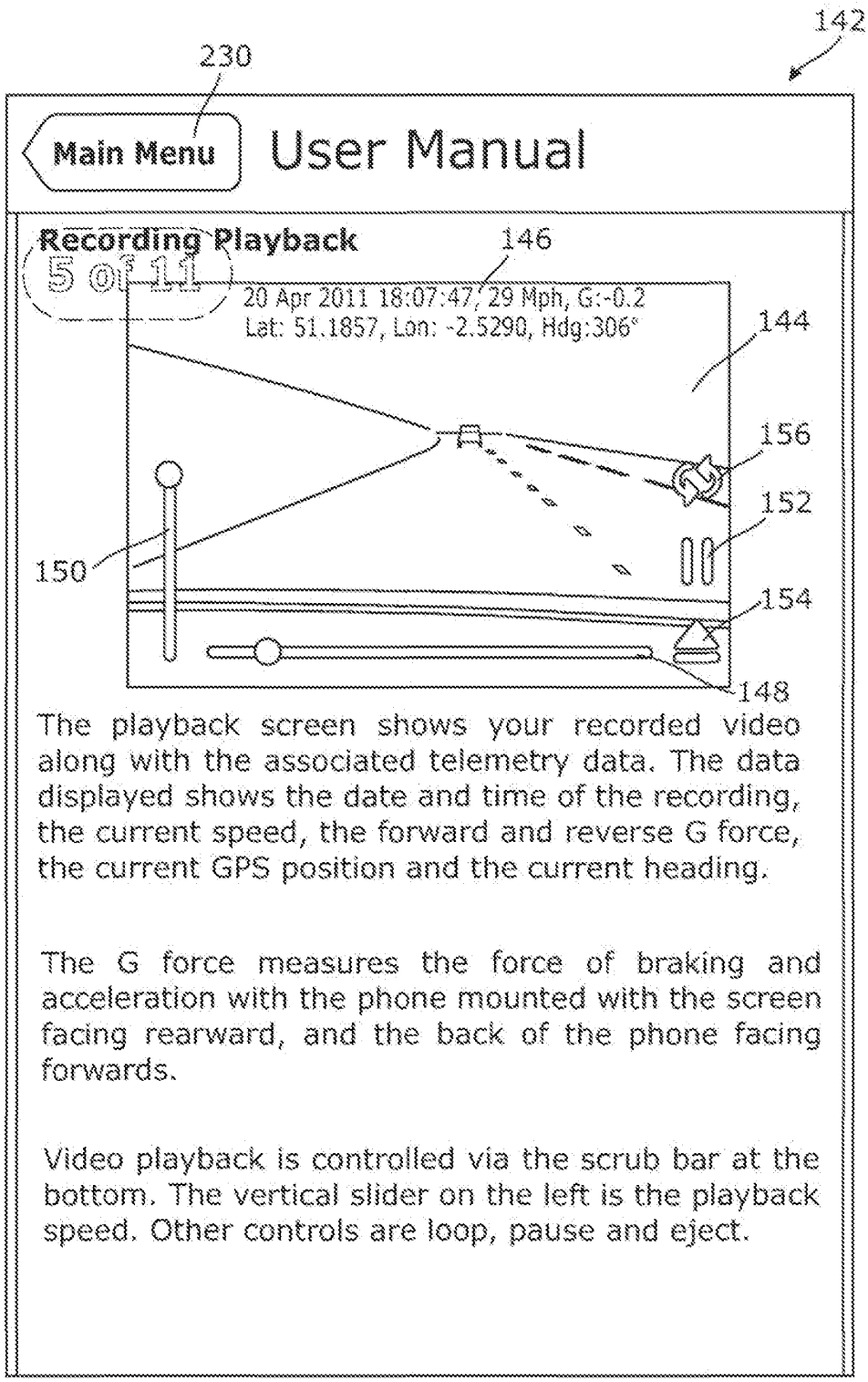

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230
Main Menu
User Manual
Recording Playback
5 of 11
146
20 Apr 2011 18:07:47, 29 Mph, G:-0.2
Lat: 51.1857, Lon: -2.5290, Hdg:306°
144
156
152
150
154
148
The playback screen shows your recorded video along with the associated telemetry data. The data displayed shows the date and time of the recording, the current speed, the forward and reverse G force, the current GPS position and the current heading.
The G force measures the force of braking and acceleration with the phone mounted with the screen facing rearward, and the back of the phone facing forwards.
Video playback is controlled via the scrub bar at the bottom. The vertical slider on the left is the playback speed. Other controls are loop, pause and eject.

Fig. 8

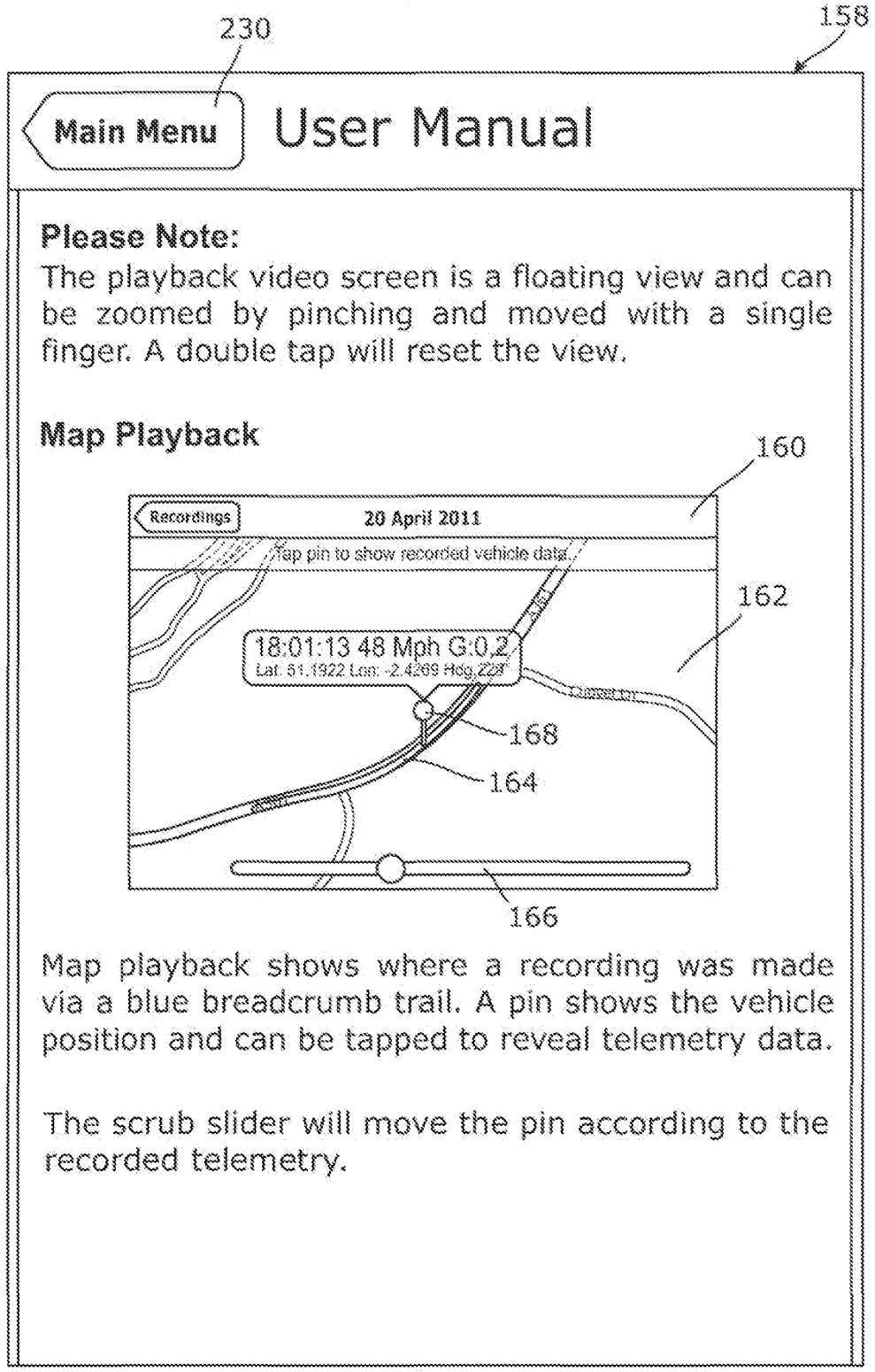

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158
Main Menu
User Manual
Please Note:
The playback video screen is a floating view and can be zoomed by pinching and moved with a single finger. A double tap will reset the view.
Map Playback
160
Recordings
20 April 2011
Tap pin to show recorded vehicle data.
162
18:01:13 48 Mph G:0.2
Lat: 51.1922 Lon: -2.4269 Hdg:228°
168
164
166
Map playback shows where a recording was made via a blue breadcrumb trail. A pin shows the vehicle position and can be tapped to reveal telemetry data.
The scrub slider will move the pin according to the recorded telemetry.

Fig. 9

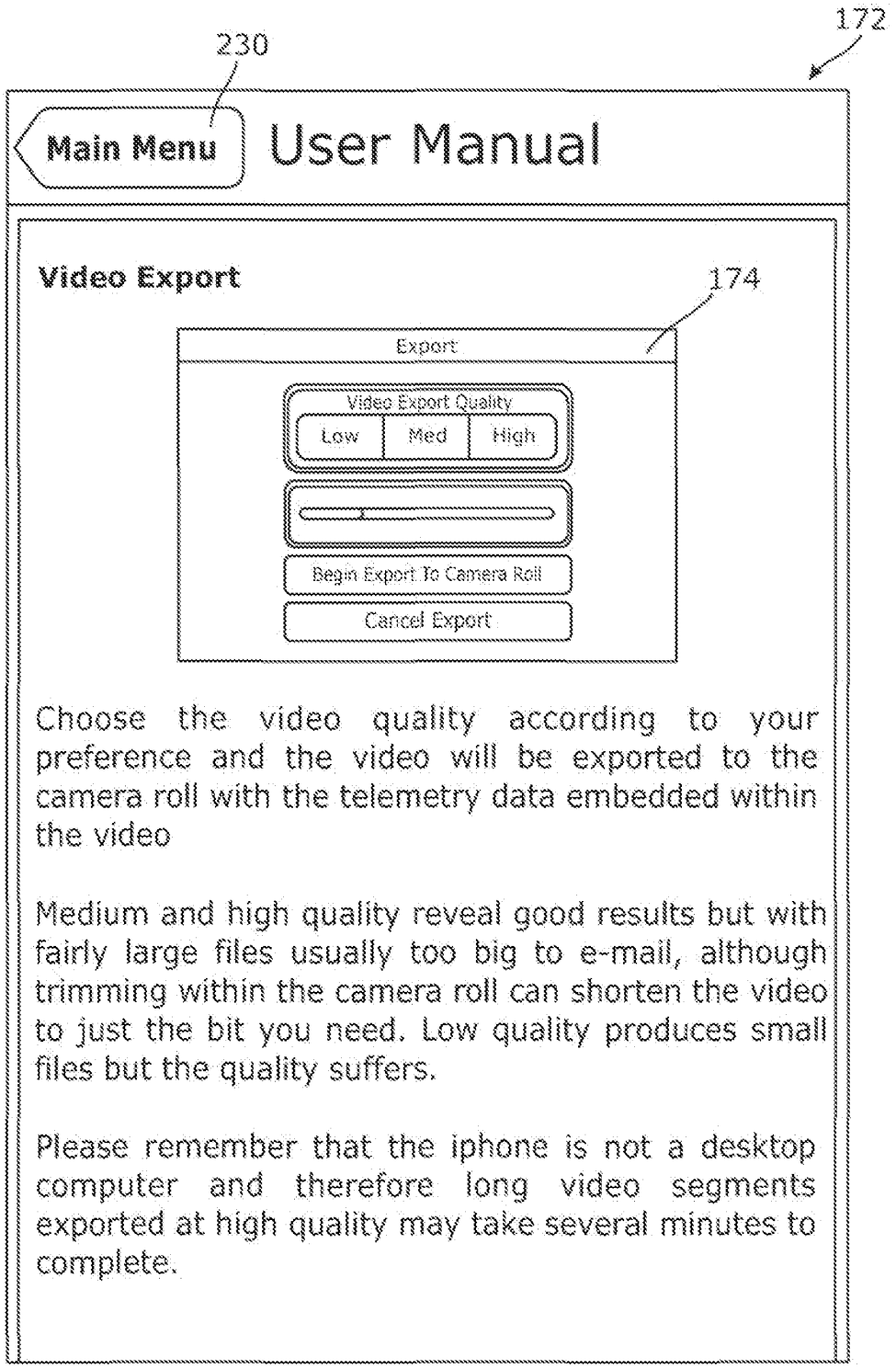

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Main Menu
User Manual
Video Export
174
Export
Video Export Quality
Low
Med
High
Begin Export To Camera Roll
Cancel Export
Choose the video quality according to your preference and the video will be exported to the camera roll with the telemetry data embedded within the video
Medium and high quality reveal good results but with fairly large files usually too big to e-mail, although trimming within the camera roll can shorten the video to just the bit you need. Low quality produces small files but the quality suffers.
Please remember that the iphone is not a desktop computer and therefore long video segments exported at high quality may take several minutes to complete.

Fig. 10

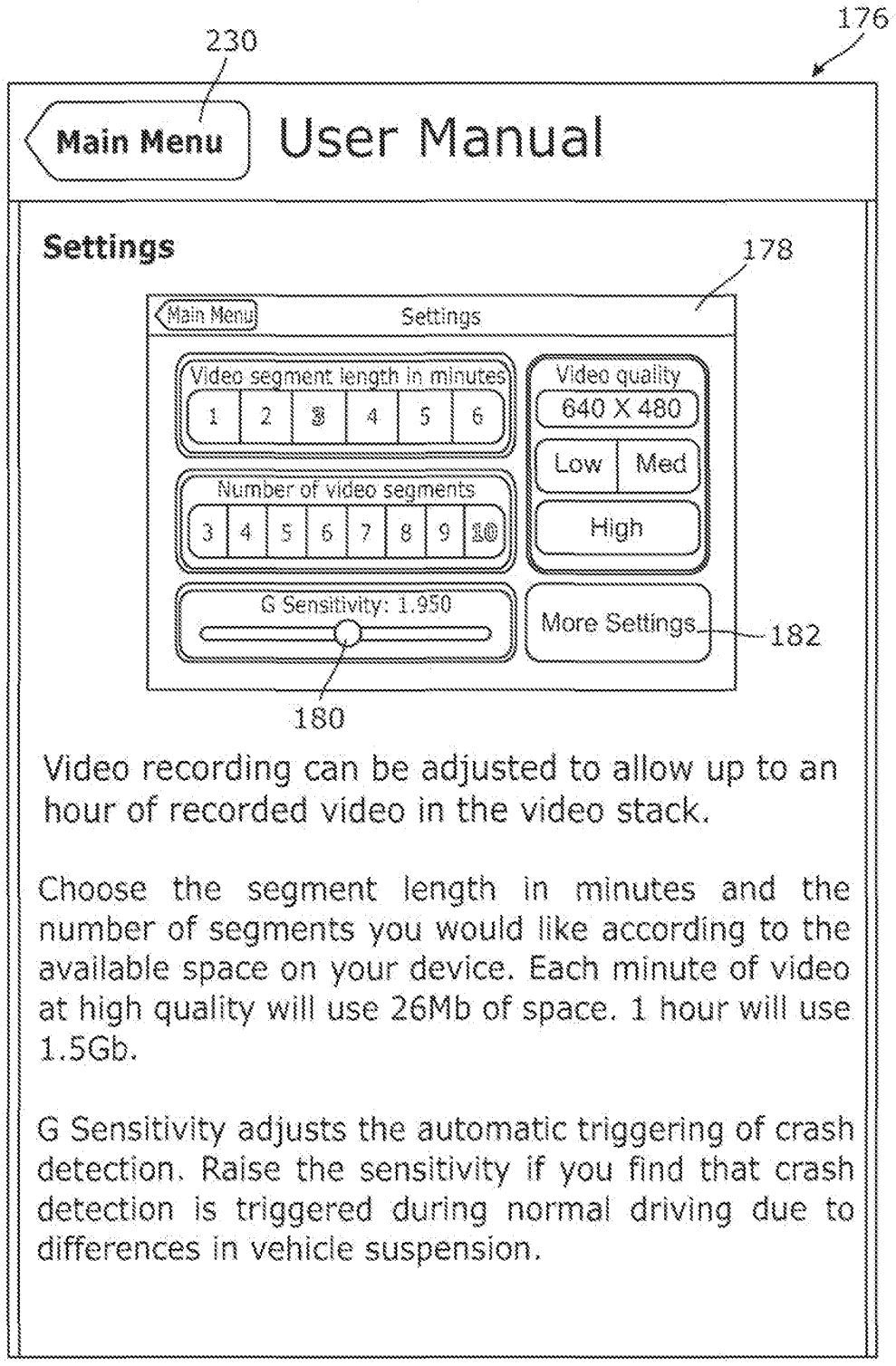

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Main Menu
User Manual
Settings
178
Main Menu
Settings
Video segment length in minutes
1 2 3 4 5 6
Video quality
640 X 480
Low Med
High
Number of video segments
3 4 5 6 7 8 9 10
G Sensitivity: 1.950
More Settings
182
180
Video recording can be adjusted to allow up to an hour of recorded video in the video stack.
Choose the segment length in minutes and the number of segments you would like according to the available space on your device. Each minute of video at high quality will use 26Mb of space. 1 hour will use 1.5Gb.
G Sensitivity adjusts the automatic triggering of crash detection. Raise the sensitivity if you find that crash detection is triggered during normal driving due to differences in vehicle suspension.

Fig. 11

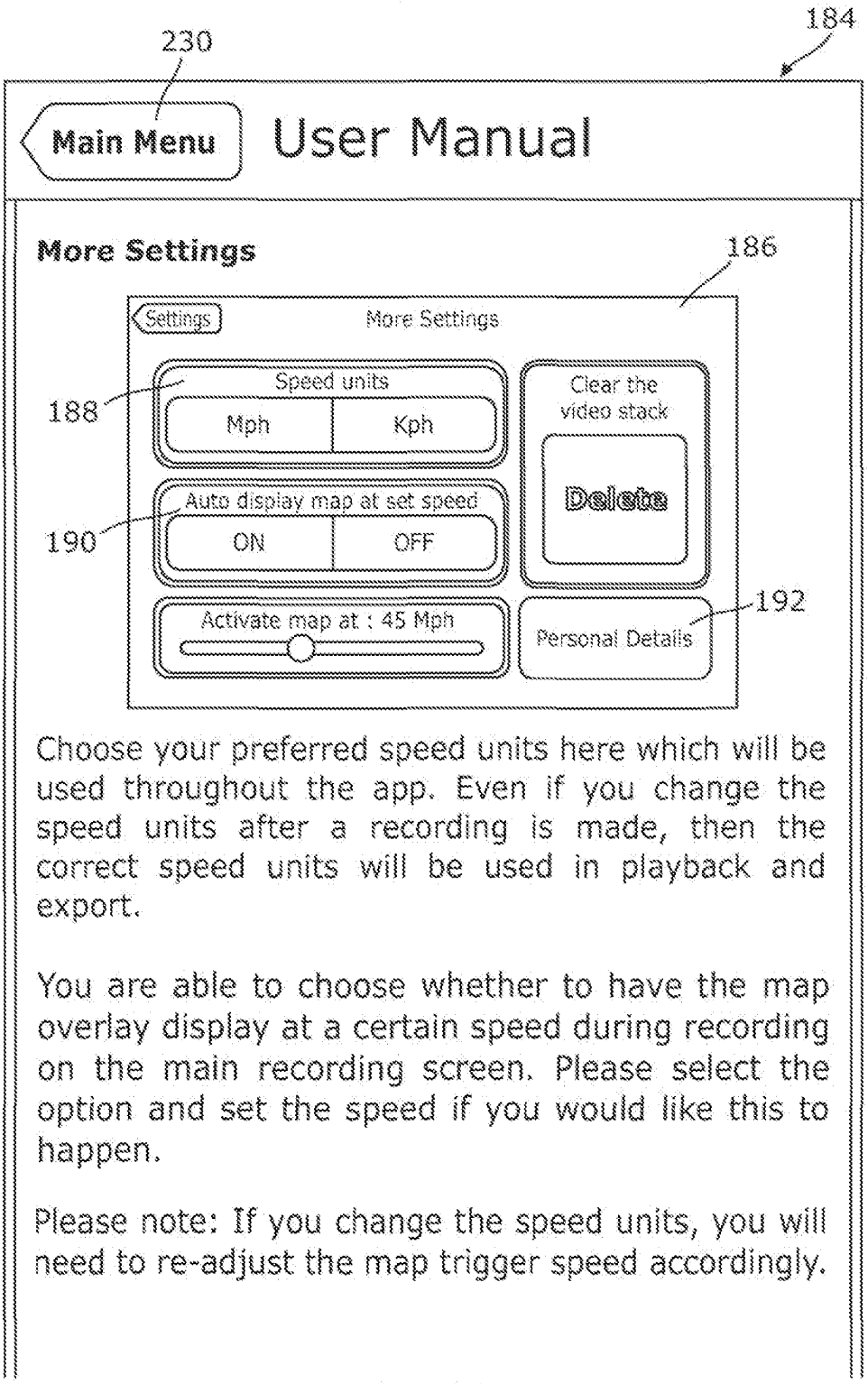

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Main Menu
User Manual
More Settings
186
Settings
More Settings
188
Speed units
Mph
Kph
Clear the video stack
Delete
190
Auto display map at set speed
ON
OFF
192
Activate map at : 45 Mph
Personal Details
Choose your preferred speed units here which will be used throughout the app. Even if you change the speed units after a recording is made, then the correct speed units will be used in playback and export.
You are able to choose whether to have the map overlay display at a certain speed during recording on the main recording screen. Please select the option and set the speed if you would like this to happen.
Please note: If you change the speed units, you will need to re-adjust the map trigger speed accordingly.

Fig. 12

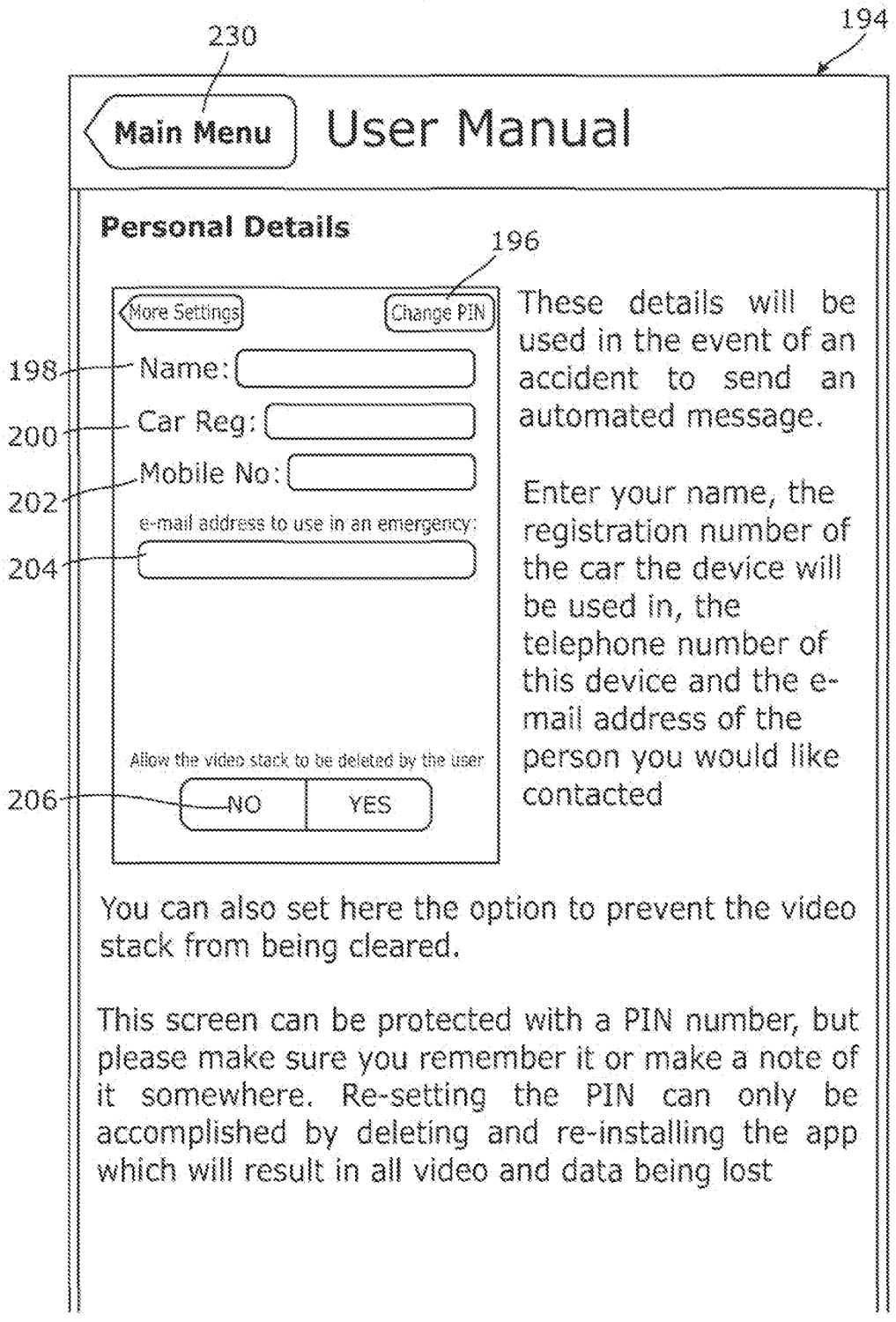

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194
Main Menu
User Manual
Personal Details
196
More Settings
Change PIN
198
Name:
200
Car Reg:
202
Mobile No:
e-mail address to use in an emergency:
204
Allow the video stack to be deleted by the user
206
NO
YES
These details will be used in the event of an accident to send an automated message.
Enter your name, the registration number of the car the device will be used in, the telephone number of this device and the e-mail address of the person you would like contacted
You can also set here the option to prevent the video stack from being cleared.
This screen can be protected with a PIN number, but please make sure you remember it or make a note of it somewhere. Re-setting the PIN can only be accomplished by deleting and re-installing the app which will result in all video and data being lost

Fig. 13

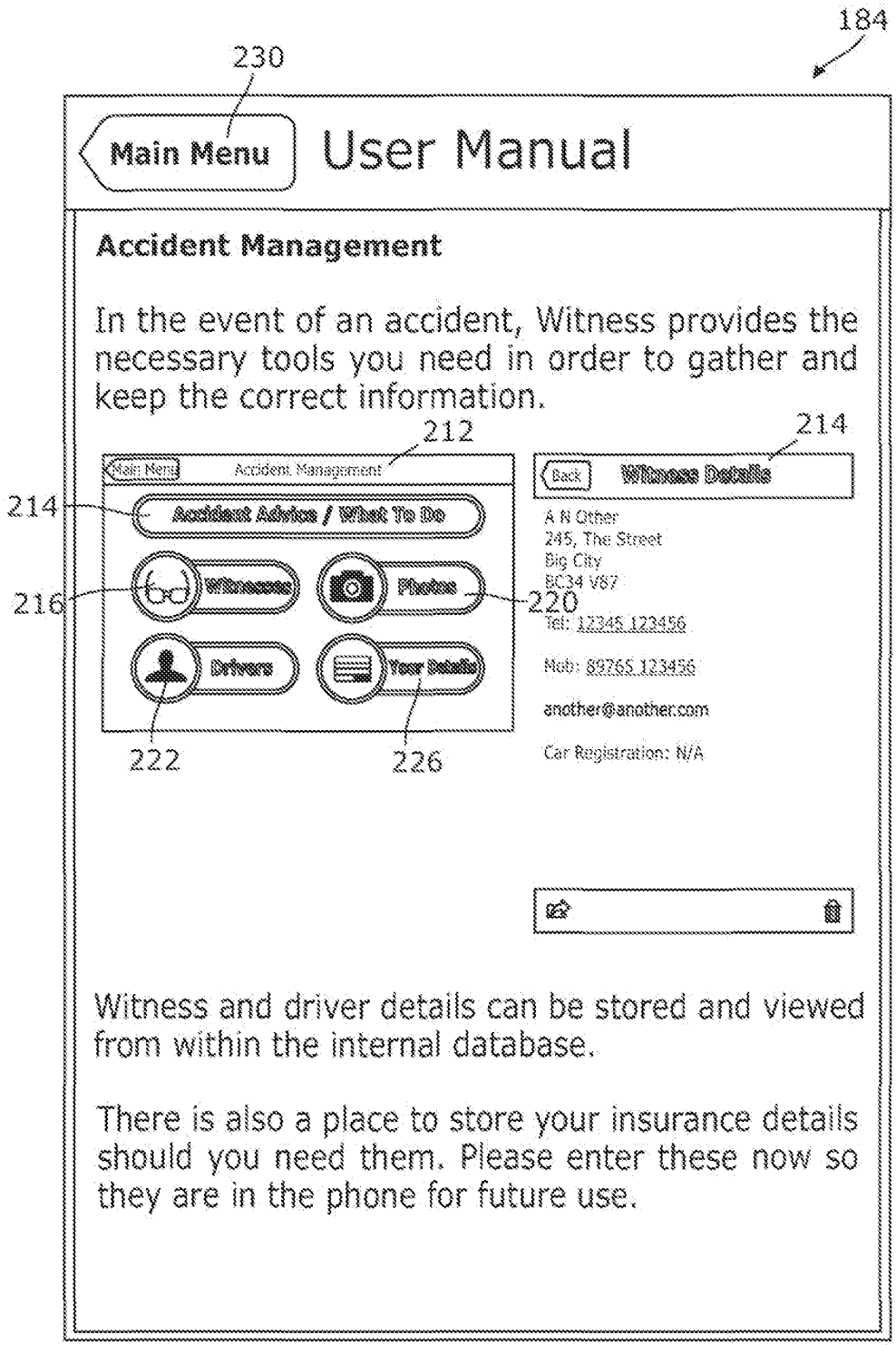

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Main Menu
User Manual
Accident Management
In the event of an accident, Witness provides the necessary tools you need in order to gather and keep the correct information.
212
214
Main Menu
Accident Management
Back
Witness Details
214
Accident Advice / What To Do
A N Other
245, The Street
Big City
BC34 V87
216
Witness
Photos
220
Tel: 12345 123456
Mob: 89765 123456
Drivers
Your Details
another@another.com
Car Registration: N/A
222
226
Witness and driver details can be stored and viewed from within the internal database.
There is also a place to store your insurance details should you need them. Please enter these now so they are in the phone for future use.

Fig. 14


230
Accident Management
What should you do?
Make sure you and others are safe
* Is anyone injured?
* Is the accident causing a hazard?
* Has someone left the scene?
If yes to any of these, then call the emergency services
1. Witnesses - Collect the names and addresses of any witnesses.
2. Photographs - Take pictures of the scene of the accident, damage to cars and other property, and the occupants of the other vehicle.
3. Drivers - Collect names, addresses, registration numbers and insurance details of all other drivers involved.

Fig. 15

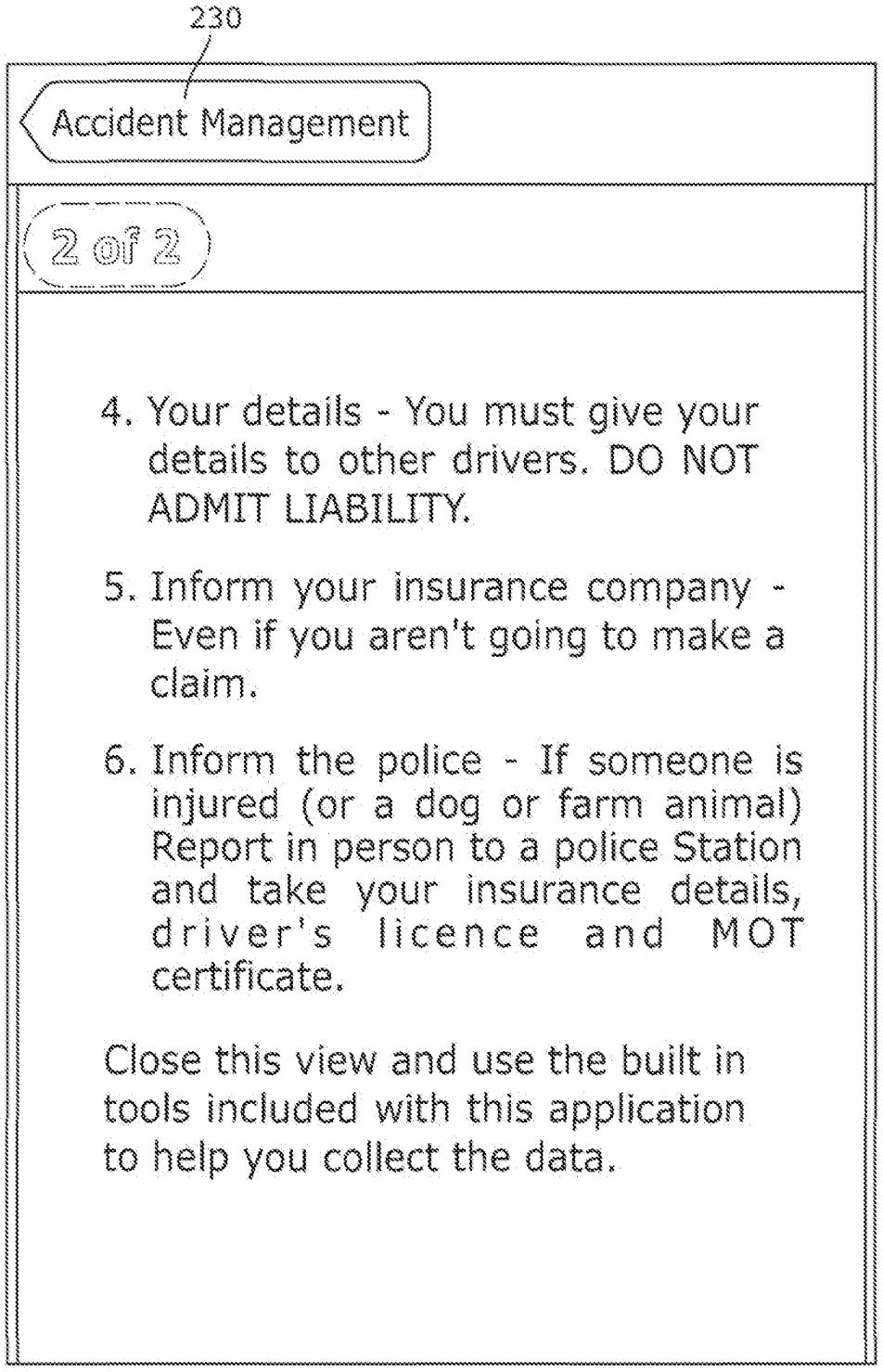

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Accident Management
2 of 2
4. Your details - You must give your details to other drivers. DO NOT ADMIT LIABILITY.
5. Inform your insurance company - Even if you aren't going to make a claim.
6. Inform the police - If someone is injured (or a dog or farm animal) Report in person to a police Station and take your insurance details, driver's licence and MOT certificate.
Close this view and use the built in tools included with this application to help you collect the data.

Fig. 16

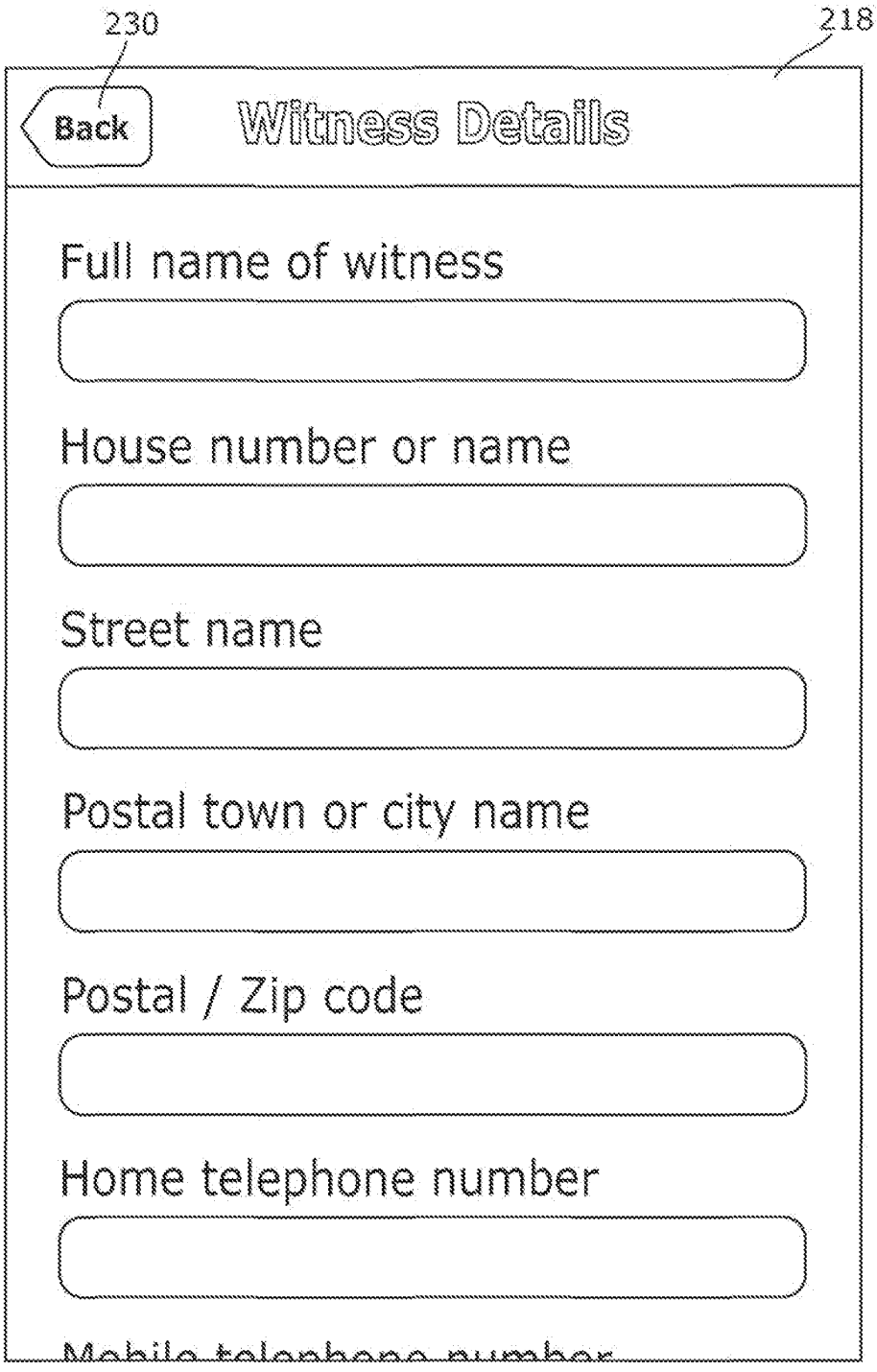

230
218
Back
Witness Details
Full name of witness
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number
Mobile telephone number

Fig. 17

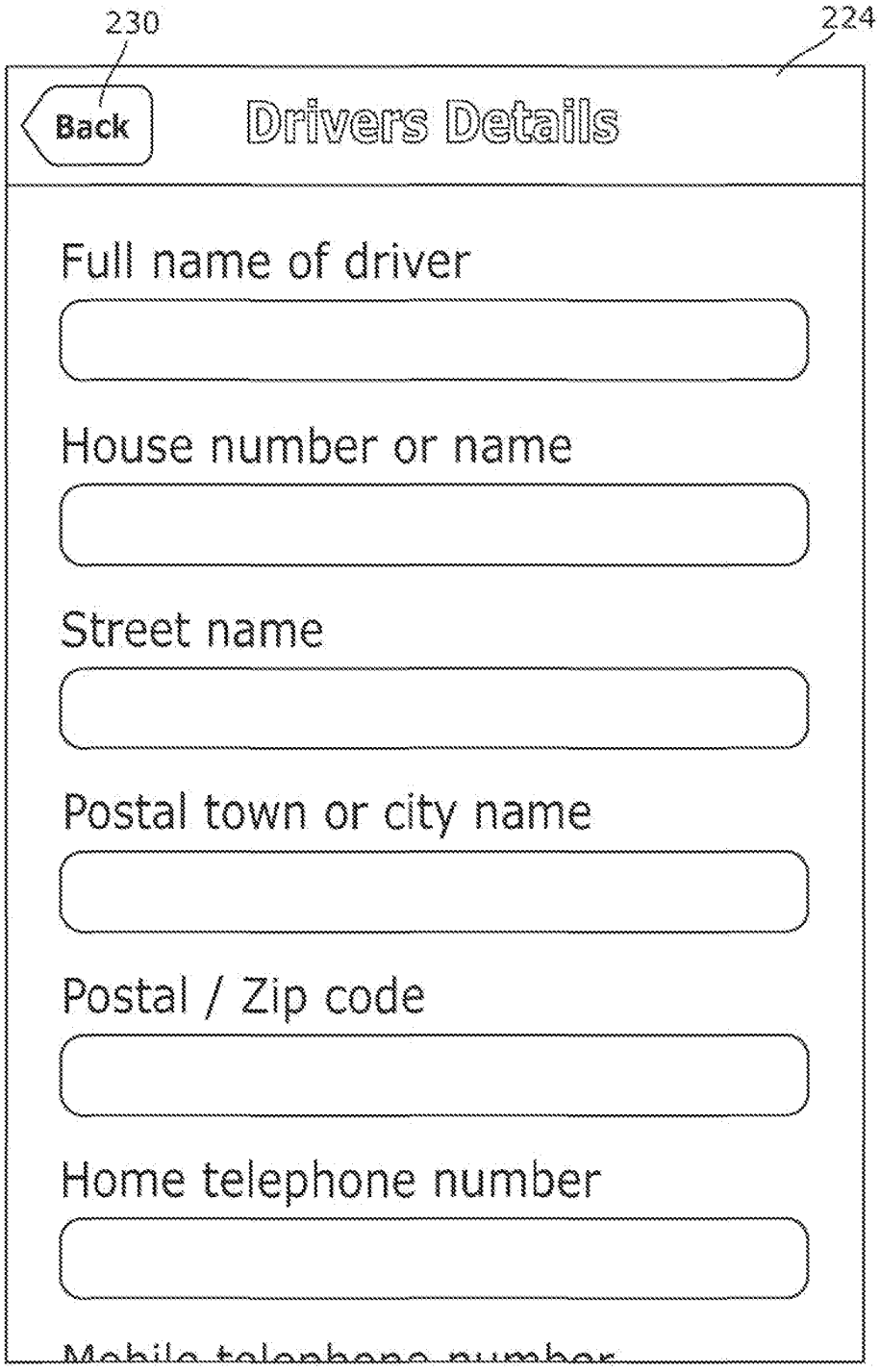

230
224
Back
Drivers Details
Full name of driver
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number

Fig. 18

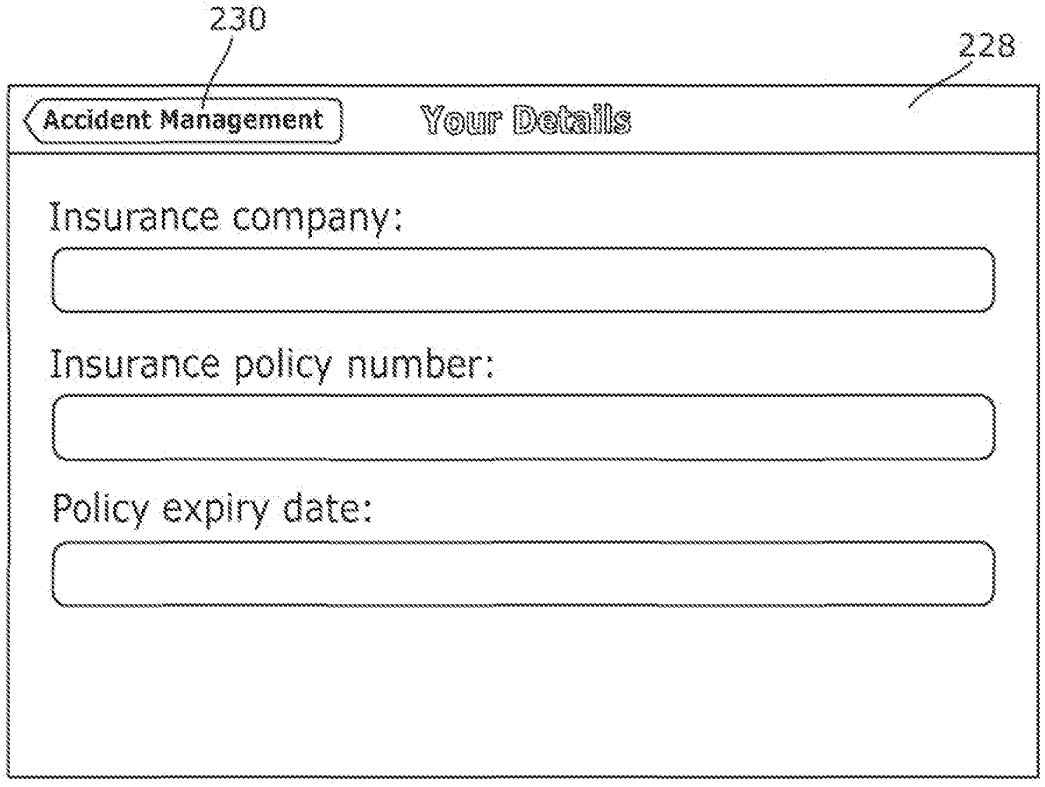

230
228
Accident Management
Your Details
Insurance company:
Insurance policy number:
Policy expiry date:

Fig. 19

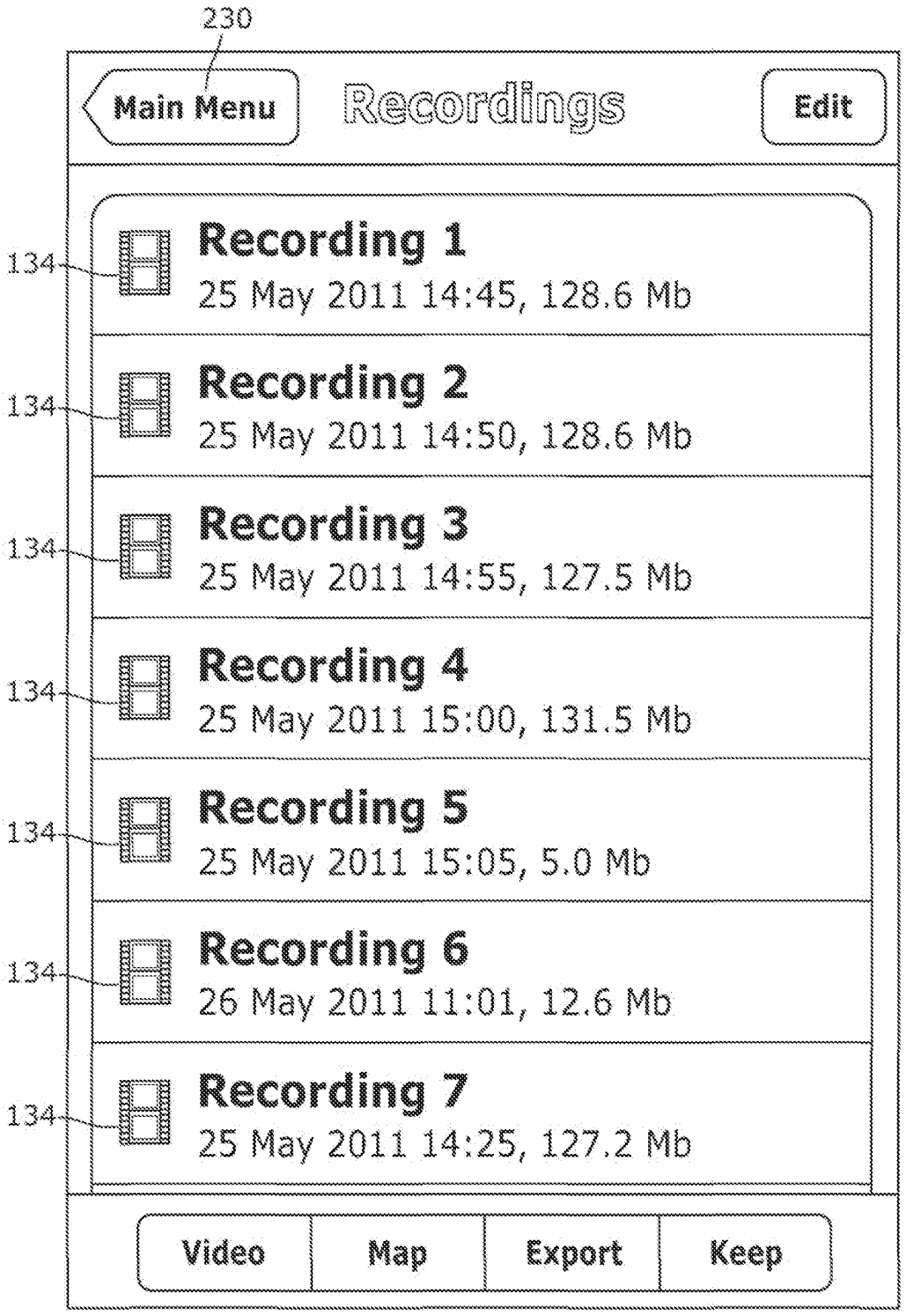

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Recordings
Edit
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Recording 1
25 May 2011 14:45, 128.6 Mb
134
Recording 2
25 May 2011 14:50, 128.6 Mb
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Recording 3
25 May 2011 14:55, 127.5 Mb
134
Recording 4
25 May 2011 15:00, 131.5 Mb
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Recording 5
25 May 2011 15:05, 5.0 Mb
134
Recording 6
26 May 2011 11:01, 12.6 Mb
134
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Fig. 20

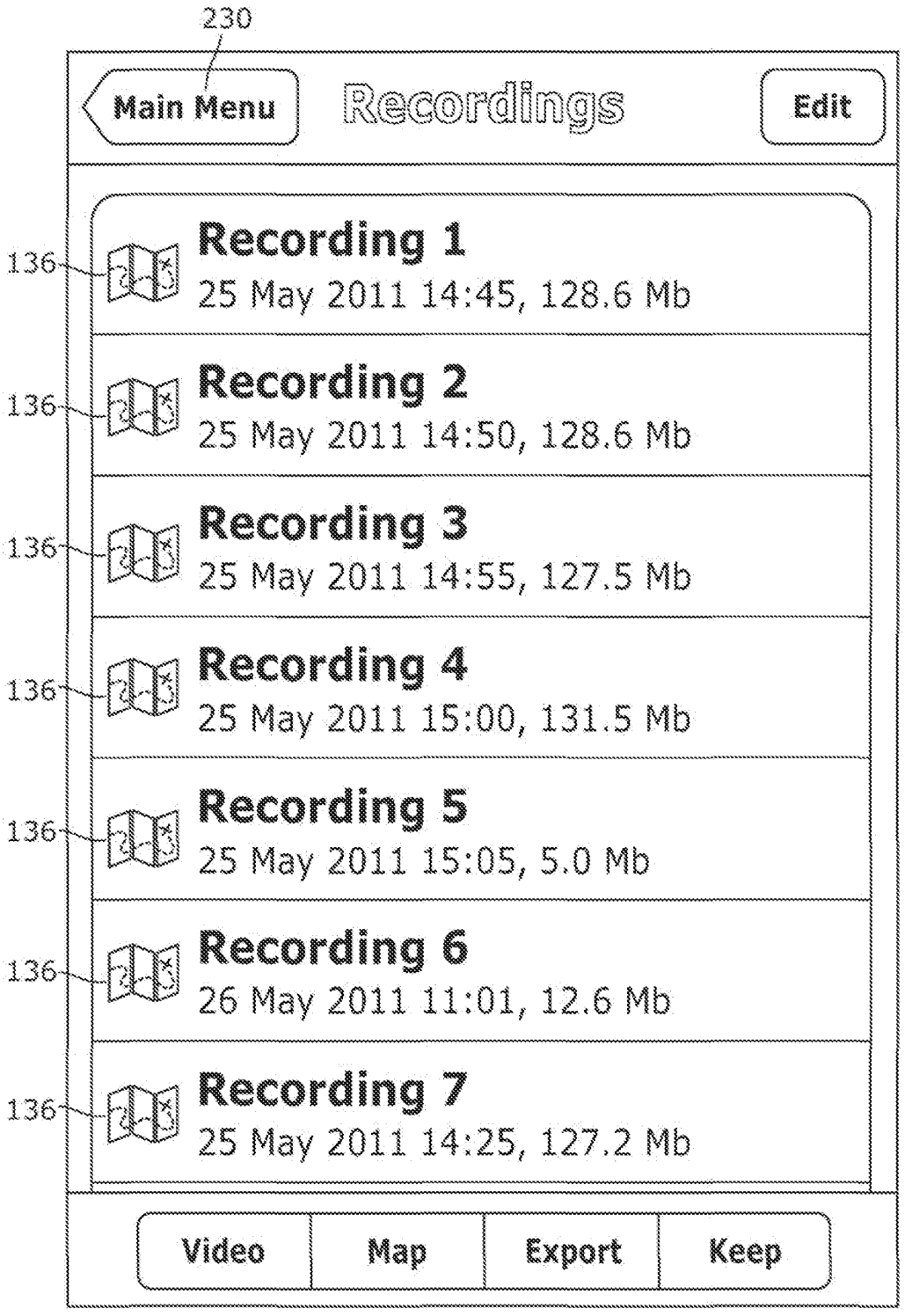

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Main Menu
Recordings
Edit
136
Recording 1
25 May 2011 14:45, 128.6 Mb
136
Recording 2
25 May 2011 14:50, 128.6 Mb
136
Recording 3
25 May 2011 14:55, 127.5 Mb
136
Recording 4
25 May 2011 15:00, 131.5 Mb
136
Recording 5
25 May 2011 15:05, 5.0 Mb
136
Recording 6
26 May 2011 11:01, 12.6 Mb
136
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Fig. 21

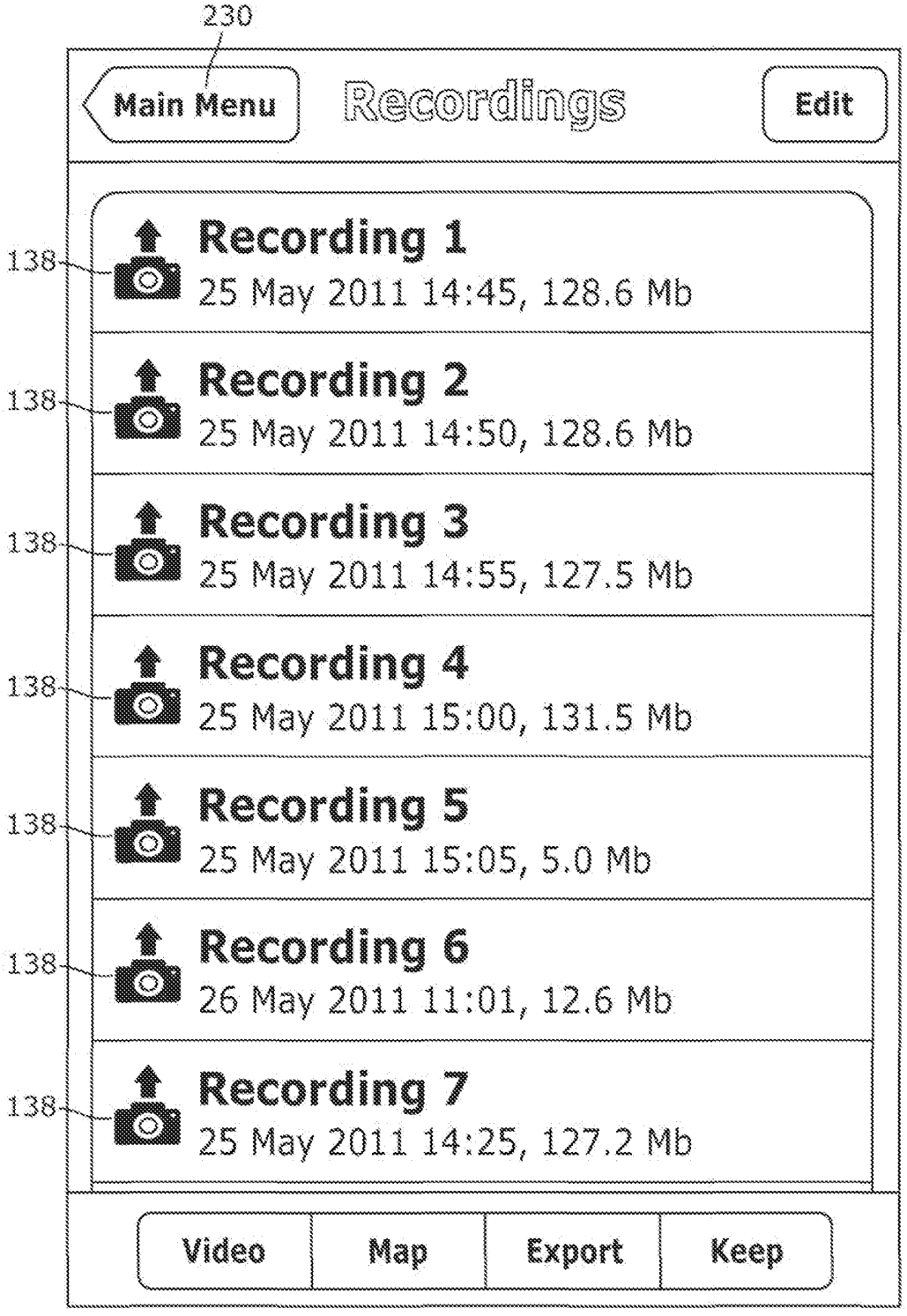

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Main Menu
Recordings
Edit
138
Recording 1
25 May 2011 14:45, 128.6 Mb
138
Recording 2
25 May 2011 14:50, 128.6 Mb
138
Recording 3
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Recording 4
25 May 2011 15:00, 131.5 Mb
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Recording 5
25 May 2011 15:05, 5.0 Mb
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Recording 6
26 May 2011 11:01, 12.6 Mb
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Recording 7
25 May 2011 14:25, 127.2 Mb
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Fig. 22

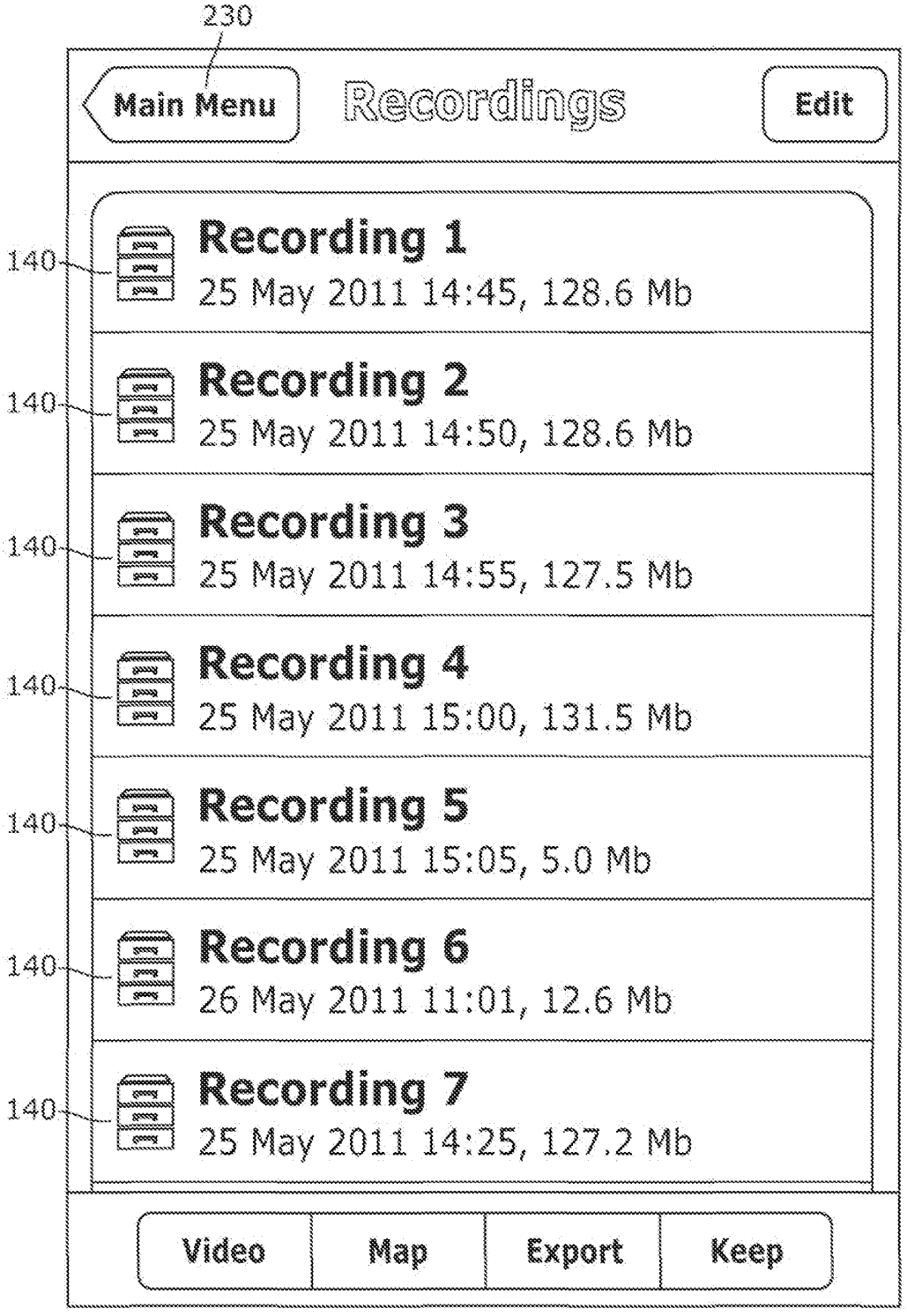

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25 May 2011 15:05, 5.0 Mb
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Recording 6
26 May 2011 11:01, 12.6 Mb
140
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Fig. 23

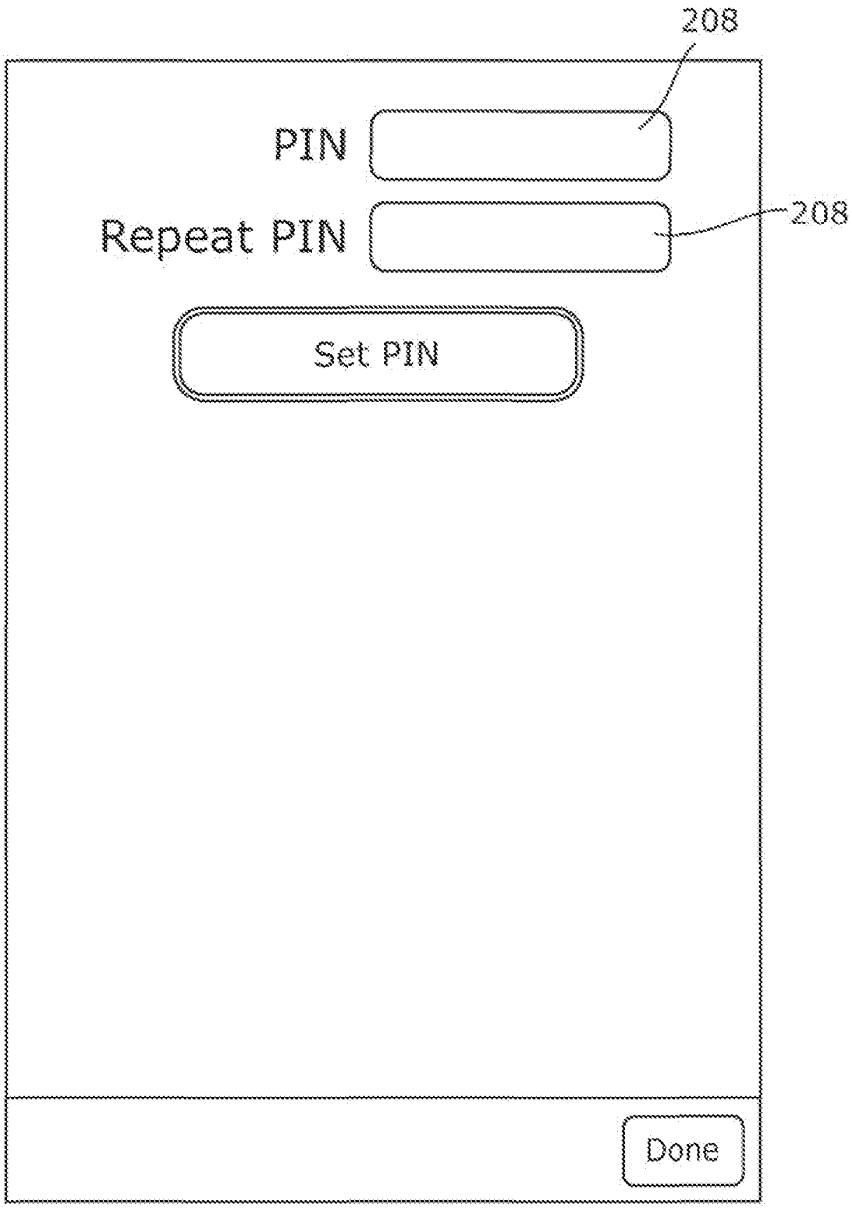


Fig. 24

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2011/052491

A. CLASSIFICATION OF SUBJECT MATTER
INV. G07C5/08 G07C5/00 H04M1/725
ADD.

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)
G07C H04M G06F H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/039254 A1 (COOPER MARCUS DONALD [US] ET AL) 18 February 2010 (2010-02-18)	1-4, 7-10, 36-47
Y	paragraph [0002] - paragraph [0008] paragraph [0027] - paragraph [0033] paragraph [0053] - paragraph [0057] paragraph [0066] - paragraph [0087] paragraph [0109] - paragraph [0122] claims 8-10,14-16,18,20,21; figures 1-3,7,8,14	5,6, 11-35
X	US 2007/219685 A1 (PLANTE JAMES [US]) 20 September 2007 (2007-09-20)	1
Y	paragraph [0001] paragraph [0034] - paragraph [0037] paragraph [0063] - paragraph [0076] paragraph [0080] - paragraph [0081] figures 1-5,7,8	5,6, 11-32

-/--

[X] Further documents are listed in the continuation of Box C. [X] 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

"E" earlier document 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
5 April 2012	12/04/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bocage, Stéphane

2

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2011/052491

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2006/127534 A1 (SIEMENS VDO AUTOMOTIVE CORP [US]; DENIAU JEAN-CHRISTOPHE [US]; VASQUEZ) 30 November 2006 (2006-11-30)	33-35
A	page 1, line 9 - line 11 page 2, line 2 - line 7 page 3, line 9 - page 4, line 5 page 5, line 13 - page 6, line 5 figure 1	1-32, 36-47
A	EP 2 177 811 A2 (NATIVE DESIGN LTD [GB]) 21 April 2010 (2010-04-21) paragraph [0012] - paragraph [0016]	2

2

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2011/052491

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010039254 A1	18-02-2010	NONE	
US 2007219685 A1	20-09-2007	EP 2002234 A2	17-12-2008
		US 2007219685 A1	20-09-2007
		WO 2007117378 A2	18-10-2007
WO 2006127534 A1	30-11-2006	EP 1882350 A1	30-01-2008
		JP 2008546257 A	18-12-2008
		WO 2006127534 A1	30-11-2006
EP 2177811 A2	21-04-2010	EP 2177811 A2	21-04-2010
		GB 2464352 A	21-04-2010

Form PCT/ISA/210 (patent family annex) (April 2005)

Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Filer:	Mark Krietzman H/Tonya Mertens
Attorney Docket Number:	044228.010200
Filed as Small Entity	

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Basic National Stage Fee	2631	1	140	140
Natl Stage Search Fee - all other cases	2632	1	300	300
Natl Stage Exam Fee - all other cases	2633	1	360	360
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**800**

Electronic Acknowledgement Receipt	
EFS ID:	16046563
Application Number:	13994455
International Application Number:	PCT/GB11/52491
Confirmation Number:	1621
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Customer Number:	30734
Filer:	Mark Krietzman H/Tonya Mertens
Filer Authorized By:	Mark Krietzman H
Attorney Docket Number:	044228.010200
Receipt Date:	14-JUN-2013
Filing Date:	
Time Stamp:	15:56:14
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$800
RAM confirmation Number	2746
Deposit Account	502036
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. 1.492 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)	
Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	Keltie_010200_ADS.pdf	108663 e5a958efb5aecdd62dc2bdf0d1896e4e995349f6	no	7
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
2	Transmittal of New Application	Keltie_010200_Transmittal.pdf	142991 270a75fe746b2637e6fcd57794c84311440217df	no	4
Warnings:					
Information:					
3	Documents submitted with 371 Applications	Keltie_010200_Publication_Reduced.pdf	10644046 4b9a898126f1be34b8f2da330f7fb6c945ec3f1a	no	68
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	33134 1417c2e989794411f5cf8546b8f68cda7292e0c4	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	10928834		

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/AIA/14 (03-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	044228.010200
	Application Number	
Title of Invention	Method and System for Logging Vehicle Behavior	

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

Secrecy Order 37 CFR 5.2

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

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Andrew	William	Wright	

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

City	Surrey	Country of Residence	GB

Mailing Address of Inventor:

Address 1	Cedar Springs, Waverly Drive		
Address 2			
City	Virginia Water	State/Province	SU
Postal Code	GU25 4PZ	Country	UK

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	30734		
Email Address	patents@bakerlaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	Method and System for Logging Vehicle Behavior		
Attorney Docket Number	044228.010200	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	25	Suggested Figure for Publication (if any)	1

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	044228.010200
	Application Number	
Title of Invention	Method and System for Logging Vehicle Behavior	

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	30734		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this 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.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)

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(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
PCT/GB2011/052491	WO	2011-12-15	

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	044228.010200
	Application Number	
Title of Invention	Method and System for Logging Vehicle Behavior	

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
1021292.6	GB	2010-12-15	

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
1101259.8	GB	2011-01-25	

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
1109759.9	GB	2011-06-10	

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
1118777.0	GB	2011-10-31	

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.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

PTO/AIA/14 (03-13)
Approved for use through 01/31/2014. 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 contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	044228.010200
	Application Number	
Title of Invention	Method and System for Logging Vehicle Behavior	

If 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 World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

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

PTO/AIA/14 (03-13)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	044228.010200
	Application Number	
Title of Invention	Method and System for Logging Vehicle Behavior	

Mailing Address Information For Applicant:			
Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address	patents@bakerlaw.com		

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

Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute 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 only if non-applicant assignee information is desired to be included on the patent application publication in accordance with 37 CFR 1.215(b). Do not include in this section 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), as the patent application publication will include the name of the applicant(s).

If the Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Non-Applicant Assignee:			
Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

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

PTO/AIA/14 (03-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	044228.010200
	Application Number	
Title of Invention	Method and System for Logging Vehicle Behavior	

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/Mark Krietzman/			Date (YYYY-MM-DD)	2013-06-14
First Name	Mark	Last Name	Krietzman	Registration Number	41128
Additional Signature may be generated within this form by selecting the Add button.					

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

Privacy Act Statement

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

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

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

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

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

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

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

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Andrew William Wright	Examiner:	Not Yet Assigned
Serial No.	13/994,455	Group Art Unit:	Not Yet Assigned
I.A. No.:	PCT/GB2011/052491	Confirmation No.:	1621
Filed:	June 14, 2013	Docket No.	044228.010200

Title: **METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR**

Customer No.: 30734

CERTIFICATE UNDER 37 CFR 1.6(d)

I hereby certify that this correspondence and identified enclosures are being transmitted via EFS on June 14, 2013.

/Tonya Mertens/
Name: Tonya Mertens

PRELIMINARY AMENDMENT

Mail Stop: Preliminary Amendment
Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

Dear Sir or Madam:

Applicant herewith submits a Preliminary Amendment corresponding to claims of this U.S. National Stage application. Applicant respectfully requests consideration of the amendments and the remarks on the pages that follow, early and favorable consideration being earnestly solicited.

Amendments to the claims begin on page 2 of this paper. Remarks begin on page 14.

/ / /

AMENDMENTS TO THE CLAIMS

Claim 1. (Original) A mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising:

a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module;

a processor for processing sensor data from the sensor set to derive said driving information;

a memory for storing said derived driving information; and

a wireless telecommunications module operable to download an application;

the mobile device being arranged to execute the downloaded application to control the mobile device to:

register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver;

process sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

store a selection of the driving information to the memory.

Claim 2. (Original) A mobile telecommunications device according to claim 1, comprising an adapter arranged to hold the device securely to the vehicle.

~~Claim 3.~~ (Canceled) ~~A mobile telecommunications device according to claim 1 or claim 2, controlled by the executed application to register the start of a driving period in response to an initialisation input generated automatically in response to the sensor data having predetermined values.~~

~~Claim 4.~~ (Canceled) ~~A mobile telecommunications device according to claim 3, wherein the initialisation input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.~~

~~Claim 5.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, comprising a registration module configured to register the installation of the mobile device to the vehicle.~~

~~Claim 6.~~ (Canceled) ~~A mobile telecommunications device according to claim 5, wherein the registration module is arranged to determine a match between the location of the mobile device and the location of the vehicle.~~

~~Claim 7.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to manage voice-calls incoming to the mobile device during a driving period.~~

~~Claim 8.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to enable a hands-free mode of operation on detection of a driving period.~~

~~Claim 9.~~ (Canceled) ~~A mobile telecommunications device according to claim 8, wherein the hand-free mode of operation comprises enabling voice-activated commands on the mobile device~~.

~~Claim 10.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate.~~

~~Claim 11.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response store driving information associated with that event to the memory.~~

~~Claim 12.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to detect the occurrence of a predetermined event of~~

~~significance, such as a crash, and in response transmit driving information associated with that event via the wireless telecommunication module to a remote data logging system.~~

~~Claim 13.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, comprising an event detector for detecting the occurrence of a predetermined event by correlating the sensor data against an event indication model.~~

~~Claim 14.~~ (Canceled) ~~A mobile telecommunications device according to claim 13, wherein the event indication model comprises a set of predetermined data values that the event detector is arranged to compare against corresponding sensor data.~~

~~Claim 15.~~ (Canceled) ~~A mobile telecommunications device according to claim 14, wherein the event indication model comprises a sequence of predetermined data values, the sequence being associated by a function of time.~~

~~Claim 16.~~ (Canceled) ~~A mobile telecommunication device according to claim 13 or claim 14, wherein the event indication model comprises a pattern of predetermined data values and the event detector is arranged to detect the occurrence of an event by carrying out pattern recognition by matching sensor data values to the pattern of predetermined data values of the event indication model.~~

~~Claim 17.~~ (Canceled) ~~A mobile telecommunication device according to any one of claims 13 to 15, wherein there are a plurality of event indication models.~~

Claim 18. (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with how the vehicle is driven for each of the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.~~

~~Claim 19.~~ (Canceled) ~~A mobile telecommunications device according to claim 18 when dependent on claims 14 to 17, controlled by the executed application to modify one or more event indication models in response to the benchmark.~~

~~Claim 20.~~ (Canceled) ~~A mobile telecommunications device according to any one of claims 11 to 19, controlled by the executed application to take at least one predetermined action in response to a detected event.~~

~~Claim 21.~~ (Canceled) ~~A mobile telecommunications device according to claim 20, wherein the at least one predetermined action comprises transmitting driving information via the wireless telecommunication module of the mobile device, to a remote system.~~

~~Claim 22.~~ (Canceled) ~~A mobile telecommunications device according to claim 20 or claim 21, wherein the at least one predetermined action comprises storing driving information captured at a higher sampling rate than when an event is not detected.~~

~~Claim 23.~~ (Canceled) ~~A mobile telecommunications device according to any one of claims 20 to 22, wherein the at least one predetermined action comprises providing feedback to a user to indicate that an event has been detected.~~

~~Claim 24.~~ (Canceled) ~~A mobile telecommunications device according to claim 23, configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback.~~

~~Claim 25.~~ (Canceled) ~~A mobile telecommunications device according to claim 23 or claim 24, wherein the feedback comprises notifying a user that a further action has been scheduled, and will be taken within a predetermined period.~~

~~Claim 26.~~ (Canceled) ~~A mobile telecommunications device according to claim 25, configured to receive a user interaction to confirm or deny whether the further scheduled action should be taken within a predetermined period.~~

/ / /

~~Claim 27.~~ (Canceled) ~~A mobile telecommunications device according to any one of claims 20 to 26, wherein the at least one predetermined action comprises providing the user with options to control the mobile device to take further actions.~~

~~Claim 28.~~ (Canceled) ~~A mobile telecommunications device according to any one of claims 20 to 27, wherein the at least one predetermined action comprises communicating to a remote system that an event has been detected.~~

~~Claim 29.~~ (Canceled) ~~A mobile telecommunications device according to claims 28, configured to receive from the remote system a request to transmit to the remote system selected portions of the driving information associated with the detected event, and operating the wireless telecommunication module to transmit the requested driving information.~~

~~Claim 30.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, wherein the memory comprises a long term memory for persistently storing driving information and a short term memory for transiently storing driving information, the short term memory being arranged to receive driving information at a higher update rate than the long term memory.~~

~~Claim 31.~~ (Canceled) ~~A mobile telecommunications device according to claim 30, controlled by the executed application to write driving information to the short term memory at a predetermined update rate during the driving period in a predetermined sequence, the mobile device being further controlled to overwrite the driving information previously written to the short term memory in accordance with the predetermined sequence.~~

Claim 32. (Canceled) ~~A mobile telecommunications device according to claim 30 or claim 31, when dependent on any one of claims 20 to 29, wherein at least one predetermined action comprises transferring data from the short term memory to the long term memory.~~

~~Claim 33.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, further arranged to interface with an external device having access to external driving information associated with the behaviour and/or condition of the vehicle, the mobile device~~

~~being arranged to receive at least a portion of the external driving information from the external device.~~

~~Claim 34.~~ (Canceled) ~~A mobile telecommunications device according to claim 33, wherein the external device is an engine management system of the vehicle.~~

~~Claim 35~~. (Canceled) ~~A mobile telecommunications device according to claim 33 or claim 34, further arranged to interface with the external device wirelessly.~~

~~Claim 36~~. (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to determine a unique identifier associated with the mobile device and retrieve from the memory and transmit via the wireless telecommunication module to a remote system said driving information paired with said unique identifier.~~

~~Claim 37~~. (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to process the driving information to generate a driving score to be stored on the memory of the mobile device.~~

~~Claim 38.~~ (Canceled) ~~A mobile telecommunications device according to any preceding claim, controlled by the executed application to process the driving information to generate a driving score to be transmitted via the wireless telecommunication mobile device to a remote system.~~

~~Claim 39.~~ (Canceled) ~~A mobile telecommunications device according to claim 38 or claim 39, wherein the driving score is associated with a particular driver.~~

~~Claim 40~~. (Canceled) ~~A data-logging system for logging driving information comprising:~~

~~a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;~~

~~a communications interface arranged to communicate with a remote mobile device according to any preceding claim, and receive therefrom:~~

~~a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and~~

~~driving information to be logged to that corresponding account~~.

~~Claim 41.~~ (Canceled) ~~A data-logging system according to claim 40, wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver.~~

~~Claim 42.~~ (Canceled) ~~A data logging system according to claim 40 or 41, further arranged to process the driving information logged to the corresponding account to generate a driving score.~~

~~Claim 43.~~ (Canceled) ~~A data logging system according to claim 42, wherein the driving score is used to determine a risk profile for at least one of the vehicle and driver.~~

~~Claim 44.~~ (Canceled) ~~A data logging system according to any one of claims 42 to 44, wherein the driving score is used to define an insurance premium associated with the account.~~

~~Claim 45.~~ (Canceled) ~~A data logging system according to any one of claims 40 to 44, further arranged to communicate to a mobile device an insurance offer generated in response to the driving information received from the mobile device.~~

~~Claim 46.~~ (Canceled) ~~A data logging system according to claim 45, arranged to receive from the mobile device a user-acceptance of the insurance offer.~~

~~Claim 47.~~ (Canceled) ~~A method of logging driving information associated with a vehicle when driven, the method comprising:~~

~~adapting and installing a mobile device to the vehicle, the mobile device comprising a memory;~~

~~registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver;~~

~~processing sensor data from a sensor set during the driving period to derive driving information associated with how the vehicle is driven; and~~

~~storing a selection of the driving information to the memory of the mobile device.~~

Claim 3. (New) A mobile telecommunications device according to claim 1, controlled by the executed application to register the start of a driving period in response to an initialization input generated automatically in response to the sensor data having predetermined values, wherein the initialization input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.

Claim 4. (New) A mobile telecommunications device according to claim 1, comprising a registration module configured to register the installation of the mobile device to the vehicle, wherein the registration module is arranged to determine a match between the location of the mobile device and the location of the vehicle.

Claim 5. (New) A mobile telecommunications device according to claim 1, controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate.

Claim 6. (New) A mobile telecommunications device according to claim 1, controlled by the executed application to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with how the vehicle is driven for each of the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

/ / /

Claim 7. (New) A mobile telecommunications device according to claim 6, comprising an event detector for detecting the occurrence of a predetermined event by correlating the sensor data against at least one event indication model, the at least one event indication model comprising a set of predetermined data values that the event detector is arranged to compare against corresponding sensor data, wherein the mobile telecommunications device is controlled by the executed application to modify the at least one event indication model in response to the benchmark.

Claim 8. (New) A mobile telecommunications device according to claim 1, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response take at least one predetermined action.

Claim 9. (New) A mobile telecommunication device according to claim 8, wherein the at least one predetermined action is at least one of storing driving information associated with that event to the memory, storing driving information captured at a higher sampling rate than when an event is not detected, and transmitting driving information via the wireless telecommunication module of the mobile telecommunication device to a remote system.

Claim 10. (New) A mobile telecommunications device according to claim 8, wherein the at least one predetermined action comprises providing feedback to a user to indicate that an event has been detected, the mobile telecommunications device being configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback.

Claim 11. (New) A mobile telecommunications device according to claim 10, wherein the feedback comprises notifying a user that a further action has been scheduled, and will be taken within a predetermined period, the mobile telecommunications device

being further configured to receive a user interaction to confirm or deny whether the further scheduled action should be taken within a predetermined period.

Claim 12. (New) A mobile telecommunications device according to claim 8, wherein the at least one predetermined action comprises communicating to a remote system that an event has been detected, the mobile telecommunications device being further configured to receive from the remote system a request to transmit to the remote system selected portions of the driving information associated with the detected event, and operate the wireless telecommunication module to transmit the requested driving information.

Claim 13. (New) A mobile telecommunications device according claim 1, wherein the memory comprises a long term memory for persistently storing driving information and a short term memory for transiently storing driving information, the short term memory being arranged to receive driving information at a higher update rate than the long term memory, the mobile telecommunications device being controlled by the executed application to write driving information to the short term memory at a predetermined update rate during the driving period in a predetermined sequence, the mobile device being further controlled to overwrite the driving information previously written to the short term memory in accordance with the predetermined sequence.

Claim 14. (New) A mobile telecommunications device according to claim 13, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response take at least one predetermined action, including transferring data from the short term memory to the long term memory.

Claim 15. (New) A mobile telecommunications device according to claim 1, further arranged to interface with an external device, such as an engine management system, the external device having access to external driving information associated with a

condition of the vehicle, the mobile device being arranged to receive at least a portion of the external driving information from the external device.

Claim 16. (New) A mobile telecommunications device according to claim 1, controlled by the executed application to process the driving information to generate a driving score, associated with a particular driver, to be transmitted via the wireless telecommunication of the mobile device to a remote system.

Claim 17. (New) A data-logging system for logging driving information from a remote mobile telecommunications device according to claim 1, the data logging system comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with the remote mobile telecommunications device according to claim 1, and receive therefrom:

a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and,

driving information to be logged to that corresponding account.

Claim 18. (New) A data-logging system according to claim 17, wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver, the data logging system being further arranged to process the driving information logged to the corresponding account to generate a driving score used to determine a risk profile for at least one of the vehicle and driver.

/ / /

Claim 19. (New) A data logging system according to claim 18, wherein the driving score is used to define an insurance premium associated with the account and the data logging system is further arranged to communicate to the mobile telecommunication device an insurance offer generated in response to the driving information received from the mobile device.

Claim 20. (New) A method of logging driving information associated with a vehicle when driven, the method comprising:

adapting and installing a mobile device to the vehicle, the mobile device comprising a memory;

registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver;

processing sensor data from a sensor set during the driving period to derive driving information associated with how the vehicle is driven; and,

storing a selection of the driving information to the memory of the mobile device.

REMARKS

No new matter has been added by this Preliminary Amendment.

If the Examiner believes that a telephone conference would aid in the prosecution of this case in any way, the Examiner is invited to telephone the Applicants' undersigned attorney.

The Director is authorized to charge any additional fee(s) or any underpayment of fee(s), or to credit any overpayments to **Deposit Account Number 50-2036**. Please ensure that Attorney Docket Number 044228.010200 is referred to when charging any payments or credits for this case.

Respectfully submitted,

Date: June 14, 2013

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REPLACEMENT SPECIFICATION

Method and System for Logging Vehicle Behavior

Cross-reference to Related Applications

[0001] This application is a United States National Stage entry of PCT/GB2011/052491, which claims the full Paris Convention benefit of and priority to GB 1021292.6 filed 15 December 2010, GB 1101259.8 filed 25 January 2011, GB 1109759.9 filed 10 June 2011, and GB 1118777.0, filed 31 October 2011, the contents of which are incorporated by this reference as if fully set forth herein in their entirety.

Field ~~of the invention~~

[0002] The present ~~invention~~ disclosure relates to methods and systems for logging driving information associated with vehicle behaviour. Moreover, the present ~~invention~~ disclosure relates to a mobile device adapted for installation to a vehicle and configured to log such driving information, for example, video footage associated with how the vehicle is driven. Such driving information may subsequently be utilised to determine the cause of an event such as an accident, to modify driver behaviour and/or to determine insurance premiums.

Background

[0003] Data logging devices are commonly installed on aircraft that log data about events associated with the behaviour of the aircraft and also the crew controlling the aircraft. Such data logging devices are commonly termed "black boxes" and are very useful for determining the cause of problems that have effected the aircraft, especially when no other record of a significant event such as a crash exists.

[0004] Similar data logging devices exist for road vehicles, and can be used to realise similar advantages. Vehicle users as well as authorities can use such devices to determine the cause of traffic accidents or other vehicle-related events, whether these stem from a vehicle malfunction or driver negligence. For example, the data logged by these devices can be used as evidence for insurance claims and so potentially to determine insurance premiums.

[0005] Some of these data logging devices can be integrated with the car data network, and so may take inputs from sensors integrated with the vehicle, such as those measuring the speed of the vehicle. However, these can be difficult and costly to install. Others having their own internal sensor set are more readily retrofitted to a vehicle. Nonetheless, such data logging devices for road vehicles are less prevalent perhaps due to their unjustifiable expense. Accordingly the uptake of data logging devices that can be retrofitted to road vehicles, as are known in the art, has been minimal.

[0006] It is the object of the present ~~invention~~ disclosure to alleviate the above-mentioned problems, at least in part.

Summary ~~of the invention~~

[0007] ~~According to a first aspect of the present invention there is~~Aspects of some exemplary implementations provides a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from

the sensor set to derive said driving information; a memory for storing said derived driving information; and a wireless telecommunications module operable to download an application; the mobile device being arranged to execute the downloaded application to control the mobile device to: register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; process sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and store a selection of the driving information to the memory.

[0008] Advantageously, the use of a mobile telecommunication device enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle. Mobile telecommunication devices such as "smart-phones" are becoming increasingly widespread, and these devices tend to have the requisite sensor sets to capture data concerning vehicle behaviour. Thus, a generic mobile telecommunication device already owned by a driver of the vehicle can be loaded with the application to provide such data logging functionality that would otherwise necessitate a dedicated black-box. Thus, the functionality of a black-box can be realised without additional expense.

[0009] Following on from this, it will be appreciated that the mobile device is ideally a portable mobile telecommunication device. Ideally, the mobile device is a hand-portable mobile device. Advantageously, the portability permits the mobile device to be conveniently fitted to and removed from the vehicle.

[00010] Furthermore, such a mobile telecommunication device presents additional advantages over known dedicated black-box systems as the data logging functionality of the mobile telecommunication device can be continually refined. This can be achieved without physically upgrading the hardware of the device, and also without significant user intervention. Specifically, the application may be arranged to determine whether a software update exists and if so, control the mobile device to download at least portions of an improved version of the application. Conveniently, downloading may be via the wireless telecommunication module. Said downloading may be automatic, or may be user-confirmed. For the avoidance of doubt, the application will typically be stored on a portion of the memory of the mobile device and executed therefrom, as is known in the art. Also, it will be appreciated that the application, or portion thereof may be downloaded via the wireless telecommunication module and/or via an intermediary device. For example the application may be side-loaded to the mobile device from an intermediary computing device.

[00011] The application may be sourced from an application store and/or content provider. For example, the content provider may comprise the Apple® Appstore®. The content provider may comprise a cloud computing provider.

[00012] It will be appreciated that the use of such a generic mobile device in this context may be counter-intuitive to a person skilled in the art - such generic devices are not designed to withstand events such as catastrophic crashes. Furthermore, such generic devices are usually not necessarily configured to appropriately detect conditions that may need to be recorded. Such devices are usually kept in a user's pocket or bag, and so are not best placed to generate sensor data associated with the behaviour of a vehicle. However, the inventor of the present

inventiondisclosure has realised that such a mobile device that is adapted for installation to the vehicle can overcome such drawbacks and fulfil a role similar to a black box. To this end, the mobile telecommunication device may comprise an adapter arranged to hold the device securely to the vehicle.

[00013] Advantageously, as well as protecting the device from damage, the adapter improves the suitability and reliability of the sensor data and so the driving information associated with when and/or how the vehicle is being driven. For example, if the sensor set comprises an accelerometer, the acceleration of the vehicle can be more accurately measured due to the mobile device being firmly attached to the vehicle. Similarly, if the sensor set comprises an image sensor, for example, for capturing video footage of the road ahead, better footage can be obtained as the mobile device can be held in the correct position and orientation relative to the vehicle. In particular, the mobile device may be positioned by the adapter so that its image sensor views the road ahead through a windshield of the vehicle.

[00014] As mentioned, the device is arranged to log driving information associated with the vehicle, when that vehicle is being driven. This is realised by registering the start of the driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by the driver. Advantageously, this prevents driving information from being needlessly recorded. As will be appreciated the mobile device has only a finite storage capacity and so registering the start of the driving period is useful for minimising the unnecessary usage of memory. In particular, where the mobile device comprises an image sensor, and the sensor data comprises a sequence of images (e.g. a video) the storage space can be very quickly filled by the memory.

[00015] To this end, it is preferred that when the application is executed, it controls the mobile device to register the start of a driving period in response to an initialisation input. The initialisation input may comprise a user input - for example, the user manually executing the application on the mobile device. The initialisation input may also or instead be generated automatically in response to the mobile device being installed to the vehicle and/or the vehicle being driven. The initialisation input may be generated automatically in response to the sensor data having predetermined values. For example, if the sensor data reflects a detected speed above a predetermined threshold – for example, 20 kilometres per hour – then this can be used to trigger the start of the driving period. Similarly, if the sensor data reflects that the mobile device is held securely to the vehicle in a predetermined position (for example, via the adapter) this can also be used to trigger the start of the driving period. To this end, the adapter and/or the mobile device may comprise a registration module configured to register the installation of the mobile device to the vehicle and/or the adapter. The registration module may comprise a proximity sensor to detect the proximity of the mobile device to the vehicle. The registration module may comprise a NFC (near field communication) device. The registration module may be arranged to determine a match between the location of the mobile device and the location of the vehicle. The match may be performed by receiving and comparing a first positioning input associated with the position of the vehicle and a second positioning input associated with the position of the mobile device. The registration module and/or adapter may be a smart holster.

[00016] Preferably, the executed application controls the mobile device to manage voice-calls incoming to the mobile device during a driving period. For example, said voice-call management may comprise temporarily disabling and/or diverting voice-calls incoming to the mobile device during a driving period. Advantageously, this safety feature discourages users from making or receiving phone calls whilst driving. It will be appreciated that a driver is less able to control a vehicle effectively whilst also manipulating a mobile device, and in many countries doing so is illegal. However, the provision of a 'hands-free' mode or accessory – as are well known in the art - may obviate the need for a user to manipulate the mobile device. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the detection of a hands-free accessory or hands-free mode enabled on the mobile device.

[00017] Furthermore, the executed application may be arranged to control the mobile device to enable a hands-free mode of operation on detection of a driving period. For example, the enabled hands-free mode of operation may comprise enabling voice-activated commands. In light of this, it is preferred that the adapter is configured to hold the mobile device in a way that facilitates reception of voice commands from the user. In particular, the mobile device may be held in a position relative to the user to permit clear reception of the users voice. Typically, this position is about the dashboard in a vehicle such as car or van. Furthermore, the adapter is configured with an opening through which an audio sensor of the mobile device is able to receive the user's voice.

[00018] Also, even though a drivers control of a vehicle may be affected by manipulating the mobile device, under certain circumstances, this may not be objectionable – for example, when the vehicle is stationary. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the driving information – for example, the speed and location of the vehicle.

[00019] Furthermore, it will be appreciated that the driver may not be the only user within the vehicle, and so disabling functions of the mobile device may not be appropriate under all circumstances, as a passenger of the vehicle may want to use the mobile device whilst the driver is driving. Under these circumstances, the executed application is arranged to control the mobile device to register the presence of a non-driver (for example, via image recognition, or entry of an unlock code) and unlock, or retain the original functionality of the mobile device. Furthermore, the executed application may be arranged to run in the background. Accordingly, the mobile device may be used for other purposes, such as making or receiving a telephone call.

[00020] It is advantageous to store only selected driving information for the purpose of logging how a vehicle is being driven during the driving period. Whilst it may be possible to sample and process sensor data at a relatively high rate (i.e. many times a second), continually storing driving information derived from that sensor data at such a high rate can use up a lot of storage space on the mobile device, the majority of which is likely to be redundant. Therefore, by

being selective about the driving information that is stored, storage utilisation can be made more efficient.

[00021] In particular, the executed application may control the mobile device to store a summary of the driving period. The summary may comprise compressed and/or summarised driving information. For example, the sensor data can be processed at a first sampling rate and then down-sampled to a fraction of the first sampling rate for storage as driving information. Put another way, the mobile device can be controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate. Advantageously, this retains a snapshot of when and/or how the vehicle is being driven, but with fewer data points, and so requiring less storage space.

[00022] Nonetheless, under certain circumstances, it is more useful to retain information at higher or the highest possible sampling rates. In particular, it is more important to have detailed information associated with the behaviour of a vehicle during a crash than when the vehicle is being driven normally.

[00023] Accordingly, the executed application may be arranged to control the mobile device to detect the occurrence of a predetermined event of significance (such as a crash) and in response store driving information associated with that event to the memory. Preferably, said driving information associated with that event comprises driving information in the lead up to and immediately following the event. In particular, detailed driving information in the lead up to, and immediately following a predetermined event of significance is preferably stored. It will be understood that the driving information associated with the detected event may be transmitted via the wireless telecommunication module in addition to, or instead of storing said data. Said transmitted driving information may be transmitted to a remote data logging system.

[00024] To this end the mobile device may comprise an event detector for detecting the occurrence of an event.

[00025] Preferably, the event detector is arranged to detect the occurrence of a predetermined event by correlating data, such as sensor data, against an event indication model. The application may comprise the event indication model.

[00026] Preferably, the event indication model comprises a set of predetermined data values corresponding to a predetermined event. Accordingly, the event detector is arranged to compare the set of predetermined data values against corresponding sensor data to determine whether the predetermined event has occurred.

[00027] For example, the event indication model may indicate that a serious crash has occurred if values returned by an accelerometer sensor exceed predetermined data values of the event indication model, thereby representing a sustained vehicle deceleration beyond a threshold level. Following on from this, it will be appreciated that detection of an event may be dependent on matching a sequence of data values that have occurred over time. Moreover, the event indication model may comprise a sequence of predetermined data values, the sequence being associated by a function of time. Thus, the event detector may be arranged to compare the sequence of predetermined data values against corresponding sensor data that have been

generated over a given time period. Put another way, the event detector and event indication model are arranged to indicate the occurrence of an event in dependence on the correlation between a set of predetermined data values occurring over time. Thus, a set of values returned from sensor data over a period of time are compared against a corresponding sequence of predetermined data values of the event indication model. Typically, this is to determine a rate of change of variables associated with a sensor set.

[00028] It will be understood that an event indication model may comprise a plurality of sets of predetermined data values, each set corresponding to different sensor data. For example, an event indication model associated with a serious accident event may contain data values corresponding to both the deceleration of the vehicle, and the orientation of the vehicle. Thus, if a vehicle is involved in a serious impact, and overturns, this is represented by the model, and so can be detected by the event detector.

[00029] Preferably, the event indication model comprises a pattern of predetermined data values. Preferably, the event detector is arranged to detect the occurrence of an event by carrying out pattern recognition by matching sensor data values to the pattern of predetermined data values of the event indication model. Preferably, there are a plurality of event indication models. Each event indication model may be associated with a separate predetermined event.

[00030] Preferably, the executed application may be arranged to control the mobile device to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with when and/or how the vehicle is driven for each of the driving periods. Preferably, sensor data processed during a first set of driving periods define a benchmark against which sensor data is compared during subsequent sets of driving periods. In particular, the executed application may be arranged to control the mobile to modify one or more event indication models in response to the benchmark. Advantageously, such a benchmark ensures that the event indication models may be tailored to the standard behaviour of a particular vehicle. As will be appreciated, different sensor types, mobile devices, mounting positions, vehicles, drivers and road conditions may generate different sets of sensor data for driving behaviour that is considered standard or safe. Accordingly, the benchmark allows the mobile device to account for variable driving conditions.

[00031] Preferably, a plurality of benchmarks may be defined. A benchmark may be defined for each driver. A benchmark may be defined for each vehicle to which the mobile device is to be installed. Ideally, a benchmark is defined for each driver-vehicle pair. To this end, the mobile device may be arranged to receive an input to specify a driver, a vehicle or a driver-vehicle pair. Advantageously, this ensures that different drivers and vehicles do not disrupt the accurate event detecting capabilities of the event detector.

[00032] Once a predetermined event has been detected by the event detector, it is desirable to take an appropriate action in response to that detected event. Accordingly, the executed application may be arranged to control the mobile device to take at least one predetermined action in response to a detected event. The action taken may comprise transmitting driving information and/or sensor data, via the wireless telecommunication module of

the mobile device, to a remote system. Advantageously, this enables a remote system to be notified of the occurrence of a particular event, and the details associated with that event. For example, the remote system may be arranged to deploy emergency services based on a transmitted notification concerning the occurrence of a crash, and also the location of the mobile device (and so the vehicle) are also included in the transmitted information. A further advantage of transmitting driving information and/or sensor data to a remote system is that such data then does not need to be stored on or processed by the mobile device. Thus, this can free the storage space on the mobile device, and also allow the processor of the mobile device to carry out other tasks. A remote system may comprise or be interfaced with an insurance company database.

[00033] A further advantage associated with sending driving information to a remote system is that the driving information can be assessed remotely. This assessment can be performed automatically or manually - either way it advantageously removes the processing burden from the mobile device. Alternatively, if transmission bandwidths are small, the processing can be executed automatically on the processing device. In this case, the use of virtual neural networks can be used to determine whether the driving information represents acceptable or unacceptable driving patterns.

[00034] The action taken may comprise storing data captured at a higher (or the highest possible) sampling rate than when an event is not detected. Thus, as described above, this may involve preventing the down-sampling of sensor data. Furthermore, the action taken may comprise protecting said driving information from being overwritten.

[00035] The action taken may comprise providing feedback to a user to indicate that an event has been detected. Preferably, the mobile device is configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback. Advantageously, such user feedback can be used to modify event indication models thereby to refine the effectiveness of the event detector. The mobile device may comprise a speaker. Accordingly, such feedback may be provided via an audio prompt. The mobile device may comprise a display screen. Accordingly, such feedback may be provided via a visual prompt. The feedback may comprise notifying a user that a further action has been scheduled, and will be taken within a predetermined period. For example, the feedback may indicate to a user that an event such as a serious crash has been detected, and so the next action to be taken will be to contact emergency services within 10 seconds. Preferably, the feedback includes a prompt to receive a user input. For example, the prompt may be arranged to receive a user input to cancel a subsequently scheduled action. Advantageously, this prevents actions being taken needlessly as a result of an incorrect determination of an event.

[00036] The feedback may provide reassurance and/or guidance to a user. For example, a user may be provided with an important checklist of things to do following an accident or incident. For example, the user may be guided to use a camera (image sensor) on the mobile device to take photographs of the vehicles involved in the incident, including the number plates of those vehicles. The user may be guided to use a text input device on the mobile device to note the name, address, insurance details etc of third parties involved in incident.

[00037] The action taken may comprise communicating to a remote system associated with an insurance company that an incident has been detected (e.g. via a low bandwidth data connection or via text message). If appropriate – or in response to a request from a communication to the mobile device from the remote system – the action taken may comprise transmitting all or selected portions of the driving information associated with the detected event.

[00038] Preferably, the executed application is arranged to control the mobile device to prioritise essential communications, such as calls to the emergency services.

[00039] Preferably, the memory comprises a long term memory for persistently storing driving information and/or sensor data. Preferably the memory comprises a buffer. The buffer may comprise a short term memory for transiently storing driving information and/or sensor data. Preferably, the short term memory is arranged to receive driving information and/or sensor data at a higher update rate than the long term memory. Preferably, the long term memory has a larger capacity than the short term memory.

[00040] Preferably, the executed application controls the mobile device to write driving information and/or sensor data to the short term memory at a predetermined update rate during the driving period. Ideally, the driving information and/or sensor data is written to the short term memory in a predetermined sequence, ideally a chronological sequence. Preferably, the executed application controls the mobile device to overwrite driving information and/or sensor data previously written to the short term memory. Advantageously, this ensures that recording of sensor data and/or driving information, especially data that is recorded at a relatively high update rate, is not prevented during the driving period due to the short term memory becoming full.

[00041] Preferably, the driving information and/or sensor data is overwritten in accordance with the predetermined sequence. Advantageously, this can ensure that the most relevant, up-to-date data is retained in the short term memory.

[00042] Preferably, the action taken in response to a detected event comprises transferring data from the short term memory to the long term memory. Advantageously, this can ensure that the most recent information associated with an event is persistently stored in the long term memory, and is not overwritten.

[00043] Preferably, the sensor set comprises an accelerometer for detecting the acceleration of the mobile device. Accordingly, the corresponding sensor data may comprise acceleration data generated by the accelerometer. The accelerometer may be a single axis or dual axis accelerometer. However, it is preferable that the accelerometer is a three-axis accelerometer so that movement of the vehicle may be determined in three-dimensional space. Furthermore, as the mobile device may be mounted by a user in one of a number of different orientations relative to the vehicle, a three-axis accelerometer ensures that acceleration along the axis aligned with the general forward movement of the vehicle may be effectively detected. This is particularly important to determine an event such as heavy braking of the vehicle and/or a crash.

[00044] Preferably, the sensor set comprises an image sensor such as a camera. Accordingly, the corresponding sensor data may comprise images and/or a sequence of images generated from the image sensor. Said sequence of images may be processed and/or stored in

the form of a video. Advantageously, this can improve the space utilisation of the sequence of images. Preferably, the mobile device is arranged to receive a user input to store a user-selected image or sequence of images to the memory. The image sensor data may be processed to determine safety information and feedback said safety information to the driver. For example, the mobile device may be controlled to determine the proximity of the mobile device to other vehicles. Said determination may be via comparing the apparent size of the number plate of other vehicles in an image with a known size of a standard number-plate, and from that the distance to those other vehicles. Thus, the mobile device can make a determination that another vehicle is too close, and issue a warning to the driver to slow down to avoid a collision. Similarly, images of the road ahead may be processed to determine whether a vehicle is drifting out of lane (e.g. because the driver is falling asleep). In response to such a determination, an alert can be issued. Similarly, images of road signs may be processed to assess driver behaviour.

[00045] It will be appreciated that the mobile device may comprise a plurality of image sensors. For example, the mobile device may have a forward-facing camera and a rear-facing camera. Accordingly, it may be possible to view images of the road ahead, external to the vehicle, and also from inside the vehicle. In particular, the mobile device may be arranged to capture images or a sequence of images of the driver. Images of the driver may be processed to make a safety determination. For example, the images may be processed to detect whether the driver is falling asleep. In particular, a blink rate of the driver may be detected by processing the image data. Similarly, a determination may be made whether the driver has their eyes closed. In response to such a determination that a driver is falling asleep, the mobile device may be arranged to issue an alert so as to wake the driver.

[00046] Preferably, the sensor set comprises an audio sensor such as a microphone. Accordingly, the corresponding sensor data may comprise audio data.

[00047] Advantageously, an image sensor and/or an audio sensor can provide an important record of an event such as a crash.

[00048] Preferably, the sensor set comprises a positioning module arranged to determine the position of the mobile device. The positioning module may comprise a GPS module. The positioning module may be arranged to utilise the wireless telecommunication module to self-localise, for example by determining a position relative to one or more mobile telecommunication cell towers. Advantageously, the positioning module can allow the mobile device to determine its position (and so the position of the vehicle) over time. Accordingly, the positioning module can thus determine the speed of the mobile device and vehicle. Thus, the corresponding sensor data may comprise latitude, longitude, elevation, speed and other data obtainable from positioning modules such as GPS modules as is known in the art.

[00049] Preferably, the sensor set comprises an orientation sensor for determining the orientation of the mobile device. Said orientation sensor may comprise an electronic compass for determining a bearing, and so the direction in which the mobile device is facing. Accordingly, the corresponding sensor data may comprise orientation and bearing data. Advantageously, such data can be used to augment the data of the positioning module. Furthermore, the executed

application may be arranged to use the data from the orientation sensor to determine whether the mobile device has been fitted to vehicle, and whether the mobile device has been fitted in the correct orientation. Advantageously, the data from the orientation sensor may also be used to determine whether a significant event has occurred, such as the vehicle overturning.

[00050] Preferably, the sensor set comprises a user-input device arranged to receive an input from a user. The user input device may comprise at least one of buttons and a touch-sensitive display screen. Advantageously, this allows a user to input data to the mobile device.

[00051] Preferably, the mobile device comprises a timer. Preferably, the executed application is arranged to control the mobile device to record sensor data and/or driving information against time as determined by the timer. Accordingly, the timer can be used to time-synchronise sensor data and/or driving information.

[00052] Preferably, the executed application is arranged to encrypt the driving information stored on the memory. Advantageously, this reduces the possibility of said driving information being modified without authorisation. This is an important consideration when such driving data may be used as evidence, for example, when determining the cause of an accident.

[00053] Preferably, the mobile device is arranged to interface with an external device to receive external driving information from said external device. It will be appreciated that the sensor set onboard the mobile device may be supplemented by a sensor set external to the mobile device. For example, the external device may be an engine management system of the vehicle and/or the external device may be arranged to connect to the on-car data network of the vehicle. Thus, the external device may have access to information associated with the behaviour of the vehicle (for example, the speed of the vehicle, how much the brake pedal is being pressed, etc). Such driving information can be processed and/or stored by the mobile device under control of the executed application in a manner similar to driving information derived from sensor data internal to the mobile device.

[00054] Preferably, the mobile device is arranged to interface with an external device wirelessly, for example via a Bluetooth® connection. Advantageously, this removes the need for the mobile device to be physically connected to the external device. As will be appreciated, following a driving period, a user may want to leave the vehicle and so take a personal mobile telecommunication device with them, and so a wireless interface with such an external device obviates the inconvenience of physically detaching and then subsequently re-attaching the mobile device.

[00055] Preferably, the mobile device is further controlled by the application to determine a unique identifier associated with the mobile device and retrieve from the memory and transmit via the wireless telecommunication module to a remote system said driving information paired with said unique identifier.

[00056] Advantageously, by pairing an identifier uniquely associated with the mobile device enables the remote system to unambiguously determine the source of the driving information. Accordingly, said driving information can be matched to a particular driver and/or vehicle. This is particularly useful when assessing a risk profile of said driver.

[00057] Preferably, the mobile device is controlled by the executed application to process the driving information to generate a driving score. The driving information may comprise the driving score.

[00058] Preferably, the mobile device comprises a display screen. Preferably, the display screen is touch-sensitive. Advantageously, the display screen may thereby be user-interactable. Preferably, the mobile device comprises a graphical user interface (GUI). The graphical user interface comprise user-interactable artefacts such as buttons. Preferably, the user-interactable artefacts may be displayed on the screen and receive a user input for selection or control of those artefacts. The mobile device may be controlled to selectively hide those artefacts in dependence on the state of the mobile device.

[00059] Preferably, the mobile device is controlled by the application to provide feedback about the driving information and/or values of the sensor data. Ideally, such feedback is via the display screen. For example, a detected speed may be displayed, a time elapsed may be displayed, a bearing/heading may be displayed, a detected position may be displayed and/or a detected image or sequence of images may be displayed (e.g. via a video feed).

[00060] According to a second aspect of the present ~~invention~~disclosure there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from at least the sensor set to derive said driving information; a memory for storing said derived driving information; a wireless telecommunications module operable to download a controlling application; and a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; wherein, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven and store a selection of the driving information to the memory.

[00061] According to a third aspect of the present ~~invention~~disclosure there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor interface arranged to receive sensor data from a sensor set; a processor for processing the sensor data to derive said driving information; a memory for storing said derived driving information; a wireless telecommunications module operable to download a controlling application; and a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; wherein, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven and store a selection of the driving information to the memory.

[00062] Preferably, the sensor interface is arranged to receive sensor data from a sensor set external to the mobile device. Preferably, the sensor interface is arranged to interface with an

external device as described in relation to the first aspect of the present ~~invention~~disclosure. Advantageously, this enables a mobile device to utilise a richer or better equipped sensor set than that local to the mobile device.

[00063] According to a fourth aspect of the present ~~invention~~disclosure there is provided a mobile device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven. Preferably, the mobile device comprises a sensor interface arranged to receive sensor data from an external sensor set. The mobile device may comprise an internal sensor set. Preferably, the mobile device comprises a processor for processing the sensor data to derive said driving information. Preferably, the mobile device comprises a memory for storing said derived driving information. Preferably, the mobile device is a mobile telecommunication device, comprising a wireless telecommunications module. Preferably, the wireless telecommunications module is operable to download an application. Preferably, the mobile device comprises a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. Preferably, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven. Preferably, the mobile device is arranged to store a selection of the driving information to the memory. Preferably, the mobile device is arranged to transmit a selection of the driving information via the wireless telecommunication module. The mobile device may be arranged to transmit a selection of the driving information via the wireless telecommunication module to a remote system such as a remote data-logging system. Advantageously, transmitting (rather than storing) selected driving information prevents storage space local to the mobile device being used up.

[00064] According to a fifth aspect of the present ~~invention~~disclosure there is provided a method of logging driving information associated with a vehicle when driven, the method comprising: adapting and installing a mobile device to the vehicle, the mobile device comprising a memory; registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; processing sensor data from a sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven; and storing a selection of the driving information to the memory of the mobile device.

[00065] According to a sixth aspect of the present ~~invention~~disclosure there is provided a data-logging system for logging driving information comprising: a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver; a communications interface arranged to communicate with a remote mobile device, and receive therefrom: a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and driving information to be logged to that corresponding account.

[00066] The remote mobile device may be a mobile device in accordance with one of the first to fourth aspects of the present ~~invention~~disclosure.

[00067] Preferably, the driving information comprises a driving score. Preferably, the driving information comprises sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver.

[00068] Preferably, the system is arranged to process the driving information logged to the corresponding account to generate a driving score. The driving score may be used to determine a risk profile for at least one of the vehicle and driver. The driving score may be used to define an insurance premium associated with the account.

[00069] Preferably, the system is further arranged to communicate to a mobile device an insurance offer generated in response to the driving information received from the mobile device. The data logging system may be further arranged to receive from the mobile device a user-acceptance of the insurance offer.

[00070] The mobile device may be arranged to generate an insurance offer in response to a predetermined set of conditions being met. For example, driving information over a plurality of driving period adhering to predetermined models. Such models may comprise safe driving parameters and/or thresholds.

[00071] For brevity, it will be understood that features, functions and advantages of different aspects of the present ~~invention~~disclosure may be combined or substituted where context allows. For example, features, functions or advantages of the mobile device described in relation to the first to fourth aspects of the present ~~invention~~disclosure may be provided as method steps in the method of logging driving information according to the fifth aspect of the present ~~invention~~disclosure.

Brief Description of the Drawings

[00072] In order that the ~~invention~~disclosure may be more readily understood, reference will now be made, by way of example, to the accompanying drawings in which:

[00073] Figure 1 is a schematic illustration of a system within which the mobile device of various embodiments of the present ~~invention~~disclosure may be used;

[00074] Figure 2 is an illustration of the automobile of Figure 1 configured with a mobile device in accordance various embodiments of the present ~~invention~~disclosure;

[00075] Figure 3 is a schematic illustration of the functional components of the mobile device of Figure 2;

[00076] Figure 4a is a process flow chart, illustrating method steps executable by the mobile device of Figures 2 and 3;

[00077] Figure 4b is a more detailed process flow chart, providing an example of how a driving incident or event may be detected in accordance with embodiments of the present ~~invention~~disclosure; and

[00078] Figures 5 to 24 illustrate a graphical user interface of the mobile device according to Figures 1 to 4b.

Detailed Description of the Embodiments

[00079] Specific embodiments are now described with reference to the appended figures.

[00080] A preferred embodiment of the present invention discloses relates to a mobile telecommunications device for recording events associated with a vehicle, such as a car. In particular, the mobile telecommunications device is loaded with an application – a 'mobile app' – which is arranged to record and document the events surrounding an incident involving the vehicle (a 'driving incident'), such as a vehicle collision. The mobile application may be referred to as the 'Witness' application in the ensuing description.

[00081] Figure 1 illustrates a system 1 within which a vehicle, such as an automobile 3 configured with a mobile telecommunications device executing the Witness application, may communicate with one or more remotely located devices or systems. Such devices may relate to one or more servers, such as an insurance server 5, an emergency services server 7, a content provider server 9, and a personal computer 11. Communication between the automobile 3 and the one or more remotely located devices 5, 7, 9, 11 may be effected via a shared communication network 13. The shared communication network may relate to a wide area network (WAN) such as the Internet, and may also comprise telecommunications networks. For example, the mobile telecommunications device of the present embodiments may be arranged to communicate with any one of the remotely located devices 5, 7, 9, 11 via a mobile telecommunications base station 15, which is coupled to the shared mobile telecommunications network 13.

[00082] A main purpose of the mobile telecommunications device, when arranged within a vehicle in motion, such as the illustrated automobile 3, is to monitor and process sensor data captured by the mobile device, to derive driving information associated with the moving automobile 3. As mentioned previously, this driving information is subsequently used by the mobile device to determine if a driving incident or event has occurred. The term "driving incident" as used within the present context may relate to an event such as a collision, a near-miss, dangerous driving, erratic driving or similar. Similarly, the driving information may be used as a means for monitoring a driver's driving performance, and determining a driving characteristic, or user profile for the subject driver. In other words, the sensor data and/or the driving information may be used to determine for example, if the driver is a cautious driver, or a reckless driver. This information may be used, for example by an insurance provider, to conduct a risk assessment and to tailor an insurance premium to the subject driver on the basis of a determined driving characteristic. Further details of this alternative embodiment are described below.

[00083] The mobile telecommunication device's functionality is provided by the Witness application, which is installed in the device's local non-volatile storage, and which is executed by the device's native processor. The application may be downloaded to the mobile device via the shared communications network 13 and telephone base station 15, from the content provider server 9.

[00084] In use (once the application has been configured for execution on the mobile telecommunications device), when a driving incident has been detected by the mobile telecommunications device, data, comprising one or more of mobile device sensor data, derived

driving information, and captured image data may be automatically forwarded to one or more of the remotely located devices 5, 7, 9, 11. For example, the mobile device may be configured such that when a driving incident is detected, such as a collision involving an automobile 3, driving information (including image data captured by the mobile device) derived from the sensor data is automatically forwarded to the insurance server 5, via the base station 15 and shared communications network 13. In this way, data relating to the driving incident (a collision in this example), is automatically forwarded to the automobile user's insurance provider, for use in claim settlement, and/or to determine culpability.

[00085] Similarly, once a driving incident has been detected, data may also be automatically forwarded to the emergency services server 7. For example, such data may comprise the position information of the automobile 3, along with an automated S.O.S. message requesting assistance from the emergency services. Forwarded data may also comprise sensor data, and any relevant derived driving information, such as speed of impact, the g-forces the vehicle was subjected to during the collision, or any other information wherefrom the severity of the collision may be determined, and which may be used to assist the emergency services in coordinating the appropriate level of response.

[00086] Optionally, an electronic message may be sent to a personal contact preselected by the user. For example, an automated message, such as an e-mail, may be forwarded to the PC 11 of the user nominated personal contact, informing the personal contact that the user of the vehicle 3 has been involved in a driving incident. Similarly, and due to the mobile device's telecommunications functionality, an electronic text message, such as an SMS (Short Message Service) may be forwarded to the telephone of the user selected personal contact, informing the contact of the driving incident. The mobile device may be equally be arranged to communicate with a personal contact via any known electronic messaging service and/or instant messaging service too. For example, via Apple's® iMessage, or RIM's® BlackBerry Messenger (BBM) service.

[00087] This functionality of forwarding a message to a nominated contact, may also be of particular benefit for managing large fleets of vehicles. For example, a car hire service. In this way, if any of the vehicles comprised in the fleet are involved in a driving incident, the car hire service may be automatically notified of the identity of the specific vehicle involved in the driving incident. In such embodiments, the nominated personal contact would be preselected by the vehicle fleet manager. The option of providing a second user selected personal contact is also envisaged. In this way, a message may be forwarded to both the car hire service for example, and to the driver's selected personal contact.

[00088] In preferred embodiments the mobile telecommunications device relates to a mobile telephone having native processing functionality, and preferably relates to a smartphone. Preferably, the mobile telephone comprises a camera arranged to enable image capture, and preferably arranged to enable a sequence of images to be captured taken in temporal succession. In other words, in preferred embodiments the mobile telephone comprises a camera configured to enable video footage of a sequence of events to be captured.

[00089] Alternatively, the mobile telecommunications device may relate to a PDA, a notepad such as an iPad®, or any other mobile device comprising local processing means and means for communicating with a telecommunications network.

[00090] Figure 2 provides a more detailed view of the automobile 3 of Figure 1, and illustrates a preferred arrangement of the mobile telecommunications device 17 within the automobile 3. In the illustrated embodiment, the mobile telecommunications device 17 relates to a smartphone configured with an image capture device, such as a camera. Preferably, the device 17 is arranged within the vehicle, such that the camera has a clear line of sight of the road in the principle direction of travel of the automobile 3. For example, the device 17 may be attached to the windshield 19 of the automobile 3 in an adapter 21. The adapter 21 may comprise a flexible telescopic arm, configured with a suction cup at one end for affixing the adapter to the windshield 19, and a dock arranged at the opposite end for securely holding the telecommunications device 17 in place. The telescopic arm enables the position of the device 17 to be varied, such that a clear line of sight in the direction of travel may be obtained.

[00091] The details of the adapter 21 are irrelevant for present purposes, with the exception that it must enable a clear line of sight in the principle direction of travel of the vehicle to be obtained, and it must firmly affix the mobile to the vehicle. Affixing the mobile telecommunications device 17 to the automobile 3, ensures that the mobile device 17 is able to accurately capture the automobile's state of motion. By principle direction of travel is intended the main direction of travel of the vehicle when operated in a conventional way, indicated by the arrow **A** in Figure 2. In other words, the forward direction of travel. The skilled reader will appreciate that whilst most vehicles, such as an automobile, may have more than one direction of travel (e.g. travelling backwards when in reverse gear), the majority of vehicles have a primary direction of travel, which is the intended direction of travel for any transit of substantial length and/or distance. Arranging the telecommunications device 17 relative to the direction of principal travel, ensures that the camera (not shown) of the telecommunications device 17 is well placed to capture any image data which may be pertinent to a subsequently detected driving incident, such as a collision.

[00092] Figure 3 is a schematic of the modular components of the mobile telecommunications device 17 of Figure 2. Preferably the mobile telecommunications device 17 comprises: an image capture module 21, an accelerometer 23, a GPS receiver 25, an audio capture module 27, a communications module 29, a processor module 31 and a storage module 33. The image capture module 21, accelerometer 23, GPS receiver 25, and audio capture module 27 form a sensor set and are generically referred to as data capture modules in the ensuing description, and are differentiated from the communications module 29, processor module 31 and storage module 33, in that they comprise sensors for sampling physical data.

[00093] This sampled physical data, which is also referred to as sensor data, is subsequently processed by the processor module 31 and stored in the storage module 33.

[00094] The image capture module 21 may relate to any image capture device, such as an integrated camera commonly found in smartphones or similar mobile devices. As mentioned

previously, the image capture module 21 is preferably configured to capture a plurality of images taken in temporal succession, such as provided by a video camera.

[00095] The accelerometer 23 is arranged to provide information regarding the motion of the automobile 3 along all three dimensional axes. For example, the accelerometer 23 provides information regarding the pitch, yaw and roll of the automobile 3. Sensor data captured from the accelerometer 23 may be used to determine the g-forces the automobile has been subjected to. This is particularly useful in determining the severity of a collision. In general, the greater the g-forces experienced in a collision, the greater the risk of serious injury to the passengers of the vehicle. This information may assist the emergency services in forming an initial assessment of the severity of a collision. Furthermore, this type of data may also assist the emergency services and/or insurance provider to obtain a better understanding of the driving incident. For example, in the event of a collision, this data may assist the emergency services and/or insurance provider to obtain a better understanding of how the collision occurred. This information may subsequently be used for dispute resolution, and/or for determining culpability.

[00096] The GPS receiver 25 is arranged to provide location information, such as positional coordinates, and can also provide velocity information. When combined with the accelerometer sensor data, the GPS receiver data can be used to provide a very accurate model of a driving incident, such as a collision. In particular, the GPS sensor data provides velocity data, such as the velocity of impact. The velocity data enables one to determine if a vehicle was being driven at speeds greater than the legally permitted maximum speeds.

[00097] The audio capture module 27 provides means, such as a microphone, for recording audio data, which might be generated by a driving incident. This includes any sounds generated externally to the vehicle, for example the sound of an impact, or the sound of the crumple zone being crushed. Additionally, sounds generated internally to the vehicle are also recorded. Such audio data may also help to recreate a driving incident, and understanding the causes of the incident.

[00098] The communication module 29 provides the mobile telecommunications device 17 with functionality for communicating with the remotely located devices 5, 7, 9, 11 of Figure 1. The communication module 29 comprises a wireless telecommunications sub-module 31 enabling communication over a telecommunications network. An optional wi-fi communication sub-module is also envisaged. Similarly, the presence of wired communication modules are also envisaged, such as a USB port and/or an IEEE 1394 interface (more commonly known as FireWire™) to support wired communication with a remote device, such as a personal computer or similar. Such a connection may be useful for the purposes of side-loading the application to the mobile device.

[00099] As mentioned previously, sensor data captured from any one of the aforementioned data capture modules 21, 23, 25, 27 is processed by the processor module 33, to generate driving information. By driving information is intended any data which may be derived from raw sensor data captured by any one of the aforementioned modules 21, 23, 25, 27. For example, g-force data is driving information which is derived from the sensor data sampled by the accelerometer 23. The skilled reader will be familiar with the plurality of types of driving

information that may be derived from sensor data sampled by the aforementioned modules, and accordingly a complete list of the different types of driving information that may be derived from sampled sensor data is omitted for brevity.

[000100] The processor module 33 is also configured to analyse sampled sensor data and generated driving information to determine if a driving incident has occurred (described in more detail below).

[000101] Sampled sensor data is stored in storage 34, which is operatively coupled to the processor module 33, along with any generated driving information. The storage 34 is preferably configured with a FIFO (First In First Out) storage buffer 34a, and a permanent storage component 34b. In preferred embodiments, the data capture modules are configured to sample data at periodic intervals. Preferably, these intervals are sufficiently small, of the order of milliseconds, such that for practical purposes the data capture modules may be considered to sample data continuously. The sampled data, along with any derived driving information is preferably stored in the storage buffer 34a, unless a driving incident has been identified, in which case the associated sensor data and driving information is stored in the permanent storage component 34b to avoid undesirable overwriting.

[000102] In preferred embodiments, the FIFO storage buffer 34a is provided with a finite amount of storage space. Nonetheless, said storage space may be predefined by the user as will be described below. In any case, once this storage space has been exhausted, the oldest recorded data is overwritten by newly sampled data, and this cycle of overwriting older data with newly sampled data is continuously carried out during operation of the telecommunications device 17, unless a driving incident has been detected, in which case, and as mentioned previously, all data related to the driving incident is stored in a long term protected storage 34b to safeguard it from being overwritten by newer data.

[000103] In preferred embodiments, the mobile telecommunications device 17 may be configured with a data recording strategy by the user. This might define the frequency with which sensor data is sampled. In other words, how many measurements are made per unit of time. Furthermore, the recording strategy also defines how data is recorded. In preferred embodiments, sampled sensor data is stored in data files in the buffer 34a. Each data file represents a plurality of sequentially sampled sensor data, captured over a defined period of time, which will be referred to as a 'data file period'. This is best illustrated by considering captured image data, such as video footage. A video period may be defined, which period defines the unit of physical time covered by captured video footage comprised in a single video data file – this is the data file period for image data. The video data file is subsequently stored in the buffer 34a. For example, a five minute video period setting, instructs the processor 33 to store all sequentially captured image data captured by the image capture module 21 over a period of five minutes, in a separate video data file. It is to be understood that whilst the image capture module 21 is continuously sampling image data (in other words, it is continuously capturing image data), this plurality of captured image data is grouped together for storage in video data files, each data file representing a five minute data file period.

[000104] Sampled sensor data and derived driving information is also continuously analysed by the processor module 33 for the purposes of detecting a driving incident. As soon as a driving incident is identified, the associated sensor data and derived driving information is stored in a data file in accordance with the data recording strategy. Returning to the example described in the preceding paragraph, this entails combining the video footage captured within a temporal window of five minutes leading up to the detected driving incident, in a single video file, and storing this data file in protected storage 34b. Whilst each different type of sensor data may be recorded in separate data files, in preferred embodiments all the different types of sensor data sampled by the mobile telecommunications device 17 are stored together in a single data file in accordance with the user selected data recording strategy. This means that the five minute data file referred to above, preferably also comprises GPS data, accelerometer data, and audio data sampled over the five minute time period.

[000105] Data files are stored in the buffer 34a, unless they are associated with a driving incident, in which case they are then stored in protected storage 34b, which cannot be overwritten. Once the storage space comprised in the buffer 34a has been exhausted, the oldest data file is overwritten by a newer data file.

[000106] Data compression methods may also be used in conjunction with the present invention/disclosure to improve the use of storage. For example, data comprised in data files which have not been associated with a driving incident may be compressed using compression techniques, which techniques will be known to the skilled reader. Similarly, within a data file associated with a driving incident, sensor data captured at time coordinates which are distant from the determined driving incident may be compressed. In this way, the resolution of sensor data which is directly pertinent to a driving incident is maintained, whilst sensor data which may be less relevant to the driving incident is maintained at a lower resolution.

[000107] Since the sensors of the mobile telecommunications device 17 are continuously recording sensor data, even when a driving incident is detected, the device 17 may be configured to comprise sensor data and/or driving information recorded/derived shortly after the driving incident in the same data file, since this data may also be relevant for understanding a driving incident. Furthermore, this also enables the mobile telecommunications device to record multiple driving incidents. For example, a multiple collision.

[000108] The processor module 33 may be configured with encryption means, enabling stored data files to be encrypted to prevent data tampering. Envisaged encryption means may comprise both software solutions and hardware solutions. For example the processor module may comprise a cryptoprocessor, or the processor may be configured with code to carry out a cryptographic process.

[000109] Figure 4a is a flow chart outlining the method carried out by the mobile telecommunications device 17, to determine if a driving incident has occurred, in accordance with a preferred embodiment. An application is downloaded from the content provider server 9 of Figure 1, onto the mobile telecommunications device 17, at step 36, as previously described. This may be done over a telecommunications network. The application provides the mobile

telecommunications device 17 with the previously described functionality, when executed on the device. The mobile telecommunications device is configured within the vehicle, at step 38. This may comprise affixing the mobile telecommunications device 17 to the vehicle via an adapter, as described previously.

[000110] The recording strategy is specified at step 40. As mentioned previously, this comprises setting the period of time that each recorded data file represents. Furthermore, it may also comprise defining the size of the buffer 34a and/or the number of data files that are to be stored within the buffer. Preferably, the recording strategy is specified only once, upon first use of the mobile telecommunications device 17. Where the recording strategy has already been defined, method step 40 is skipped, and the method continues with step 42.

[000111] The start of a driving period is registered, at step 42. The start of the driving period determines when the recording of sampled sensor data begins. The start of a driving period may be manually entered by the user via the application's graphical user interface (GUI). Alternatively, the start of the driving period may be automated. For example, the mobile device 17 may be configured to initiate the driving period once sensor data above a minimum threshold value is recorded, indicative of the vehicle being in motion. For example, once a velocity greater than 20 kilometres per hour is detected.

[000112] Alternatively, the start of the driving period may be initiated once the application determines that the mobile telecommunications device 17 has been affixed to the vehicle. For example, the adapter 21 may comprise a registration module (not shown) arranged to register the installation and fixation of the mobile device to the vehicle and/or adapter. The registration module may comprise an NFC device. When the mobile device is brought into close proximity with the registration module, a driving period is initiated.

[000113] Once the driving period has been initiated, sensor data is sampled and recorded in storage 34, at step 44. Additionally, the sampled sensor data is used to generate driving information by the processor module 33. The sampled sensor data and the driving information is continuously analysed by the processor module 33, at step 46.

[000114] The processor module 33 determines if a driving incident has been detected, at step 48. This is determined on the basis of the analysis carried out at step 46. If a driving incident has been detected, all the sensor data and driving information associated with the data file period, is stored in a data file in protected storage 34b, at step 50.

[000115] There are several ways in which a driving incident may be detected. Preferably, this is an automated process, wherein the processor module 33 determines a driving incident has occurred on the basis of an observed marked variation in sensor data and/or driving information. The term 'marked variation' is to be understood to relate to a significant change in sensor data and/or driving information occurring over a very short time period. In other words, a detected impulse in recorded sensor data and/or driving information, indicative of a significant change in the state of motion of the vehicle occurring over a short time period. For example, a sudden increase in the g-forces the vehicle is subjected to, may be indicative of a collision and if

observed, result in a driving incident being determined to have occurred by the processor module 33.

[000116] Predefined threshold values may also be used to automate the detection of a driving incident. For example, each data type and/or derived driving information (e.g. acceleration, velocity, g-force, pitch, roll, yaw etc.) may be associated with a threshold value. When any one of these threshold values is exceeded, the processor module 33 may be configured to determine that a driving incident has occurred. Similarly, the automated detection of a driving incident may require that a threshold condition associated with a combination of predefined threshold values, each threshold value being associated with a different data type and/or type of driving information, must be exceeded, in order for the processor module 33 to automatically determine that a driving incident has occurred. For example, in the event of a collision, it is reasonable to expect to observe a marked variation in g-force, accompanied by a marked variation in velocity. Accordingly, the threshold condition may require that in order for a collision to be automatically detected, both a marked variation in g-force and a marked variation in speed, in excess of predefined threshold values must be observed.

[000117] Similarly, the occurrence of a driving incident may also be recorded manually by the user via the application GUI. This may be beneficial for the purposes of documenting data associated with a low velocity collision - colloquially referred to as a 'fender-bender' - which may not result in any marked variations in sampled sensor data, and therefore may not be automatically detected.

[000118] Once a driving incident, such as a collision, has been detected, and the data file comprising the associated sensor data and driving information has been securely stored in protected storage 34b, the data file is transmitted to the insurance server 5 of Figure 1, at step 52. The data file informs the insurance provider that a driving incident has occurred and provides the insurance provider with the sensor data and derived driving information. This data assists the insurance provider in better understanding the collision, in addition to assisting with determining culpability, where more than one vehicle are involved.

[000119] Similarly, once a driving incident has been detected, an S.O.S. message may be automatically forwarded from the mobile telecommunications device 17 to the emergency services server 7, at step 54. The S.O.S. message may also comprise sensor data and derived driving information, which may assist the emergency services in coordinating their response.

[000120] As mentioned previously, the mobile telecommunications device 17 will continue to sample and record sensor data even once a driving incident has been detected, unless the mobile telecommunications device 17 detects that the driving period has terminated, at step 56. If the driving period has terminated, the present method is terminated and the device stops recording sensor data. The end of a driving period may be automatically detected by the processor module 33, if certain conditions are met. For example, if the measured velocity of the vehicle remains zero for a predetermined period of time, the processor module 33 may infer that the vehicle is stationary and no longer being driven, and accordingly ceases recording sensor data, and the method is terminated. If instead the processor determines that the driving period

has not yet terminated, a new data file period is initiated, at step 58, and steps 44 through 62 are repeated.

[000121] Where a driving incident is not detected at step 48, the processor module 33 will determine if the data file period has expired, at step 60. If the data file period has expired, then the sensor data and the derived driving information generated during the data file period is combined and stored in a single data file, for storage in the buffer 34b, at step 62. The processor 3 then determines, at step 56, if the driving period has terminated. If the driving period has not terminated, a new data file period is initiated, at step 58. The mobile telecommunications device 17 continues to sample sensor data, to derive driving information, and steps 44 through 62 are repeated, until the driving period is determined to have terminated.

[000122] Figure 4b provides more detail regarding how a driving incident may be automatically detected (i.e. steps 46 and 48 of Figure 4a) in a preferred embodiment, where the mobile telecommunications device 17 is configured to sample audio data, accelerometer data, and GPS data only. Each one of these types of data is analysed in turn, at steps 64, 66 and 68. The analysis may comprise comparing measured sensor data and/or derived driving information with a data model. The model may comprise defined threshold values for different data types. Sampled sensor data and/or driving information may be compared with the data model to determine if a driving incident has occurred.

[000123] For example, the analysis of sampled audio data, at step 64, may comprise comparing the recorded audio data with predetermined audio data models representing specific sounds. Such sounds may relate to the sound of tyre squeals, the sound of deforming metal, the sound of breaking glass, passenger screaming and/or shouting, the sound of airbag deployment, and any other sound which may be associated with a driving incident. Effectively, this may be considered audio fingerprinting, which serves to identify specific sounds associated with a driving incident by carrying out a signal profile analyses of the audio signal captured by the audio capture module 27. To achieve this, the storage device 34 may comprise a database of prestored audio sound files. The audio sound files represent sounds associated with a driving incident. The captured audio signal is compared with the sound files comprised in the database, to identify matches between the captured audio signal and the database of sound files. This facilitates the audio fingerprinting of specific sounds, indicative of a driving incident, present within the captured audio data signal captured by the audio capture module 27.

[000124] Similarly, the analysis of sampled accelerometer data, at step 66, may comprise comparing the sampled data with predetermined accelerometer data models. The data models represent specific states of motion of the vehicle. For example, this might comprise defining threshold values for yaw, pitch and roll, which if exceeded, indicate a state of motion of the vehicle indicative of a driving incident. For example, a measured yaw value above a predetermined threshold value may be indicative of the vehicle having lost traction and is fishtailing and/or skidding. Similarly, a roll and/or pitch value above a predetermined threshold value may be indicative of the vehicle having overturned.

[000125] Accelerometer sensor data is also used for deriving driving information such as g-forces. Analysis of g-force data is also used to determine if a driving incident has occurred. For example, approximate g-force values for detecting certain driving incidents are as follows:

- Harsh braking – a deceleration of greater than 2.5 m/s^2 or forward G-force of greater than 0.7G for more than 400msec.
- Harsh acceleration – from stationary, an acceleration greater than 2.5 m/s^2 or backward G-force of greater than 0.7G for more than 800msec.
- Harsh swerving - lateral G-forces greater than 0.7G for more than 400msec.

[000126] The data models are preferably preconfigured and are comprised within the application executed on the mobile telecommunications device. Different data models are used depending on the type of vehicle the telecommunications device is being used with. Different vehicle types will experience different states of motion during regular operation, which must be considered in determining if a driving incident has occurred. For example, a motorcycle will display more roll and/or pitch than an automobile during regular operation. Accordingly, different data models and/or threshold values must be used to automate the identification of a driving incident for different vehicle types. The specific data models used may be selected during an initial configuration of the mobile telecommunications device, by indicating the type of vehicle the device is being used with.

[000127] On the basis of the audio data analysis and the accelerometer data analysis, the mobile telecommunications device determines, at step 72, if a driving incident has occurred. If it is determined that a driving incident has occurred, then the telecommunications device proceeds with step 50 of Figure 4a. If instead a driving incident is not detected, the telecommunications device proceeds with step 60 of Figure 4a.

[000128] The GPS data analysis, at step 68, comprises analysing positional data and velocity data for any anomalous readings. For example, a sudden deceleration followed by a zero-velocity reading lasting a predetermined period of time, may be indicative of a collision. If such a zero-velocity reading is observed at step 70, in conjunction with anomalous audio and/or accelerometer sensor at step 72, then a driving incident is determined and the mobile telecommunications device proceeds with step 50 of Figure 4a. This is a further example of a threshold condition, discussed previously.

[000129] The previously described mobile telecommunications device and method may also be used to monitor and generate a driver profile. The driver profile may be indicative of the type of driver a user is. For example, this may comprise determining if a user is a calm and patient driver, or an aggressive driver. Also, this may comprise determining whether a user regularly flouts speed limits, and/or ignores safety distances. This type of information may be used by an insurance provider to conduct a personalised risk assessment for individual users. Insurance premium rates may then be tailored to the specific user on the basis of the personalised risk assessment.

[000130] For example, analysis of captured image data, such as video footage, may be used to determine if a user regularly flouts safety distances. In preferred embodiments, the mobile

telecommunications device is arranged within the subject vehicle to have a clear line of sight of the road in the direction of principle motion. Accordingly, the number plate of any vehicle preceding the subject vehicle will be captured by the image capture module. Since the physical dimensions of number plates are standardised and known in each country, they may be used as a metric to scale the captured image. When combined with the known optical characteristics of the image capture module, this enables the distance of the image capture module from the image object (i.e. the preceding vehicle) to be determined at the time of image capture. This information may then be used to see if a user adheres to recommended safety distances. A user that is observed to regularly flout recommended safety distances, may be considered to represent a greater risk, and accordingly may be required to pay a greater insurance premium than a user who regularly respects recommended safety distances.

[000131] Image analysis can also be used to determine driving conditions and the driving environments. For example, image processing can detect road signs, such as stop signs or traffic lights. Furthermore, driving conditions, as affected by the weather can be determined. For example, if the windscreen wipers are detected to be in motion, it can be inferred to be raining. Once the driving conditions are so determined, an assessment of the driving performance of a user can be made by determining whether the user reacts or behaves appropriately to the driving conditions. For example, if the driver is seen to be jumping red lights, or driving dangerously in rain or snow, then a higher risk profile may be assigned to that driver.

[000132] Similarly, accelerometer and g-force data may be used to determine if a user has an erratic driving style. For example, a user that generates sharp variations in g-force data and accelerometer data during regular operation of a vehicle, may be considered to drive erratically, and therefore at greater risk of being involved in an accident, and insurance premium rates for the user may be tailored accordingly.

[000133] The mobile telecommunications device may also be configured to interface and communicate directly with a vehicles native telemetry systems. For example, the majority of modern cars have inbuilt electronic control systems or engine management systems, arranged to collect data regarding vehicle system performance. This data may be communicated to the mobile telecommunications device either via a wired physical connection, such as USB (Universal Serial Bus), or via a wireless communication protocol such as Bluetooth®. This data may subsequently be used by the mobile telecommunications device to complement sensor data captured directly by the telecommunications device. In this way a more accurate model of a driving incident, and/or of a user profile may be generated. For example, native vehicle telemetric systems may comprise electronic tyre pressure sensors, and are able to detect if a tyre is under and/or over-inflated. This information may be communicated to the mobile telecommunications device and may help to explain the causes for a driving incident, such as a sudden loss of traction resulting from a burst tyre.

[000134] Further features of the Witness application, are set out below.

[000135] Benchmarking

[000136] It will be appreciated that different sensor types, phones, mounting positions, vehicles, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

- During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.
    - Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of driving incident.
- There is preferably an option to notify the Witness application of a change in parameters (e.g. different driver, driving off-road etc). Thus a number of 'profiles' may be set up. Each profile may require an independent training mode period.
- If the Witness application incorrectly detects that a driving incident has occurred, it can receive feedback from the user to modify its sensitivities. E.g. a more aggressive driver is actually driving.

[000137] Crash/Collision Management

- On detection of a crash (or other driving incident) the Witness application is arranged to take one or more of the following actions:
    - Announce that it has detected an accident (audio/screen prompt)
    - Call the emergency services (with option to cancel) – e.g: Audio/screen prompt: 'Witness has detected that you have been involved in a (serious) accident and will call the emergency services. If this is not the case, please cancel within 10 seconds.'
    - Provide reassurance
    - Provide the user with a checklist of things to do:
        - Take photographs of vehicles involved in the incident (inc number plates)
        - Take down name, address, insurance details etc of 3rd parties involved in incident
    - Communicate to the insurance company that an incident has been detected (e.g. low bandwidth data or text message)
    - Protect the high quality recorded data so it is not overwritten
    - If appropriate – or in response to a request from a communication to the phone from the insurance company – transmit all or selected portions of the recorded data associated with the incident.
        - N.B. Use of the communication channels is controlled by the Witness application to prioritise essential communications such as calls to the emergency services.
    - Note that data transmission from the mobile telephone to the insurance company may be automatic (for example, triggered by a detected incident) or manual (for example, in response to a request from the insurance

company). In the latter case, the Witness application may include functionality to allow the insurance company to browse through the data files available on the mobile telephone so as to select one or more for transmission to the insurance company.

[000138] Data processing for generating a user profile

Further features of the user profile generation embodiment are summarised:

- If the Witness application incorrectly detects an event or incident of significance, and receives feedback that the vehicle was not involved in an accident (but was in a near miss) – this could alter the risk profile of the driver. For example – if this happens frequently, but no accident occurs over a given period, this could be an indicator that the driver is good at reacting to potential hazards.
- Erratic driving (e.g. jerky steering or braking detected by G-force sensor).
- Driving faster than the speed limit allocated to a given road (detected by GPS).

[000139] Further details regarding the features and functionality of the Witness application, in particular the graphical user interface of the Witness application, are now described.

[000140] Referring to Figure 5, a first page 80 of the Witness application user manual is shown in which an image of the Main Menu (the top-level menu) 82 is displayed. The Main Menu is displayed when a user first runs the application on a smart-phone, such as the iPhone® 4. The main menu includes the following user-selectable buttons:

- **Recording Screen** 84
- **File Management** 86
- **Settings** 88
- **Accident Management** 90
- **Information** 92 (displays up a manual, as shown in Figures 5 to 14).

[000141] Selecting the Recording Screen button 84 opens the Recording Screen 94 – the second image shown in Figure 5. The Recording Screen 94 contains a video feed 96 from the camera of the smart-phone, which occupies the majority of the visible screen area. Overlaid on to the video feed is the detected speed of the vehicle 98 (e.g. 0 mph), heading 100 (e.g. south by south-west) and the elapsed recorded time 102 (e.g. 00:00). Displayed in a left column of the Recording Screen are additional user selectable buttons:

- **Keep current video** 104 (pressing this button will automatically copy the current video - and the previous video segment - to the protected storage 34b, and prevents that information from being overwritten. The user is advised to press this button in the event of a driving incident that needs to be recorded).
- **Take photo** 106 (captures a still photograph).
- **Exit Recorder** 108 (returns to main screen).
- **Start / Stop Recording** 110 (starts recording video footage - and other data).

[000142] Referring to Figure 6, a second page 112 of the Witness application user manual is shown, in which an image of the Recording Screen 114 is shown and described operating in a map-displaying mode rather than a video-feed mode.

[000143] During recording, (i.e. when the 'Start / Stop Recording' button 110 is pressed) the Exit Recorder button in the Recording Screen is substituted with a Map Display button 116. Pressing it will toggle between the modes showing the video feed and a map of the current location.

[000144] Referring to Figure 7, a third page 118 of the Witness application user manual is shown, in which the File Management Screen 120 is shown and described. The File Management Screen 120 can be accessed by pressing the File Management Button 86 in the Main Menu.

[000145] The File Management Screen 120 displays video and associated data (e.g. telemetry data) that has been previously recorded. The stored data is contained in either a protected area of storage or in a "Recording Stack". Data files in the protected area are saved and so not overwritten as part of a Recording Strategy. In contrast, data files in the Recording Stack may be overwritten as part of the Recording Strategy.

[000146] As illustrated in Figure 7, the bottom section of the list represents the "Kept" data files 122, whereas the top section of the list represents the "Recording Stack" 124. "Kept" data files 122 can be edited and deleted from the File Management Screen 120, whereas "Recording Stack" data files cannot. Editing "Kept" data files can involve renaming them.

[000147] The recorded data files are listed on screen along with the time and date of the recording and the electronic size of the data file. Accordingly, the user is provided with feedback about how big the data files are, and so if the smart-phone is low in storage, the user can elect to delete certain "Kept" data files. "Recording Stack" data files will be automatically overridden by the Recording Strategy.

[000148] The controls on the toolbar at the bottom of the recordings screen allow a user to change the selection mode of the video stack and includes:

- **Video** 126 (when highlighted, if a data file is selected, a video recording playback screen will be displayed).
- **Map** 128 (when highlighted, if a data file is selected, then a map will be displayed showing the area over which the recording was made).
- **Export** 130 (when highlighted, a selected data file will be passed to an Export Screen where export options will be provided).
- **Keep** 132 (when highlighted, if a "Recording Stack" data file is selected, then a user will be prompted to name it, and then it will be stored as a "Kept" data file).

[000149] The icons in the File Management Screen change in dependence on the selected mode. For example, Figure 20 shows the icons 134 displayed when the Video selection mode is highlighted; Figure 21 shows the icons 136 displayed when the Map selection mode is highlighted; Figure 22 shows the icons 138 displayed when the Export selection mode is highlighted and Figure 23 shows the icons 140 displayed when the Keep selection mode is

highlighted. Advantageously, this provides improved feedback to a user about what selection mode is highlighted and so what action is likely from the selection of a data file.

[000150] Referring to Figure 8, a fourth page 142 of the Witness application user manual is shown, in which an image of a Recording Playback screen 144 is shown and described. The Recording Playback screen is invoked by highlighting the Video Mode 126 in the File Management Screen 120 and selecting an appropriate data file.

[000151] In the Recording Playback screen 144 it is possible to play back a pre-recorded video feed associated with a chosen data file. As well as playing back the recorded video feed, the Recording Playback screen also displays other associated data such as telemetry data 146. For example, date, time, speed, forward/backward G-forces, latitude, longitude and heading information is overlaid onto the video feed. As the video is played back, these values will typically change depending on the behaviour of the vehicle, as recorded by the mobile device.

[000152] Forward and backward G-forces are those that correspond to the forward and backward movement of the vehicle and are the primary metric for determining an event such as a crash. However, other G-forces (e.g. up/down and side-to-side) may also be measured by the device – even if they are not necessarily displayed on the mobile screen.

[000153] As recited in Figure 8, the Recording Playback screen provides further user controls in the form of:

- **Playback Position Scrub Bar** 148 (horizontal bar at bottom of screen)
- **Playback Speed Bar** 150 (vertical bar at left side of screen)
- **Pause** 152 (pauses playback)
- **Eject** 154 (return to previous screen)
- **Loop** 156 (plays the data file continuously)

[000154] The Playback Position Scrub Bar 148 allows a user to jump to different positions within the recording without necessarily needing to watch all of the recorded footage. Advantageously, this allows a user to more quickly locate a desired item of footage within a given data file. Also, the Playback Speed Bar 150 can be used to speed up or slow down the playback of the data file. This allows a desired item of footage to be found more quickly through sped-up playback, and also allows an item of footage to be more carefully analysed through slowed-down playback. Furthermore, it is possible to zoom in and out of a region of the video file using a 'pinch and zoom' movement as is standard with most multi-touch touch-screen devices.

[000155] Referring to Figure 9, a fifth page 158 of the Witness application user manual is shown, in which a different type of Recording Playback screen 160 is shown and described. Specifically, the image represents playback of a pre-recorded data file as can be invoked by highlighting the Map Mode 128 in the File Management Screen 120 and selecting an appropriate data file.

[000156] In contrast with the Video Mode playback, this Map Mode playback shows a map of the area 162 where the recording took place. A blue breadcrumb trail 164 is overlaid on to the map showing the extent of movement of the vehicle during the recorded period. A scrub slider 166

is shown, which is user-operable to adjust the time within the recorded period. As the slider is adjusted, a pin 168 moves along the blue breadcrumb 164 to show the position of the vehicle at the time as specified by the slider 166. Tapping the pin 168 displays associated telemetry data 170 at that position and time.

[000157] Referring to Figure 10, a sixth page 172 of the Witness application user manual is shown, in which an image of a Video Export Screen 174 is described. The Video Export Screen 174 may be invoked by highlighting the Export button 130 in the File Management Screen 120 and selecting an appropriate data file.

[000158] The Video Export Screen 174 allows the quality of the video associated with the selected data file to be adjusted, before that video is exported. Advantageously, this can allow the user to control the size of the data to be exported. Telemetry data (i.e. sensor data) is also exported, embedded within the video file. Video data can be exported with or without sound, depending on the permissions of the user. Export typically involves copying data files from the mobile device to a local computer (e.g. via a data cable) or a remote server (e.g. via a wireless connection).

[000159] Referring to Figure 11, a seventh page 176 of the Witness application user manual is shown, in which an image of the Settings Screen 178 is displayed and described. The Settings Screen 178 allows the operation of the Recording Strategy to be controlled. Specifically, the Settings Screen allows a user to select the number of video segments that the application should store, and the size of those segments (i.e. a data file period). Accordingly, the user is able to set a limit to the storage usage of the Recording Stack (i.e. the size of the buffer 34a) part of the program. The user can also control the storage usage of the Recording Stack through the use of the video quality buttons.

[000160] Note that the Witness application may be arranged to calculate the remaining memory available on the smart-phone and suggest the appropriate settings automatically.

[000161] The Recording Strategy involves maintaining a user-controlled number of video segments. When a new video recording is initialised – instantiating a new segment – this is written over the oldest video segment. Thus only the most recently recorded videos are maintained in the Recording Stack.

[000162] Another setting that can be controlled in the Settings Screen 178 is the G-force threshold at which the Witness application will assume that a crash has taken place. It is expected that different vehicles and driving styles will need different G-force thresholds to be set to ensure a reasonable sensitivity to crash forces whilst also prevent crash detection false positives. It should be noted that although the manual recites "*Raise the sensitivity if you find that crash detection is triggered during normal driving…*" it is the sensitivity *threshold* that is to be raised, and not the sensitivity itself. A slider 180 allows the sensitivity threshold to be set via the touch-sensitive screen.

[000163] The Settings Screen 178 also has a button 182 to allow a user to define more settings via a More Settings Screen.

[000164] Referring to Figure 12, an eighth page 184 of the Witness application user manual is shown, in which an image of the More Settings Screen 186 is displayed and described. Here, it is possible for the user to select speed units 188 and also select whether the map should be displayed during recording 190, and at which speed it should be displayed in favour of the video feed. This is a safety feature of the Witness application that hides the video feed during recording when the vehicle is detected as travelling above a predetermined speed. The video feed is replaced by a map of the location of the vehicle – as is typical with in-vehicle GPS devices. Note that although the on-screen video feed is replaced with a map, video recording continues in the background.

[000165] In alternatives, the application may be arranged to detect the vehicle speed, and at a particular speed, switch off the screen entirely. It should be understood that the device will continue to record video, telemetry and other information even when the screen is switched off. Entirely switching off the screen of the device is advantageous as it significantly reduces the drain on the battery of the mobile device.

[000166] Note that the Witness application is also arranged to interface with the phone to detect low-light conditions and in response change the brightness of the screen to prevent the user/driver being dazzled. This can also save battery life.

[000167] The More Settings Screen 186 also includes a Personal Details button 192 which, when pressed invokes a Personal Details Screen.

[000168] Referring to Figure 13, a ninth page 194 of the Witness application user manual is shown, in which an image of the Personal Details Screen 196 is displayed and described.

[000169] Here, the name 198, vehicle registration number 200, mobile number 202 and email address 204 to be used in an emergency, can be specified by the user. In the event of a detected incident, these details, along with information regarding the detected incident (e.g. time of incident, location and optionally telemetry data) will be emailed to the specified email address automatically. This can ensure that the chosen recipient of that email will be informed immediately about the occurrence and nature of the detected incident.

[000170] This Personal Details Screen 196 also allows the user to set whether it is possible for the video stack to be deleted 206. A security PIN protects the changing of this option so that if a first user having the PIN (for example, a parent) can review the driving style and behaviour of a second user not having the PIN (for example, their son or daughter) by reviewing the Recording Stack – as the Recording Stack cannot be deleted by that second user. As shown in Figure 24, the PIN can be set for the first time by entering it twice into the appropriate PIN fields 208.

[000171] Referring to Figure 14, a tenth page 210 of the Witness application user manual is shown, in which images of an Accident Management Screen 212 and Witness Details Screen 214 are displayed and described.

[000172] The Accident Management Screen 212 can be invoked by the user selecting the accident management button 90 on the Main Menu , or can be automatically switched to after the Witness application has detected that there has been an incident (e.g. via G-forces exceeding a

threshold level). Similarly, data can automatically be permanently stored as "Kept" and/or sent if high G-forces are detected.

[000173] As can be seen on the Accident Management Screen 212, there are the following user selectable buttons:

- **Accident Advice / What to do** 214

This option provides guidance as to what to do during an accident – see Figures 15 and 16 for the displayed Accident Advice Screens.

- **Witnesses** 216

This option invokes functionality to allow the collection of information from or about witnesses to an incident. An image of the Witnesses Detail information summary screen 214 is shown in Figure 14. Figure 17 shows the Witness Detail information collection screen 218. Voice notes can also be taken via the microphone of the smart-phone.

- **Photos** 220

This option enables the camera to allow a user to capture images associated with an incident.

- **Drivers** 222

This option invokes functionality to allow collection about the other drivers involved in an incident, such as their vehicle and insurance details. The Drivers Detail information collection screen 224 is shown in Figure 18.

- **Your Details** 226

This option provides a readily available store of the details of the user - as to be provided to other drivers – and can contain name, address and insurance details. The 'Your Details' screen 228 is shown in Figure 19.

[000174] Details recorded via the Accident Management Screen 212 are electronically authenticated and feature a time-stamp. In alternatives, this data may be encrypted to ensure the integrity of the stored data.

[000175] Furthermore, in alternatives, the exchange of the details of the drivers and witnesses can be conducted, at least in part, via Bluetooth® (for example, between mobile devices) – and/or via email. Relevant information associated with the driver is pre-stored on the Witness application in a format that can be sent readily, via a communication channel such as Bluetooth® or email.

[000176] Finally, note that in each Screen or Menu, there is a button 230 provided to go back to the previous menu. Also, when certain actions are performed or selected by a user, the Witness application is arranged to provide an audible feedback signal (for example, a beep). For example, this could be in response to starting a recording, keeping a video segment and/or a stopped recording.

Alternatives and extensions

[000177] The Witness application can be extended to interface with remote users to allow them to control the operation of the application as well as view information logged by the application.

[000178] In particular, the present application can be extended to a scenario where the Witness application is under the control of an insurance company. Such an insurance company may provide insurance to the user, and so may have an interest in the behaviour of that user, and moreover, a vehicle under the control of that user, as described previously.

[000179] In such a scenario, the insurance company will maintain a device monitoring system that can interface with a mobile device running the Witness application. In fact, the device monitoring system may interface with a large number of mobile devices, each running an individual copy of the Witness application, logging respective user/vehicle behaviours. This could the insurance provider server 5 of Figure 1.

[000180] With such a monitoring system, it is unpractical to actively monitor each and every mobile device and receiving and handling the sheer quantity of data from each and every device would also be very difficult.

[000181] Consequently, the device monitoring system and the mobile devices are advantageously arranged to automatically and intelligently interface with one another in a way that minimises the computational and bandwidth burden on the device monitoring system.

[000182] In particular, each mobile device running the Witness application is arranged to make a determination as to whether there is a need to transfer data to the device monitoring system. For example, the Witness application may be arranged to automatically send data to the device monitoring system that only has high G-force activity associated with it, as this may be indicative of a crash or another driving incident. Alternatively, the Witness application may be arranged to send detailed or high-bandwidth information if a user indicates that an accident has occurred.

[000183] In either case, the video segments and associated sensor and/or derived driving information data associated with the relevant event will be sent. However, no other data (for example, from another date) will be sent.

[000184] Alternatively, less computationally or bandwidth intensive information may be sent on a periodic basis – for example, every day, week or month. Such general information may be sent to establish a profile of a particular user. For example, many high G-force related activities may indicate that the driver is driving aggressively. A determination about the profile can be made automatically by requesting and automatically analysing further data. For example, the location and speed information can be used to determine whether a vehicle is found to frequently break the speed limit. If this is the case, then the profile of the user can be set accordingly.

[000185] Such general and periodically obtained information can also be used to remotely adjust the settings of the application. For example, many high G-force related activities may instead indicate that the set up of the car is such that the mobile device is subjected to high G forces (rather than the driver driving aggressively). If the driving is determined to be safe, but the mobile device is setting off many false positives, then the device monitoring system can automatically adjust the settings of the application. For example, the G-force sensitivity threshold may be increased remotely.

[000186] Thus, the initial data that is automatically transmitted from the mobile device to the vehicle monitoring system is limited in bandwidth so as not to overload the vehicle monitoring system as a whole. However, after processing or analysis is performed on the initial data, further information may be requested. For example, further information may be requested automatically by the system or manually by a controller acting for the insurance company. Such further information may include high resolution video logs and sensor data and derived driving information such as G-force measurements.

[000187] It will be understood that the mobile device may also automatically keep certain data at random. Furthermore, the reason for keeping certain data may also be logged (e.g. logged as a result of a manual request by the user, or in response to a high G-force event).

[000188] The mobile device and device monitoring system may also be arranged to highlight detected transgressions. For example, driving during curfew hours, or driving at locations where insurance is not valid (e.g. other countries, off-road, race tracks etc).

[000189] As will be appreciated, the interaction of the mobile device and the device monitoring system has the advantage of actively improving user driving behaviour. That is, if the user knows that their logged driving behaviour may adversely effect their insurance policy, then it is likely that the user will be dissuaded from driving recklessly. In view of this, an insurance company may be able to incentivise users through lower insurance premiums.

[000190] However, so that users do not wrongfully benefit from such incentives, it is necessary to enforce the correct and consistent use of the Witness application.

[000191] It would not be beneficial from the perspective of the insurance company if the user could choose when to enable the application. For example, if a user could choose to disable the application when speeding then the effectiveness of the application would be reduced.

[000192] Accordingly, the application may include measures to guarantee that the application is enabled whenever a given insured vehicle is being driven.

[000193] Such measures may involve matching data recorded by the Witness application with that recorded independently by the vehicle. For example, the Witness application records the distance travelled during every journey. To ensure the summed distances of all journeys tracked by the Witness application tally with the total travelled distance of the vehicle, the user may be prompted to enter the odometer mileage periodically.

[000194] If the distance recorded by the Witness application does not correlate with the difference between odometer readings, then the discrepancy will be flagged to the user and/or the insurance company. A substantial discrepancy will typically indicate that the Witness application has not been monitoring all vehicle journeys and the appropriate action can be taken (e.g. the user can be warned, insurance premium may be raised etc).

[000195] It will be appreciated that such a tallying exercise depends on the Witness application being used every time one particular vehicle is driven. However, in alternatives, if the Witness application is used with different vehicles, the Witness application may be arranged to register the different vehicles so that their respective odometer readings can be tallied with distance recordings associated with each respective vehicle.

[000196] Other measures can be implemented in conjunction with the Witness application to guarantee that the application is enabled whenever a given vehicle is being driven. For example, the mobile device on which the Witness application is installed may comprise an NFC device, such as an RFID tag. The NFC device may be compatible with a complementary device on a so-called 'smart-holster' into which the mobile device may be fitted during operation.

[000197] The smart-holster interacts with the NFC device on the smart-phone to determine whether or not the smart-phone is inserted into the smart-holster. The smart-holster can then be interfaced with the engine management system of the vehicle so that the vehicle may be activated and driven only when the mobile device is in place within the smart-holster.

[000198] It will be appreciated that the mobile device has so far been described in the context of a smart-phone. However, it will be appreciated by a person skilled in the art that other devices may also be suitable for performing the functions described in relation to the Witness application. For example, the Witness application may be adapted to run on a general purpose tablet-style computing device, such as an iPad®.

[000199] Furthermore, it will be understood that features, advantages and functionality of the different embodiments described herein may be combined where context allows. In addition, a skilled person will appreciated that the functionality described above may be implemented using the mobile device suitably programmed.

[000200] Having described several exemplary embodiments of the present invention/disclosure and the implementation of different functions of the device in detail, it is to be appreciated that the skilled addressee will readily be able to adapt the basic configuration of the device to carry out described functionality without requiring detailed explanation of how this would be achieved. Therefore, in the present specification several functions of the device have been described in different places without an explanation of the required detailed implementation as this not necessary given the abilities of the skilled addressee to code functionality into the device.

Abstract

Methods and systems for logging driving information associated with a vehicle when driven are disclosed. In one aspect, a mobile telecommunications device is provided that is adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven. The mobile device is arranged to register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. The mobile device is also arranged to process sensor data during the driving period to derive driving information associated with how the vehicle is driven. The mobile device is also arranged to store a selection of the driving information to a memory.

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Sheet 1 of 1

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Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
		US- 2010/039254	02/18/2010	Cooper, Marcus Donald	Claims 1-47
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		WO 2006/075419 A1	07/20/2006	Omotaya, et al.		
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		JP 2008244674 A	10/09/2008	Takahashi, Naota		
		WO 2006/127534	11/30/2006	Siemens VDO Automotive		

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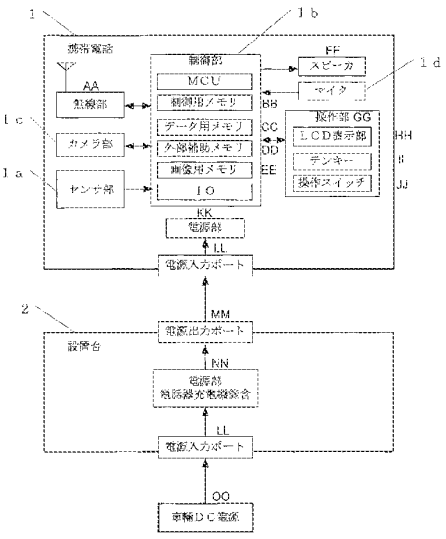
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/続葉有/

(54) Title: PORTABLE TELEPHONE EQUIPPED WITH DRIVE RECORDER FUNCTION

(54) 発明の名称: ドライブレコーダー機能を装備した携帯電話



1... PORTABLE TELEPHONE
1a... SENSOR SECTION
1b... CONTROL SECTION
1c... CAMERA SECTION
1d... MICROPHONE
2... CRADLE
AA... RADIO SECTION
BB... CONTROL MEMORY
CC... MEMORY FOR DATA
DD... EXTERNAL AUXILIARY MEMORY
EE... MEMORY FOR IMAGE
FF... SPEAKER
GG... OPERATING SECTION
HH... LCD DISPLAY SECTION
II... TEN KEY
JJ... OPERATING SWITCH
KK... POWER SUPPLY SECTION
LL... POWER SUPPLY INPUT PORT
MM... POWER SUPPLY OUTPUT PORT
NN... POWER SUPPLY SECTION INCLUDING TELEPHONE CHARGING FUNCTION
OO... VEHICLE DC POWER SUPPLY

(57) **Abstract:** A portable telephone equipped with a drive recorder function for dealing with traffic accident of vehicle, or the like, by incorporating a sensor circuit in the portable telephone having a video recording function. At an appropriate position of a vehicle, e.g. an automobile or a motorcycle, the portable telephone having the video camera function incorporating the sensor section circuit is secured to a cradle capable of charging the portable telephone while directing a photography camera toward the traveling direction so that motion picture photography is carried out in endless video recording mode at all times. When the sensor section senses variation in acceleration or impact due to crash or abrupt braking, switching is made to one time video recording mode so that video images and voices are recorded and stored for a predetermined time before and after the moment of crash or abrupt braking, and are used later for investigating the cause of accident or judgment in insurance negotiation.

(57) 要約: 自動車やオートバイなど車両の適当な部位に、センサ部回路を組み込んだヴィデオカメラ機能を内蔵している携帯電話を、携帯電話への充電が可能な設置台に撮影カメラを進行方向に向けて固定して、常にエンドレス録画モードで動画撮影させたうえで、衝突事故や急ブレーキ等による加速度変化や衝撃をセンサ部が感知したことをきっかけにワンタイム録画モードに切り替わることで、衝突事故や急ブレーキの瞬間をはさんで前後一定時間の映像と音声を記録、保存することで、後の事故原因の究明や保険交渉の判定に資することを目的に、ヴィデオ録画機能を内蔵している携帯電話にセンサ部回路を組み込んで、車両の交通事故等に対応するドライブレコーダー機能を装備する携帯電話。

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明 細 書

ドライブレコーダー機能を装備した携帯電話

技術分野

この発明は、自動車やオートバイなどの運転中に突発する衝突事故や急ブレーキによる衝撃を感知し、当該事故の瞬間の前後数秒間をヴィデオカメラ付き携帯電話に記録、保存することで、運転操作の状況や事故の原因究明に資するドライブレコーダー機能を装備した携帯電話に関する。

背景技術

周知の通り、携帯電話は、小型化と共に様々な機能が搭載され進化を続けている。単に通話だけの機能でなく、記憶容量も演算処理速度も増大し、あらゆるサービスが充実するに連れ通信端末としてますます便利になっている。

ところが、運転中の携帯電話の使用が交通事故を多発させ社会問題となり、ついに日本では運転中の携帯電話の使用を制限する法律までもが施行された。 そこで、運転中でも通話できるようにハンズフリーに対応した器具が普及している。

また、先進国に限らずあらゆる国で自動車が普及すれば、同時に交通事故の発生率も高くなる。交通事故が発生したとき当事者同士の主張が食い違ったり、現場検証で判明できない事柄もあり、目撃証言がない限り事故原因を客観的に判断するのはかなり難しいと言われている。

そこで、近年ドライブレコーダーが販売されている。これは、運転中に周囲の状況を常にヴィデオカメラで撮影して、事故の直前と直後の一定時間を数秒単位で映像記録として残し、後の事故原因の究明に利用されている。

このドライブレコーダーは、事業所向けに普及し、功績をあげて注目を得ているが、一般車両への設置は価格等の問題で普及が進まず、義務化するのも難しい現実がある。

そこで、本発明は、ヴィデオカメラ付き携帯電話にこのドライブレコーダー機能を搭載させることで価格を抑え、一般車両への普及を促すものである。

このような携帯電話のカメラ機能を使った考案として、日本特開２００５－９４７９２号がある。この明細書に示される機構は単なる写真撮影で、しかも事故のショックを受けた瞬間の撮影であるために事故原因の究明には資さないものであると考える。動画記録は事故原因を究明するためには不可欠であり、事故の数秒前からの撮影を記録することが事故原因の究明に資するのである。

従って、本発明は、携帯電話にすでに装備されつつあるヴィデオ録画機能を、そのままドライブレコーダー機能に利用させる機構を提供する。

また、本発明は、車両側のＤＣ電源を利用するので、自動車だけでなくオートバイ等の二輪車にも対応し得る。

発明の開示

本発明は、携帯電話のヴィデオ録画機能をドライブレコーダー機能に利用するために、回路内に交通事故や急ブレーキの振動や加速

度変化などの衝撃を感知するセンサ部回路を組み込むことで、事故原因の究明につながる映像と音声を記録保存するドライブレコーダー機能付き携帯電話になる。

また、突発的な事故に、センサ部が感知した時点からの撮影では、事故原因が記録されずドライブレコーダーとしての機能を成さない。

そこで、本発明は、携帯電話がドライブレコーダー機能として、事故原因の究明に必要な一定時間の情報を記録保存するために、当該一定時間の映像と音声を常に連続して記録し、当該一定時間の情報は、また、連続して上書き更新するエンドレス録画モードで常時撮影することにし、事故などでセンサ部が異常を感知したことをきっかけに、事故の瞬間を挟んだ前後当該一定時間の記録を保存するワンタイム録画モードに切り替わることで、事故の原因が判明できる瞬間前記録と、事故後の経過を判明できる瞬間後記録により当該事故全体の経過を記録するする事ができる。

このように、常時ヴィデオ撮影状態にするためには、携帯電話の電源バッテリーが長時間、減衰せずに電力を供給する事が不可欠である。しかし、現時点では、その技術が途上段階であるから今後の開発を待つこととし、今回は充電機能の付いた設置台で対応することとし、車両からのＤＣ電源を利用することとする。

また、本発明の発展型として、設置台側にも制御回路を備えて、設置台と携帯電話との間でデータや起動等の情報交換機能を持たせれば、携帯電話を設置台に載せただけで、自動でドライブレコーダーモードが作動するようにすることや、衝撃が弱くて携帯電話内部のセンサが反応したか否か不確実な場合、手動でワンタイム録画モ

ードに切り替える操作スイッチを準備することができるなど、本発明の効果を高めることができる。さらに、設置台を介して無線方式のハンズフリー機能や、車両側からの情報を受け取ることでハンドルやブレーキ等の運転操作の情報や車両本体のコンディション情報の記録も可能になり得る。

図面の簡単な説明

第１図は、装置の概要を示すブロック図であり、第２図は、本発明での携帯電話が、衝突事故や急ブレーキの原因を記録するドライブレコーダーとして機能するときの、一連の過程を示すフロー図である。

第３図、及び第４図は、本発明の発展型である制御部を備えた設置台を使用した場合のブロック図及びフロー図である。

発明を実施するための最良の形態

本発明をより詳細に説述するために、添付の図面に従ってこれを説明する。第１図で、携帯電話（１）内にこの発明にかかる新たな回路としてセンサ部（１ａ）を組み込むことを示している。このセンサ部（１ａ）には、衝突や急ブレーキにおける加速度変化、あるいは衝突時の振動や音など各種様々な衝撃に反応するセンサが使用され得る。

このセンサ部（１ａ）の組み入れにより、制御部（１ｂ）は、事故発生の瞬間にセンサ部（１ａ）で感知した信号を受け取り、カメラ部（１ｃ）で撮影しているヴィデオ映像を事故の瞬間前後数秒の一定時間を記録するとともに、マイク（１ｄ）からの衝撃音や周囲

の音声などを記録し事故原因の究明に資することができるシステムが構築されることになる。

また、第２図で、携帯電話（１）をドライブレコーダーモードに設定して、設置台（２）に取り付けた以後の制御部（１ｂ）での記録方式は、事故原因の究明に必要な一定時間の情報を記録保存するために、当該一定時間の映像と音声を常に連続して記録し、当該一定時間の情報は、また、連続して上書き更新するエンドレス録画モードで常時撮影することにし、事故などでセンサ部（１ａ）が異常を感知したことをきっかけに、事故の瞬間を挟んだ前後当該一定時間の記録を保存するワンタイム録画モードに切り替わることで、事故の原因が判明できる瞬間前記録と、事故後の経過を判明できる瞬間後記録により当該事故全体の経過を記録するするドライブレコーダーとしての一連の流れを表わしている。

第３図及び第４図は、本発明の発展型としてのブロック図とフロー図である。設置台（２）側にも制御回路（２ａ）を備えることで、設置台（２）と携帯電話（１）との間でデータや起動等の情報交換機能を持たせ、携帯電話（１）を設置台（２）に載せただけで自動でドライブレコーダーモードが作動するようにすることや、衝撃が弱くて携帯電話（１）内部のセンサー（１ａ）が反応したか否か不確実な場合、手動でワンタイム録画モードに切り替える操作スイッチ（２ｂ）を準備することができるなど、本発明の効果を高めることができる。さらに、設置台（２）のハンズフリーポート（２ｃ）を介して無線方式のハンズフリーセット（３）や、外部入出力ポート（２ｄ）を介して車両側からの情報を受け取ることでハンドルやブレーキ等の運転操作の記録も可能になる。

産業上の利用可能性

以上のように、本発明にかかるドライブレコーダー機能を装備した携帯電話の利用価値は、自動車やオートバイなどの運転時の急ブレーキや衝突事故などで、客観的な証拠や目撃証言が得られない場合の事故原因の究明に資するドライブレコーダーの普及を促すことにある。

まず、本発明はドライブレコーダーの価格を抑えて普及し易くすることに注目し、すでに一般的になったヴィデオカメラ付き携帯電話の機能を拡張するだけで可能になる。

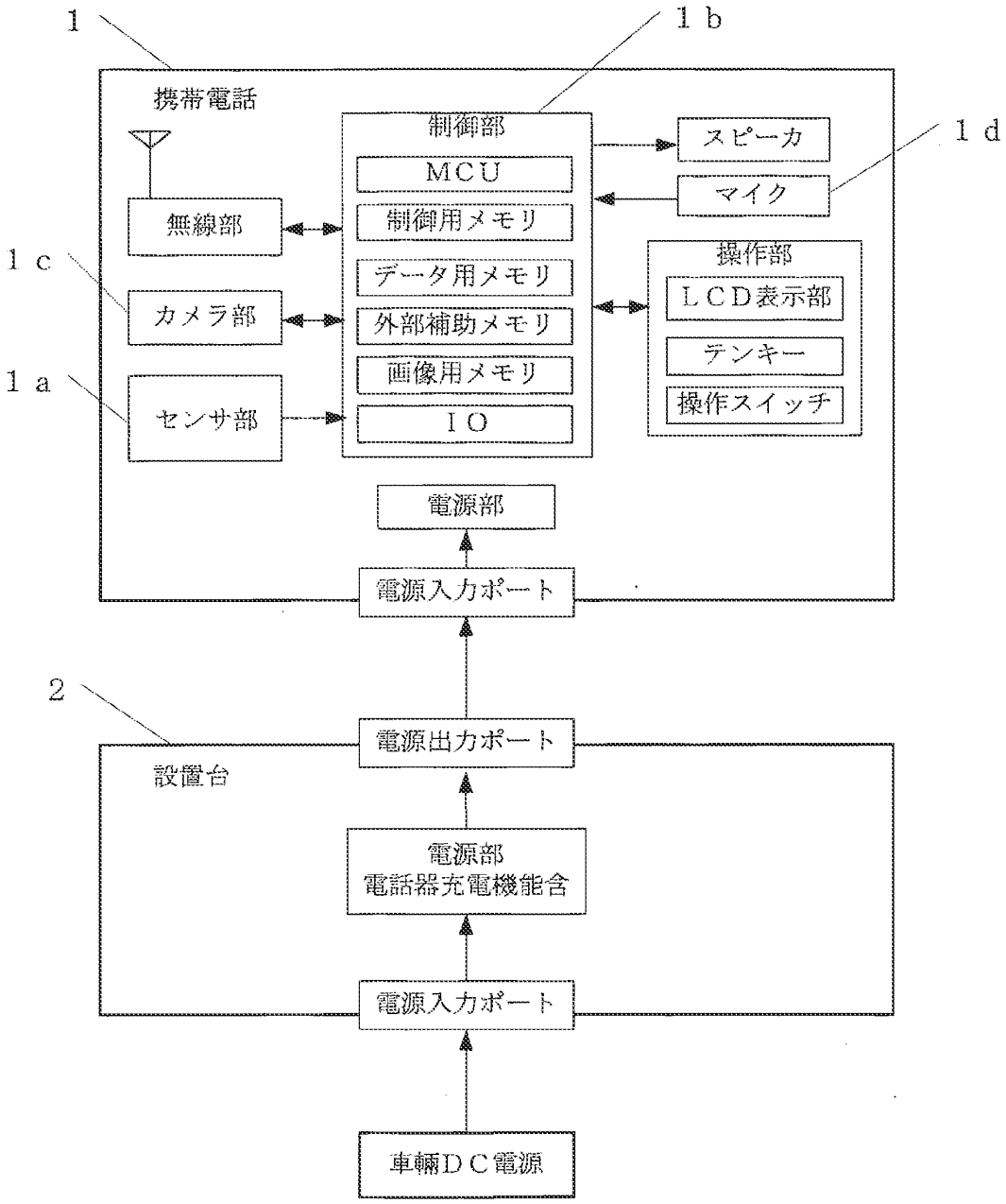
そして、このドライブレコーダー機能は、示談交渉の際に難題となっていた過失割合の判断や、事故原因の究明に役立つのであって、損害保険業界や警察関係者と事故当事者にとって、訴訟や認識のずれを回避することに貢献するとともに、ドライブレコーダーが普及することは、むしろ、運転者にとって常に見られていると意識することで、安全運転の励行を推進し得る効果がある。

請 求 の 範 囲

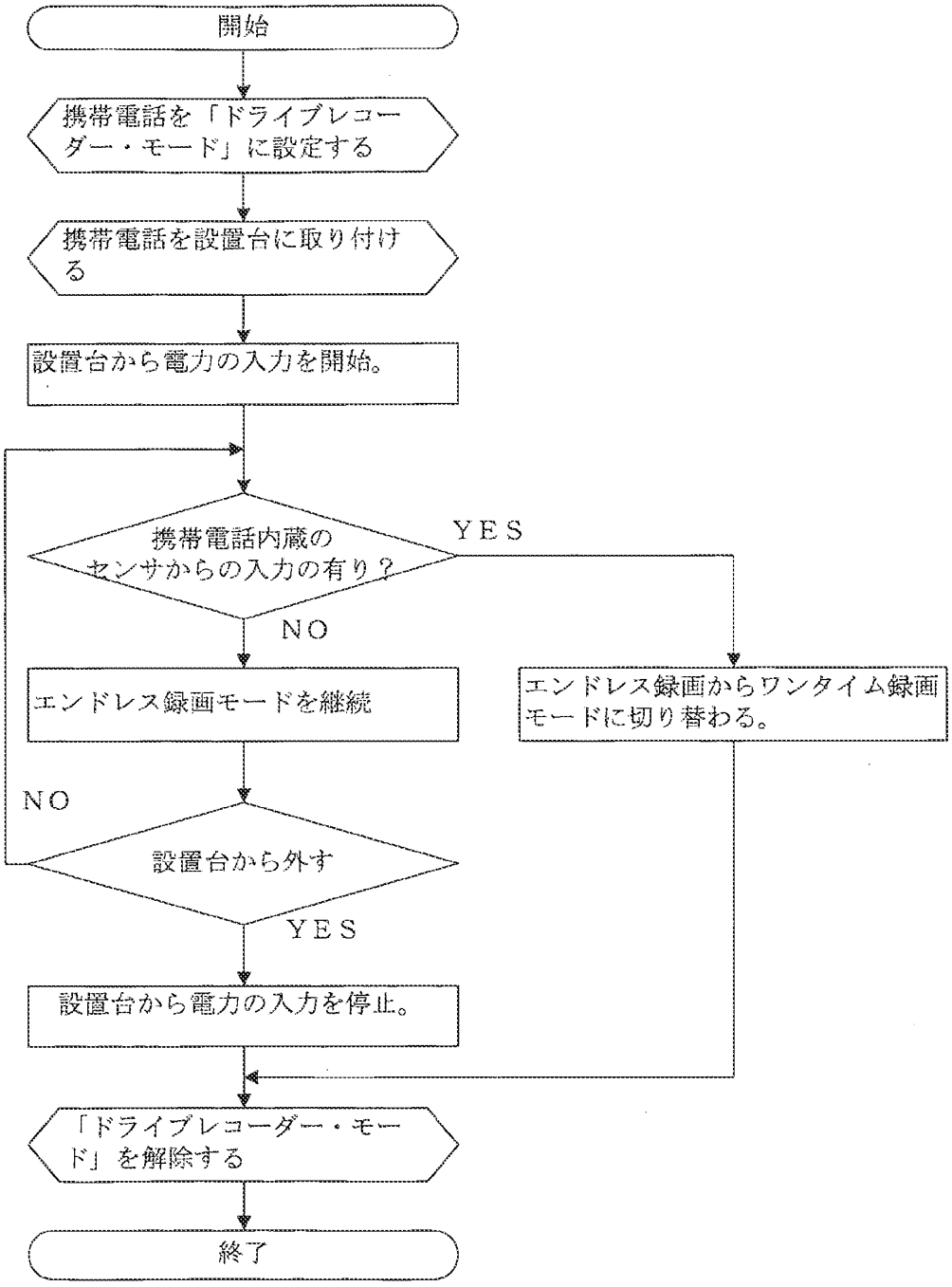
1． 自動車やオートバイなどの車両に、加速度変化や衝撃を感知するセンサ部回路を組み込ませたヴィデオカメラ付き携帯電話を、進行方向に向けて固定させ、常に動画撮影させたうえで、衝突事故や急ブレーキ等の加速度変化や衝撃をセンサ部が感知したことをきっかけに、当該事故の瞬間前後一定時間を記録することで、車両の交通事故等の一連の経過を記録保存するドライブレコーダー機能を装備する事を特徴とする携帯電話。

2． 請求項1のドライブレコーダー機能を装備する携帯電話を固定する設置台において、設置台側にも制御回路を組み込み、携帯電話側とデータ入出力ポートにより双方向通信することで、携帯電話側のセンサ部が衝撃を確実に感知したか不明確な場合に、設置台側の操作スイッチで手動により携帯電話側で事故の一連の経過を記録保存することができるとともに、外部入出力ポートにより車両側からの情報を入手することで、運転操作の記録や車両のコンディションを記録し得る、ドライブレコーダー機能を装備する事を特徴とする携帯電話。

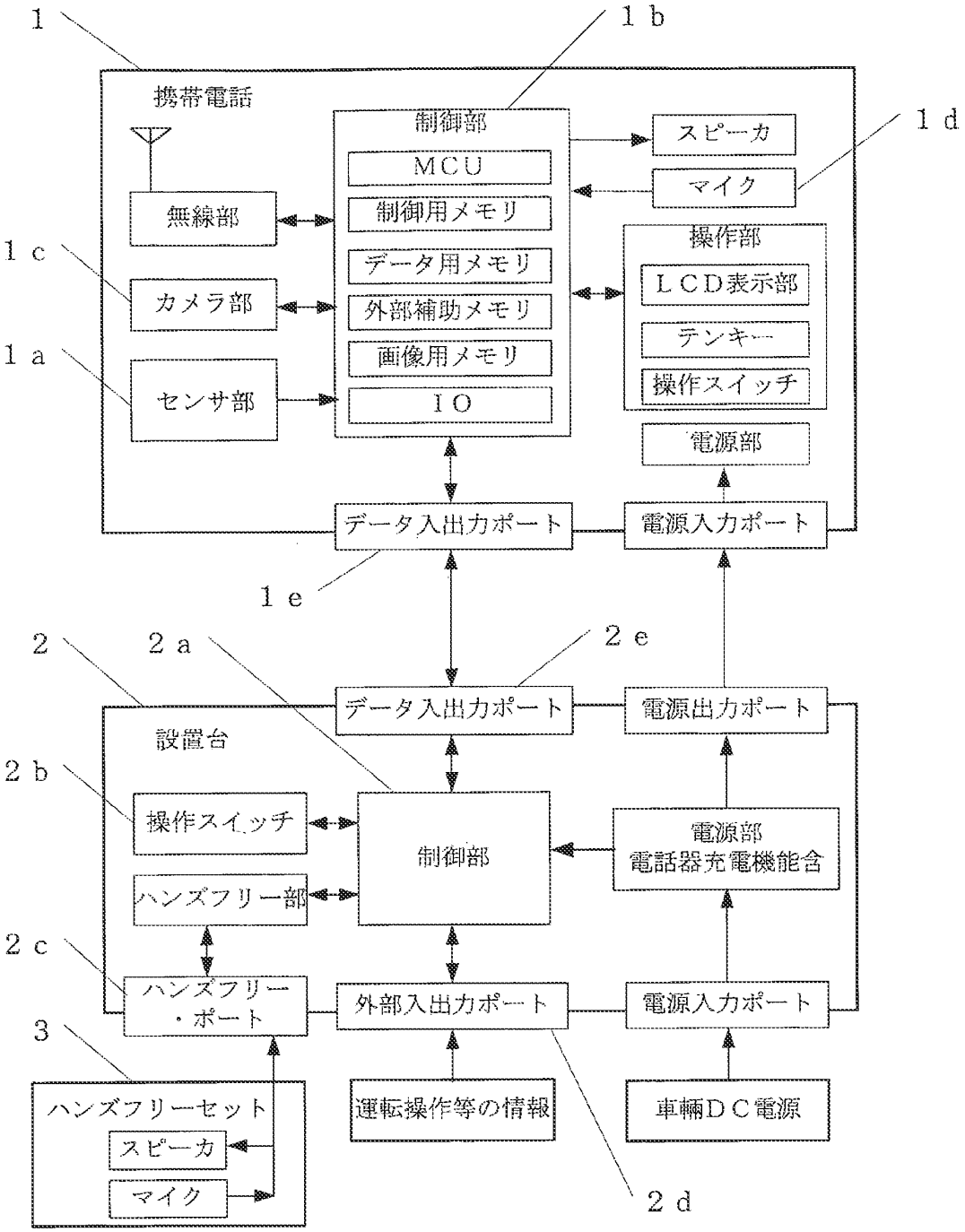
第１図


1
1 b
携帯電話
制御部
スピーカ
1 d
MCU
マイク
無線部
制御用メモリ
1 c
操作部
データ用メモリ
カメラ部
外部補助メモリ
LCD表示部
1 a
画像用メモリ
テンキー
センサ部
IO
操作スイッチ
電源部
電源入力ポート
2
電源出力ポート
設置台
電源部
電話器充電機能含
電源入力ポート
車輌ＤＣ電源

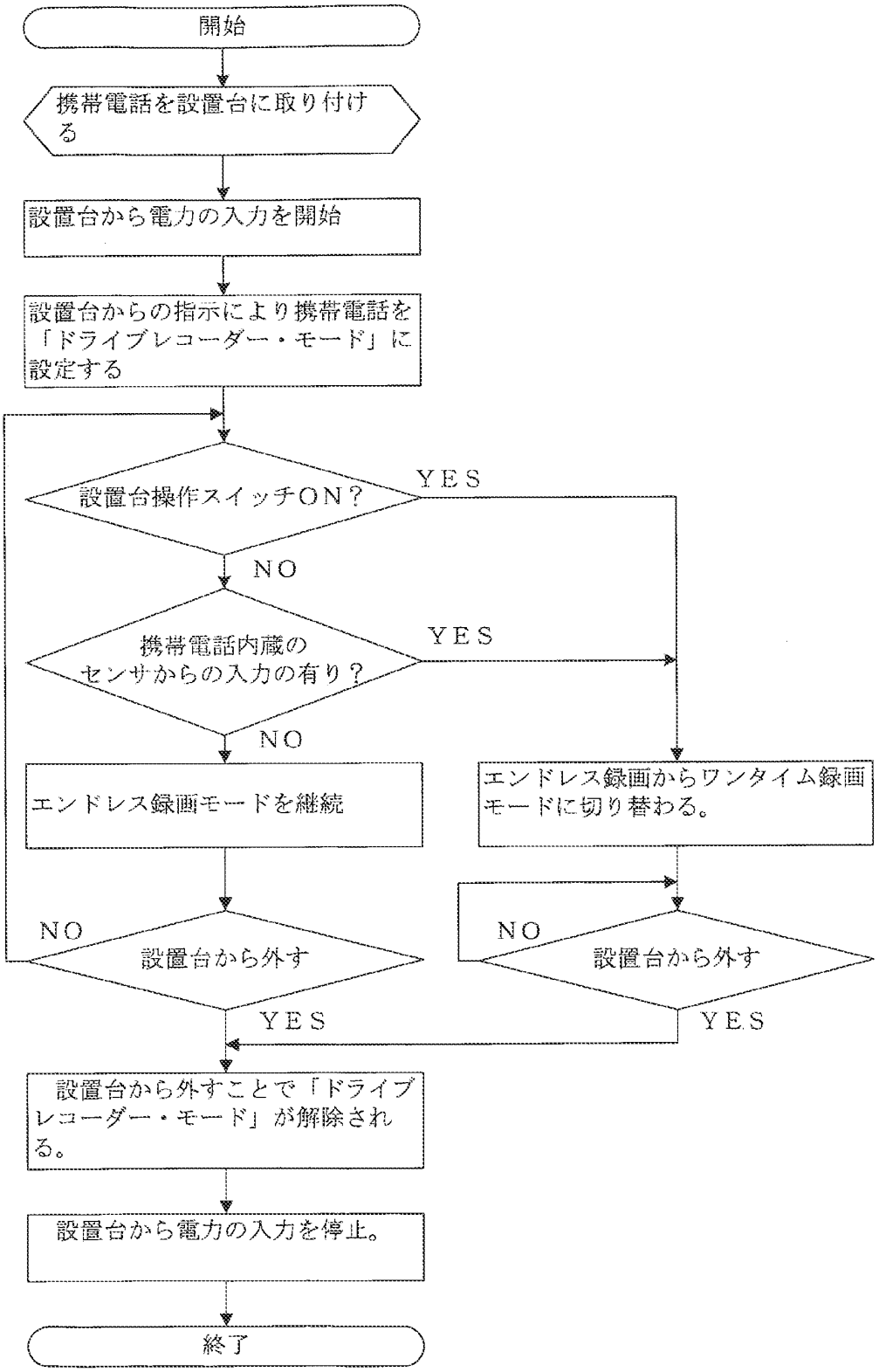
第２図


開始
携帯電話を「ドライブレコーダー・モード」に設定する
携帯電話を設置台に取り付ける
設置台から電力の入力を開始。
携帯電話内蔵のセンサからの入力の有り？
YES
NO
エンドレス録画モードを継続
エンドレス録画からワンタイム録画モードに切り替わる。
NO
設置台から外す
YES
設置台から電力の入力を停止。
「ドライブレコーダー・モード」を解除する
終了

第３図


1
1 b
携帯電話
制御部
スピーカ
1 d
MCU
マイク
無線部
制御用メモリ
操作部
1 c
カメラ部
データ用メモリ
LCD表示部
外部補助メモリ
テンキー
1 a
センサ部
画像用メモリ
操作スイッチ
IO
電源部
データ入出力ポート
電源入力ポート
1 e
2
2 a
2 e
データ入出力ポート
電源出力ポート
設置台
2 b
操作スイッチ
制御部
電源部
電話器充電機能含
ハンズフリー部
2 c
ハンズフリー
・ポート
外部入出力ポート
電源入力ポート
3
ハンズフリーセット
運転操作等の情報
車輌ＤＣ電源
スピーカ
マイク
2 d

第４図


開始
携帯電話を設置台に取り付ける
設置台から電力の入力を開始
設置台からの指示により携帯電話を「ドライブレコーダー・モード」に設定する
設置台操作スイッチON？
YES
NO
携帯電話内蔵のセンサからの入力の有り？
YES
NO
エンドレス録画モードを継続
エンドレス録画からワンタイム録画モードに切り替わる。
NO
設置台から外す
NO
設置台から外す
YES
YES
設置台から外すことで「ドライブレコーダー・モード」が解除される。
設置台から電力の入力を停止。
終了

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/015171

A. CLASSIFICATION OF SUBJECT MATTER
H04M1/00(2006.01), ***H04M1/04***(2006.01), ***B60R1/00***(2006.01), ***B60R11/02***(2006.01), ***B60R21/00***(2006.01), ***B62D41/00***(2006.01)

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)
H04M1/00(2006.01), ***H04M1/04***(2006.01), ***B60R1/00***(2006.01), ***B60R11/02***(2006.01), ***B60R21/00***(2006.01), ***B62D41/00***(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005
Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-235964 A (Fuji Photo Film Co., Ltd.), 19 August, 2004 (19.08.04), Par. Nos. [0004], [0031] to [0033] (Family: none)	1-2
Y	JP 08-235491 A (Toyota Motor Corp.), 13 September, 1996 (13.09.96), Par. Nos. [0020], [0023] to [0028], [0034] to [0038] (Family: none)	1-2
A	JP 2002-166803 A (Canon Inc.), 11 June, 2002 (11.06.02), Abstract & US 2002/63637 A1	1-2

☐ 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
"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
07 October, 2005 (07.10.05)	25 October, 2005 (25.10.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

国際調査報告

国際出願番号 PCT／JP2005／015171

A. 発明の属する分野の分類（国際特許分類（IPC））

Int.Cl.[7] *H04M1/00* (2006.01), *H04M1/04* (2006.01), *B60R1/00* (2006.01), *B60R11/02* (2006.01), *B60R21/00* (2006.01), *B62D41/00* (2006.01)

B. 調査を行った分野

調査を行った最小限資料（国際特許分類（IPC））

Int.Cl.[7] *H04M1/00* (2006.01), *H04M1/04* (2006.01), *B60R1/00* (2006.01), *B60R11/02* (2006.01), *B60R21/00* (2006.01), *B62D41/00* (2006.01)

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	1922－1996年
日本国公開実用新案公報	1971－2005年
日本国実用新案登録公報	1996－2005年
日本国登録実用新案公報	1994－2005年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

C. 関連すると認められる文献

引用文献のカテゴリー＊	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
Y	JP 2004-235964 A (富士写真フイルム株式会社), 2004.08.19, 段落【0004】、【0031】～【0033】（ファミリーなし）	1-2
Y	JP 08-235491 A (トヨタ自動車株式会社) 1996.09.13, 段落【0020】、【0023】～【0028】、【0034】～【0038】（ファミリーなし）	1-2
A	JP 2002-166803 A (キャノン株式会社) 2002.06.11, 要約 & US 2002/63637 A1	1-2

☐ C欄の続きにも文献が列挙されている。

☐ パテントファミリーに関する別紙を参照。

＊ 引用文献のカテゴリー
「A」特に関連のある文献ではなく、一般的技術水準を示すもの
「E」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの
「L」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「O」口頭による開示、使用、展示等に言及する文献
「P」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「T」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「X」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Y」特に関連のある文献であって、当該文献と他の1以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「&」同一パテントファミリー文献

国際調査を完了した日 07. 10. 2005	国際調査報告の発送日 25.10.2005
国際調査機関の名称及びあて先 日本国特許庁（ISA／JP） 郵便番号100－8915 東京都千代田区霞が関三丁目4番3号	特許庁審査官（権限のある職員） 5G 8732 稲葉 和生 電話番号 03－3581－1101 内線 3526

様式PCT／ISA／210（第2ページ）（2004年1月）

(19) Europäisches Patentamt
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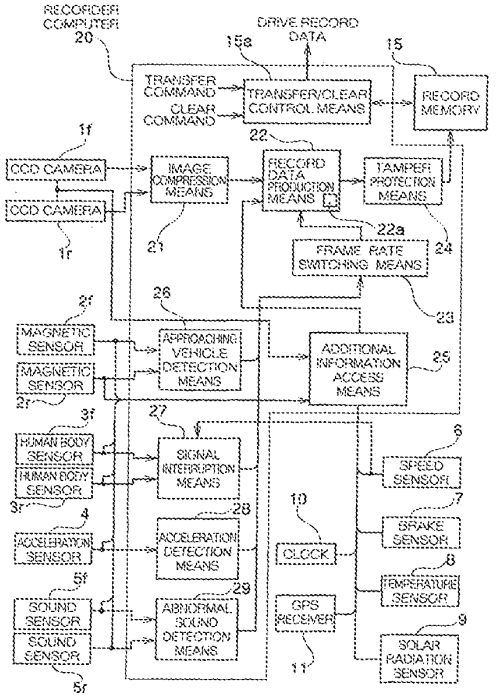
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(54) Automobile drive recorder

(57) In an automobile drive recorder, if a detection signal indicating an occurrence of an abnormal driving state is output by an abnormal state detection sensor (2f, 2r), image data of a scene taken by a monitoring camera (1f, 1r) are recorded for a period with a particular length together with additional information associated with the driving state into a record memory (15) as drive record data. The automobile drive recorder includes a magnetic sensor (2f, 2r) serving as the abnormal state detection sensor adapted to detect a magnetic field in a close region around the automobile, approaching vehicle detection means (26) for detecting an abnormally approaching vehicle by detecting a change at a rate greater than a predetermined value in the signal level of the detection signal output by the magnetic sensor (2f, 2r), and frame rate switching means (23) for controlling the frame rate at which to record the image data.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an automobile drive recorder adapted to continuously take an image of a scene around an automobile by using a monitoring camera installed in the automobile, and, if a detection signal indicating an occurrence of an abnormal driving state is output by an abnormal state detection sensor, record image data of the scene for a period with a particular length around the time of the occurrence of the abnormal driving state, together with additional information associated with the driving state, into a record memory as drive record data.

2. Description of the Related Art

[0002] Japanese Unexamined Patent Application Publication No. 2000-6854 discloses an automobile drive recorder adapted to record image information output by a CCD camera and sensor information output by various kinds of sensors such as a speed sensor and an acceleration sensor into a random access memory while updating the data stored in the random access memory as required.

[0003] If a shock sensor detects a shock to a driver's automobile, information recorded in the memory is transferred to a flash memory and further output via an encoder from an output terminal so that the information is played back.

[0004] This allows it to store an image and sensor information for a period immediately before an occurrence of an accident and thus allows it to analyze a state in which the accident occurred.

[0005] Japanese Unexamined Patent Application Publication No. 2003-203285 discloses a state recording apparatus including initial state recording means for recording a result of a test performed before a driving of an automobile is started, running state recording means for recording a running state of the automobile while updating the recorded data as required, accident detection means for detecting an occurrence of an accident by using a shock sensor, and accident state recording means for recording a state of the accident of the automobile.

[0006] This state recording apparatus makes it possible to, if an accident occurs, determine the cause of the accident by analyzing recorded information indicating whether the automobile had a failure, the GPS information, and sound information captured via a microphone.

[0007] Japanese Unexamined Patent Application Publication No. 2005-57661 discloses an accident recording system adapted to take an image of an outside scene and an image of the inside of an automobile when the automobile is being driven, capture a voice/sound in the inside of the automobile via a microphone, and transmit the image data and the voice/sound data to a recording server via a network. If an occurrence of an accident is detected by a shock sensor, recording of the data is continuously performed regardless of the driving state.

[0008] Japanese Unexamined Patent Application Publication No. 2001-63500 discloses an obstacle detection apparatus adapted to, instead of detecting a shock that an automobile receives, detect an approaching obstacle using an ultrasonic sensor and display an image of the obstacle approaching the automobile on a display screen to inform a driver of the presence of the approaching obstacle.

[0009] Japanese Unexamined Patent Application Publication No. 11-183613 discloses an automobile radar apparatus that transmits a frequency-modulated radio wave signal and detects the distance to a target or the relative speed between an automobile and the target based on a signal reflected from the target.

[0010] However, in the techniques disclosed in Japanese Unexamined Patent Application Publication No. 2000-6854, Japanese Unexamined Patent Application Publication No. 2003-203285, and Japanese Unexamined Patent Application Publication No. 2005-57661, an image of an accident is recorded when some shock caused by the accident is actually detected, and thus it is difficult to record an image of an accident with a bicycle, a motorcycle, or a pedestrian or a small accident with another automobile, which does not impose a considerable shock on the automobile.

[0011] Besides, in these techniques, an image of a dangerous state/situation that may result in an accident is not recorded, unless the dangerous state/situation actually results in an actual accident. Furthermore, it is impossible to analyze a usual driving state/condition to manage the driving state/condition of a driver.

[0012] On the other hand, in the technique disclosed in Japanese Unexamined Patent Application Publication No. 2001-63500 in which an ultrasonic sensor is used instead of a shock sensor, although it is possible to record an image of a state/situation that can cause an accident even when the state/situation does not result in an actual accident, an attenuation of an ultrasonic wave caused by rain or noise generated by a driver's automobile can cause a reduction in detection reliability.

[0013] Another problem of this technique is that it takes a processing time to detect the distance and thus it is difficult to detect a target at a very close position. The radio wave radar disclosed in Japanese Unexamined Patent Application Publication No. 11-183613 also has a problem with detection of a target at a close position. Another problem of this technique is that a complicated circuit is needed.

SUMMARY OF THE INVENTION

[0014] In view of the above, it is an object of the present invention to provide an automobile drive recorder capable of continuously recording image data of a usual driv-

ing state and an unusual driving state of a small or serious accident, or a danger not leading to an accident.

[0015] To achieve the above object, the present invention provides an automobile drive recorder that works using the property of a magnetic material included in a vehicle structure. More specifically, in an aspect of the present invention, there is provided an automobile drive recorder adapted to continuously take an image of a scene around an automobile by using a monitoring camera installed in the automobile, and, if a detection signal indicating an occurrence of an abnormal driving state is output by an abnormal state detection sensor, record image data of the scene for a period with a particular length around the time of the occurrence of the abnormal driving state, together with additional information associated with the driving state, into a record memory as drive record data, the automobile drive recorder including a magnetic sensor serving as the abnormal state detection sensor adapted to detect a magnetic field in a close region around the automobile; approaching vehicle detection means for detecting an abnormally approaching vehicle by detecting a change at a rate greater than a predetermined value in the signal level of the detection signal output by the magnetic sensor; and frame rate switching means for, if an abnormally closely approaching vehicle is detected, switching the frame rate at which image data is recorded in a record memory from a normal low frame rate to a high frame rate and maintaining the high frame rate for a predetermined period.

[0016] In this automobile drive recorder, in the normal state, the image of a scene of a close region around the automobile is taken at a low frame rate and is recorded. However, if the approaching vehicle detection means detects a change at a rate equal to or greater than the predetermined value in the detection signal output by the magnetic sensor designed to detect vehicles made of a magnetic material, the frame rate switching means switches the frame rate to the high frame rate so that image data is recorded at the high frame rate.

[0017] That is, the automobile drive recorder according to the present invention allows image data indicating a normal driving state to be recorded at the low frame rate that allows a reduction in the necessary storage capacity of the record memory. When an abnormally closely approaching obstacle such as a vehicle with magnetism is detected, the frame rate at which image data is recorded is switched to the high frame rate so that high-quality image data indicating a following driving state is recorded.

[0018] Thus, it becomes possible to record image data indicating an accident regardless of whether a large shock to the automobile occurs in the accident. Use of the magnetic sensor makes it possible to easily detect an abnormally closely approaching obstacle with magnetism by analyzing the detection signal of the magnetic sensor using a simple circuit, even when the obstacle is at a very close location without being influenced by noise generated by the user automobile.

[0019] In the detection using the magnetic sensor, the approaching vehicle detection means may detect approaching of an obstacle to an abnormally close location by detecting a change in the detection signal of the magnetic sensor relative to the moving average taken over a period with a predetermined length. This makes it possible to detect only vehicles approaching at speeds different from the speed of the user automobile by using a simple circuit.

[0020] The magnetic sensor may have a sensitivity sufficiently high to sense a magnetic field with a strength similar to the strength of a geomagnetic field so that even a small vehicle, such as a motorcycle or a bicycle, which includes only a small part made of a magnetic material and thus can only cause a small change in the ambient magnetic field, can also be detected.

[0021] The automobile drive recorder may further include a human body sensor in addition to the magnetic sensor as an additional abnormal state detection sensor, adapted to detect a human body at a location in a close region around the automobile, and the frame rate switching means may switch the frame rate in response to a detection signal output by the human body sensor. This makes it possible to record not only an image of an actual accident in which the user automobile collides with a human body but also an image of a dangerous state in which the automobile almost actually collides with a human body.

[0022] When the user automobile stops at a pedestrian crossing or the like, the signal interruption means disables outputting of the detection signal from the human body sensors over a period from a predetermined time after the stop to a time at which the automobile restarts to move so that pedestrians passing in front of the automobile at rest are not detected as abnormally approaching objects.

[0023] That is, useless detection of pedestrians passing in front of the automobile at rest is prevented, and thus recording of useless image data in the memory is prevented. This also makes it easier to analyze the driving state/condition.

[0024] The additional information may include date/time information output by a clock, sensor information output by the abnormal state detection sensor, and sensor information output by one or more driving operation sensors adapted to detect a state of a driving operation performed by a driver, the driving operation sensors including at least an automobile speed sensor so that it becomes possible to analyze the driving state/condition in a further detail manner based on the additional information recorded together with the image data.

[0025] The additional information may include position information output by a GPS receiver and indicating the position of the user automobile or the additional information may include sensor information output by one or more driving environment detection sensors adapted to detect driving environment conditions in an automobile room, the driving environment detection sensors includ-

ing at least a temperature sensor so that it becomes possible to analyze the driving state/condition from further detailed information.

[0026] That is, it becomes possible to analyze an actual accident, a dangerous state which may result in an accident, and an abnormal driving state caused not by an external obstacle but by a driver, in a further detailed manner taking into account the additional information including the date/time information, the information output by the abnormal state detection sensors and the driving operation detection sensors, the position information indicating the position of the user automobile, and the information output by the driving environment detection sensors.

[0027] The record memory may be capable of being cleared and may have a storage capacity that allows it to store all drive record data at the low and high frame rates for a period until the record memory is cleared. The capability of clearing the record memory makes it possible to analyze the driving state/condition over the whole period from the data stored in the record memory with the particular storage capacity. The drive record data stored in the record memory may be processed so as to prevent the drive record data from being tampered with.

[0028] The record memory may have a storage capacity that allows it to store all drive record data of continuous driving for at least 12 hours at the low and high frame rates. This makes it possible to check the driving state/condition in an efficient manner. Thus, for example, in taxi companies or delivery companies, it becomes possible to check and mange the driving state/condition of drivers at scheduled intervals.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

Fig. 1 is diagram showing a circuit of an automobile drive recorder according to an embodiment of the present invention;

Fig. 2 is a diagram showing parts included in a recorder computer of an automobile drive recorder;

Fig. 3 is a diagram showing an example of one frame of image recorded by an automobile drive recorder; and

Fig. 4 is a flowchart showing an operation of an automobile drive recorder.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] Referring to Figs. 1 to 4, an automobile drive recorder according to an embodiment of the present invention is described below. As shown in Fig. 2, the automobile drive recorder includes a recorder computer 20 installed in an automobile 19 and parts connected to the recorder computer 20.

[0031] The parts connected to the recorder computer 20 include a recording memory 15; CCD cameras 1f and 1r serving as monitoring cameras disposed in the front and the back of the automobile 19; magnetic sensors 2f and 2r serving as an abnormal state detection sensor disposed in the front and the back of the automobile 19; human body sensor 3f and 3r disposed in the front and the back of the automobile 19; an acceleration sensor 4; microphones serving as sound sensors 5f and 5r disposed in the front and the back of the automobile 19; driving operation sensors including an automobile speed sensor 6 that is also used for an automobile speed meter and a brake sensor 7 adapted to detect pressing of a brake pedal; driving environment sensors including a temperature sensor 8 adapted to detect the temperature in an automobile room and a solar radiation sensor 9 that also serves as a solar radiation sensor of an air conditioner; a clock 10 that output a date/time signal; and a car navigation GPS receiver 11 that detects the position of the automobile.

[0032] The recorder computer 20 operates a CPU or the like in accordance with various kinds of programs stored in a program memory disposed in the recorder computer 20 to realize various kinds of means shown in Fig. 1, that is, image compression means 21 for compressing image data captured by the CCD cameras 1f or 1r such that the number of pixels of image data is reduced by a factor of a few tens; record data production means 22 for producing record data in a particular format by capturing the image data and combining it with additional information; frame rate switching means 23 for, when an abnormal state is detected, switching a frame rate at which image data is captured from a normal frame rate (for example, 0.5 frames/sec) to a high frame rate (for example, 10 frames/sec) and maintaining the high frame rate for a predetermined period (for example 10 sec); tamper protection means 24 for embedding a digital watermark into the record data; additional information access means 25 for accessing the afore-mentioned kinds of sensor information and date/time information and latitude/longitude information output by the GPS receiver, thereby producing a group of additional information; approaching vehicle detection means 26 for detecting an abnormally approaching vehicle such as an automobile, a motorcycle and a bicycle by detecting a change at a rate greater than a predetermined value in the signal level of the detection signal output by the magnetic sensor 2f or 2r; signal interruption means 27 for interrupting transmission of the detection signal of the human body sensors 3f and 3r to the frame rate switching means 23 for a period from a few seconds after stopping of the automobile to a time at which the automobile restarts to move; acceleration/deceleration detection means 28 for detecting abnormal acceleration or deceleration of the user automobile by detecting an increase in the absolute value of a positive or negative value of the detection signal output from the acceleration sensor 4 to a level higher than a predetermined value; abnormal sound detection means 29 for detecting an abnormal sound by detecting

an increase in the detection signal output by the sound sensor 5f or 5r to a level higher than a predetermined value, and transfer/clear means 15a for, in response to a transfer command, reading data recorded in the record memory 15 and transferring the read data to a server memory of a management center and also for, in response to a clear command, clearing the content of the record memory 15 in preparation to store next data.

[0033] It is assumed that the magnetic sensors 2f and 2r have a sensitivity sufficiently high to sense a magnetic field with a strength similar to the strength of a geomagnetic field. Although the magnetic flux density of the geomagnetism tends to increase with the latitude, the magnetic flux density is about 50 μT (Tesla) or 50,000 nT even in areas outside the Japanese Islands.

[0034] In city areas, although the magnetic flux density of the geomagnetism can vary by up to 10 μT depending on environmental conditions, there is substantially no change in the magnetic flux density when the automobile is at rest. As a magnetic sensor having a sufficiently high sensitivity to detect such an order of a magnetic flux density, a semiconductor Hall device or an amorphous magnetic impedance device can be used. A GMR with very high sensitivity and high directivity, which has recently become available, can also be used.

[0035] In general, an automobile includes a large number of electrical components using a magnet, such as motors and sensors. An engine also includes parts using a magnet. As a result, a magnetic flux density of about 100 to 300 μT, which is greater than that of the magnetic flux density of the geomagnetism, is detected at a location about 1 m apart from an automobile. In general, a magnetic material is in a slightly magnetized state, which causes a change in an ambient magnetic flux density.

[0036] For example, in the case of bicycles, although they are smaller in size and weight than automobiles, magnetic materials used, for example, in their wheels can cause a change in the magnetic flux density at least by 10 μT of a normal geomagnetic field at a location 50 cm apart from a bicycle.

[0037] In a specific experimental example, when an ambient geomagnetic field and a peripheral magnetic field of the user automobile were detected by a semiconductor Hall device using a bridge circuit (model name HW-300B available from Ashahi Kasei Electronics Co., LTD) and amplified by a factor of 300, the resultant amplified output signal was 450 mV in amplitude. In this state, when a wheel portion of an arbitrary bicycle of a plurality of types was placed at a location 50 cm apart, a change (an increase or a decrease depending on the polarity) of 60 mV or greater was observed in the amplitude of the amplified output signal.

[0038] The change in the magnetic flux density includes a contribution of the concentration of the geomagnetic flux on a magnetic material, and thus a change in posture or location of the bicycle within a same degree of range does not result in a significant change in the magnetic flux density. When an automobile was placed at a location 50 cm apart, a change greater by a factor of several tens was observed in the amplified output signal. A large-sized truck caused a further greater change.

[0039] The approaching vehicle detection means 26 detects an abnormally approaching vehicle as follows. The amplified detection voltage signal of each of the magnetic sensors 2f and 2r having, as described above, sensitivity high enough to detect a magnetic field with a strength similar to that of the geomagnetic field is converted into digital form at a sampling rate of 1 msec, and the detection voltage is moving-averaged for a predetermined time period (for example, 5 sec).

[0040] If a change greater than a predetermined threshold value (for example, 20 μT) in 0.5 sec (which can cause an automobile running at a speed of 20 km/hour to move about 1.5 m) is detected in the moving-averaged detection signal level, it is determined that there is an abnormally approaching automobile.

[0041] Herein, taking into account the fact that the magnetic flux density of the geomagnetism is about 50 μT and the magnetic flux density of the geomagnetism can vary depending on environmental conditions, the threshold value is set to 20 μT which is slightly greater than the maximum variation in the magnetic flux density of the geomagnetism so that a approaching bicycle can be detected in a highly reliable manner.

[0042] More specifically, when the moving average is calculated for 5×10^3 samples of the detection signal, if a change corresponding to 20 μT is detected in the detection signal of at least 10 samples within a period corresponding to first 5×10^2 samples of the 5×10^3 samples, it is determined that there is an abnormally approaching automobile. By detecting a change over a plurality of samples in the above-described manner, it becomes possible to prevent a sharp noise component from being incorrectly regarded as a signal indicating an abnormally approaching automobile.

[0043] When the user automobile stops at a traffic signal of a crossing, the user car gradually approaches another automobile located ahead at a very low speed. Therefore, the moving average gradually changes at a corresponding low rate and thus the approaching automobile located ahead is not detected as an abnormally closely approaching object.

[0044] This is also true for an automobile approaching the back of the user car. On the other hand, when an automobile approaches the user car at a relative speed higher than a threshold value from ahead or behind, the approaching automobile is detected when the relative distance becomes less than a few meters. In the case where there is an abnormally approaching motorcycle or bicycle with small magnetization, the approaching motorcycle or bicycle is detected when the relative distance becomes less than 50 cm.

[0045] In the approaching vehicle detection means 26, the threshold value according to which it is determined whether there is an abnormally approaching vehicle may

be set properly depending on the required detection reliability and detection sensitivity. For example, when a high detection sensitivity is needed to detect an approaching bicycle or the like, the threshold may be set to a value corresponding to a detection signal level change corresponding to, for example, 5 μT (that is, 1/10 of the magnetic flux density of the geomagnetism).

[0046] Conversely, when it is desired to achieve a more reliable detection of an approaching automobile without being influenced by noise or a fluctuation in the magnetic flux density caused by environmental conditions, the threshold may be set to a value corresponding to 50 μT, although the result is a reduction in the sensitivity for approaching small automobiles such as a bicycle.

[0047] As for the human body sensors 3f and 3r, sensors using pyroelectric effect and having a broad directivity, which operate using a change in surface charge caused by a change in temperature of a crystal due to incidence of an infrared radiation from an approaching human body, such as those widely used to detect a person approaching a house, may be employed. The sensitivity of each of the human body sensors 3f and 3r is set so that a human body located within a range of 1.5 m is detected, by adjusting the internal circuit of each of the human body sensors 3f and 3r.

[0048] As described above, the human body sensors 3f and 3r are associated with the signal interruption means 27 that disables of detection of human bodies of pedestrians when the user automobile is at rest at a stop signal. Note that the signal interruption means disables the detection of human bodies after a time delay of a predetermined length so that human bodies are detected during a time period with the predetermined length after the user automobile stops at a signal.

[0049] As for the acceleration sensor 4 and the sound sensors 5f and 5r, proper known sensors may be used. With the acceleration sensor 4 functioning not only as a sensor to provide additional information but also as an auxiliary abnormal state detection sensor, the acceleration/deceleration detection means 28 detects an abnormal driving state by detecting an positive or negative change in the detection signal to a level greater than a predetermined value due to an abrupt deceleration caused by a collision with a vehicle in front of the user automobile or caused by sudden braking or due to an abrupt acceleration caused by a collision from behind.

[0050] Similarly, with the sound sensors 5f and 5r functioning not only as sensors to provide additional information but also as abnormal state detection sensors, the abnormal sound detection means 29 detects an abnormal sound such as a crashing sound, a screaming sound, or an abnormal sound caused by sudden stopping by detecting an increase in the detection signal output by the sound sensor 5f or 5r to a level greater than a predetermined value.

[0051] In synchronization with the imaging operation of the CCD cameras 1f and 1r, the additional information access means 25 accesses the detection signals output by the magnetic sensors 2f and 2r, the human body sensors 3f and 3r, the acceleration sensor 4, the sound sensors 5f and 5r, the automobile speed sensor 6, the brake sensor 7, the temperature sensor 8, and the solar radiation sensor 9, and the additional information access means 25 produce various sensor information indicating the respective detection signal levels in proper units.

[0052] The additional information access means 25 further acquire the date/time signal output from the clock 10 and the latitude/longitude information output from the GPS receiver 11, and the additional information access means 25 produce additional information indicating the driving state/condition from the sensor information, the date/time signal, and the latitude/longitude information.

[0053] The record data production means 22 capture image data into the internal storage unit 22a at the high or low frame rate controlled by the frame rate switching means 23.

The record data production means 22 also acquire the additional information at each time from the additional information access means 25 and produce record data in the format shown in Fig. 3 in the storage unit 22a while updating the record data as required. The tamper protection means 24 embed an electronic watermark into the record data on a frame-by-frame basis and store the resultant record data in the record memory 15.

[0054] The storage capacity of the record memory 15 is selected so as to allow record data to be continuously recorded, for example, for 12 hours. More specifically, for example, the record memory 15 has a storage capacity of 1 GB. If one frame of compressed image data with additional information including the electronic watermark has a data size of 40 KB and if the low frame rate is set to 0.5 frames/sec, the total data size of 12-hour record data becomes 864 MB.

[0055] If the high frame rate is set to 10 frames/sec and if 10-sec recording at the high frame rate is performed 20 times to record abnormal states, the record data at the high frame rate have a data size of 80 MB, and thus the total data size is less than 1 GB. A wide variety of memory devices usable for this purpose are known.

[0056] If desirable, the frame rate switching means 23 may be constructed so as to adaptively control the frame rate depending on a predicted driving time and/or the frequency of occurrences of abnormal states so that the record data have a data size less than a predetermined value or so that the limited storage capacity is used in an efficient manner.

[0057] Now, referring to a flow chart shown in Fig. 4, the operation of the automobile drive recorder constructed in the above-described manner is described below. When the user automobile is running, the CCD cameras 1f and 1r take images of scenes respectively in front and back of the user automobile. The image data output from the CCD cameras 1f and 1r are compressed and combined with additional information. Furthermore, an electronic watermark is embedded into the image data and

the resultant image data are sequentially stored into the record memory 15 so that all record data acquired during driving of the automobile are stored in the record memory 15.

[0058] The magnetic sensors 2f and 2r biased by the ambient magnetic field detect a change in the magnetic field caused by automobiles, motorcycles, or bicycles at close locations. If a change in the detection signal greater than the threshold value occurs at a rate greater than a predetermined value, it is determined that there is a vehicle abnormally approaching the user automobile, and image data are recorded at the high frame rate for a period with a predetermined length. As a result, image data of an actual crash, a small collision, or a dangerous state that could cause a collision but that did not result in an actual collision are recorded.

[0059] Similarly, in response to detection of an approaching human body by the human body sensor 3f or 3r, image data are recorded at the high frame rate for a period with the predetermined length to record an image of a collision with a person or a dangerous state that could cause a collision but that did not result in an actual collision. When the user automobile stops at a pedestrian crossing, a useless detection of pedestrians is not performed, and thus useless recording at the high frame rate is avoided.

[0060] In a region including a special apparatus or a facility such as a train or a large transformer, the ambient magnetic field can increase to a very high level compared with the geomagnetic field. If the automobile runs in such a region having an extraordinarily high magnetic field, the detection signals output from the magnetic sensor 2f and 2r are saturated. This makes it impossible to detect an approaching obstacle having a part made of a magnetic material. On the other hand, in very rare cases, human bodies or clothes have a temperature equal to that of an environment such as a road, and it becomes impossible for the human body sensors 3f and 3r to detect an approaching human body.

[0061] Even in such situations in which magnetic sensor 2f and 2r or the human body sensors 3f and 3r become inefficient and cannot work properly, if an abrupt acceleration/deceleration or an abnormal sound is detected, recording is performed at the high frame rate in response to a detection signal of the abrupt acceleration/deceleration or the abnormal sound.

[0062] At the end of driving an automobile each day, the drive record data in the record memory 15 are transferred to the server memory of the management center and the record memory 15 is cleared. The image data in the server memory are played back on a display screen to check the driving state/condition of each day. When the image data are displayed, the compressed image data are decompressed, and the electronic watermark is decoded to check whether the image data are tampered with.

[0063] When an abnormal state such as a state in which an accident occurred is checked, the abnormal state is analyzed based on the additional information associated with the automobile speed and the braking or sensor information output by the four types of abnormal state detection sensors. If image data indicate an occurrence of an abnormal lateral deviation from a normal running path, a further check is performed based on the additional information indicating the automobile speed, the braking condition, the acceleration, and the like as to whether the driver dozes at the wheel or looked aside.

[0064] On the other hand, if the acceleration sensor indicates an occurrence of sudden stopping of the automobile, the image data are checked to analyze the situation in which the sudden stopping occurred. When such an abnormal driving state is detected, effects of driving environmental conditions such as the temperature in the automobile room and the solar radiation may be analyzed.

[0065] Note that many alternative embodiments are possible. For example, in an alternative embodiment, additional sensors such as monitoring cameras, magnetic sensors, or human body sensors may be disposed on both sides of an automobile so that sensing is performed in all directions around the automobile. In another alternative embodiment, a Doppler sensor may be disposed on an automobile to detect an approaching speed of an obstacle and sensor information thereof may be recorded so that the approaching speed of an obstacle can be analyzed from this sensor information when the approaching speed cannot be determined from image data.

[0066] In another alternative embodiment, a moisture sensor for detecting the moisture in the automobile room may be disposed as a driving environmental condition sensor and a steering wheel sensor may be disposed as a driving operation detection sensor. In another alternative embodiment, the microphone serving as the sound sensor may be used not only to detect the sound level but also to record a voice/sound itself. In another alternative embodiment, the tamper protection means for preventing driving record data from being tampered with may encrypt the driving record data or encrypting driving record data after an electronic watermark is embedded into the driving record data.

Claims

1. An automobile drive recorder adapted to continuously take an image of a scene around an automobile by using a monitoring camera (1f, 1r) installed in the automobile, and, if a detection signal indicating an occurrence of an abnormal driving state is output by an abnormal state detection sensor, is adapted to record image data of the scene for a period with a particular length around the time of the occurrence of the abnormal driving state, together with additional information associated with the driving state, into a record memory as drive record data, the automobile drive recorder comprising:

- a magnetic sensor (2f, 2r) serving as the abnormal state detection sensor adapted to detect a magnetic field in a close region around the automobile;
- approaching vehicle detection means (26) for detecting an abnormally approaching vehicle by detecting a change at a rate greater than a predetermined value in the signal level of the detection signal output by the magnetic sensor (2f, 2r); and
- frame rate switching means (23) for, if an abnormally approaching vehicle is detected, switching the frame rate at which image data is recorded in a record memory (15) from a normal low frame rate to a high frame rate and maintaining the high frame rate for a predetermined period.

2. The recorder according to Claim 1, wherein the approaching vehicle detection means (26) are adapted to determine whether an abnormal state has occurred, based on a change in the detection signal of the magnetic sensor (2f, 2r) relative to a predetermined-period moving average of the detection signal of the magnetic sensor (2f, 2r).

3. The recorder according to Claim 1 or 2, wherein the magnetic sensor (2f, 2r) has a sensitivity sufficiently high to sense a magnetic field with a strength similar to the strength of a geomagnetic field.

4. The recorder according to any of Claims 1 to 3, further comprising a human body sensor (3f, 3r) in addition to the magnetic sensor (2f, 2r) as an additional abnormal state detection sensor, adapted to detect a human body at a location in a close region around the automobile, wherein the frame rate switching means (23) are adapted to switch the frame rate in response to a detection signal output by the human body sensor (3f, 3r).

5. The recorder according to Claim 4, further comprising signal interruption means (27) for interrupting transmission of the detection signal of the human body sensor (3f, 3r) during a period from a predetermined time after a stop of the automobile to a time at which the automobile restarts to move.

6. The recorder according to any of Claims 1 to 5, wherein the additional information includes date/time information output by a clock (10), sensor information output by the abnormal state detection sensor (2f, 2r; 3f, 3r;5f, 5r; 4), and sensor information output by one or more driving operation sensors (6,7) adapted to detect a state of a driving operation performed by a driver, the driving operation sensors (6, 7) including at least an automobile speed sensor (6).

7. The recorder according to any of Claims 1 to 6, wherein the additional information includes position information output by a GPS receiver (11) and indicating the position of the automobile.

8. The recorder according to any of Claims 1 to 7, wherein the additional information includes sensor information output by one or more driving environment detection sensors (8, 9) adapted to detect driving environment conditions in an automobile room, the driving environment detection sensors (8, 9) including at least a temperature sensor (8).

9. The recorder according to any of Claims 1 to 8, wherein the record memory (15) is capable of being cleared and has a storage capacity that allows it to store all drive record data at the low and high frame rates for a period until the record memory (15) is cleared.

10. The recorder according to any of Claims 1 to 9, wherein the drive record data stored in the record memory (15) are processed so as to prevent the drive record data from being tampered with.

11. The recorder according to any of Claims 1 to 10, wherein the record memory (15) has a storage capacity that allows it to store all drive record data of continuous driving for at least 12 hours at the low and high frame rates.

FIG. 1

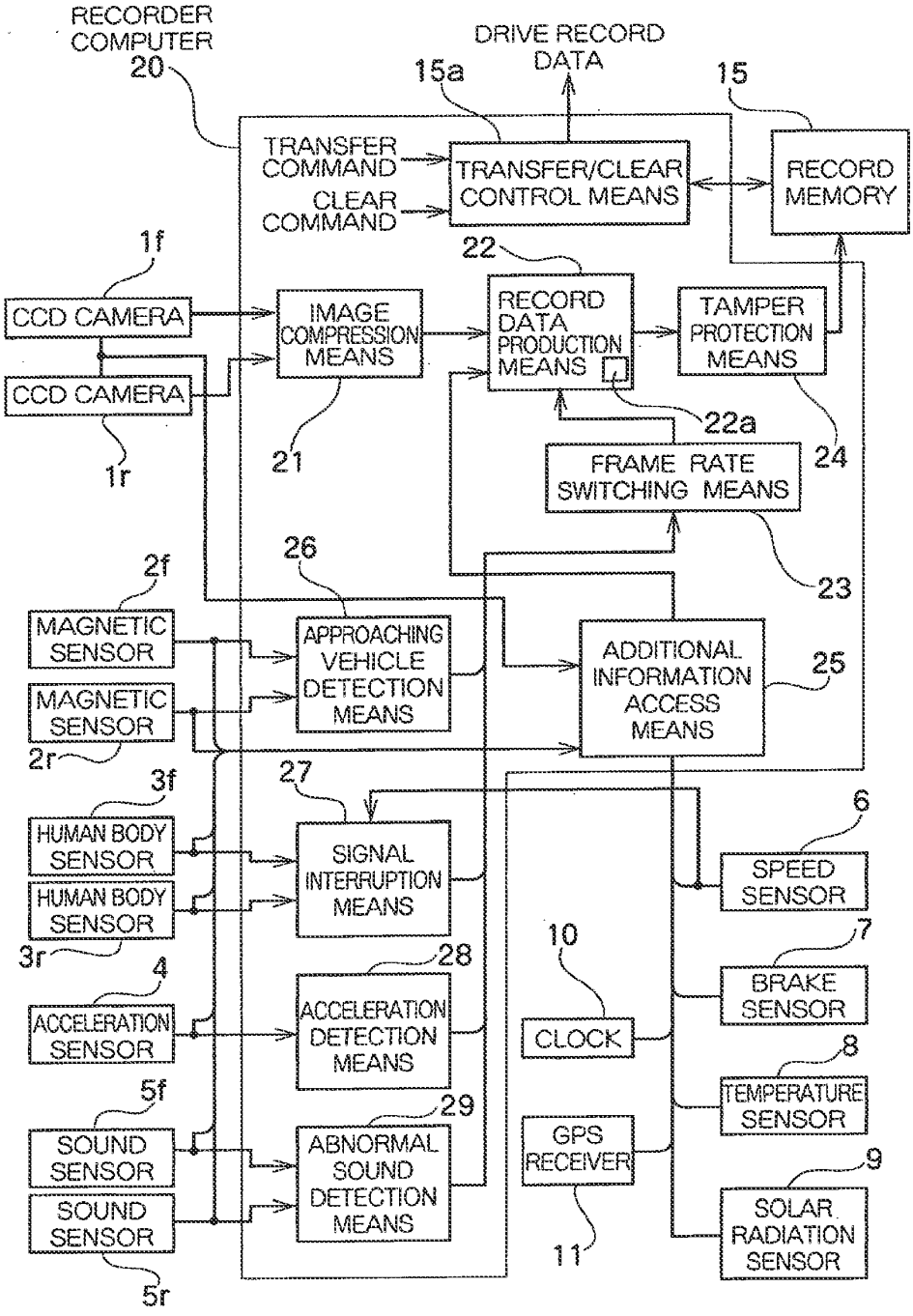

RECORDER COMPUTER
20
DRIVE RECORD DATA
15a
15
TRANSFER COMMAND
CLEAR COMMAND
TRANSFER/CLEAR CONTROL MEANS
RECORD MEMORY
1f
CCD CAMERA
CCD CAMERA
1r
IMAGE COMPRESSION MEANS
21
22
RECORD DATA PRODUCTION MEANS
22a
TAMPER PROTECTION MEANS
24
FRAME RATE SWITCHING MEANS
23
26
2f
MAGNETIC SENSOR
MAGNETIC SENSOR
2r
APPROACHING VEHICLE DETECTION MEANS
ADDITIONAL INFORMATION ACCESS MEANS
25
27
3f
HUMAN BODY SENSOR
HUMAN BODY SENSOR
3r
SIGNAL INTERRUPTION MEANS
6
SPEED SENSOR
10
7
BRAKE SENSOR
28
4
ACCELERATION SENSOR
ACCELERATION DETECTION MEANS
CLOCK
8
TEMPERATURE SENSOR
5f
29
SOUND SENSOR
SOUND SENSOR
5r
ABNORMAL SOUND DETECTION MEANS
GPS RECEIVER
9
11
SOLAR RADIATION SENSOR

FIG. 2

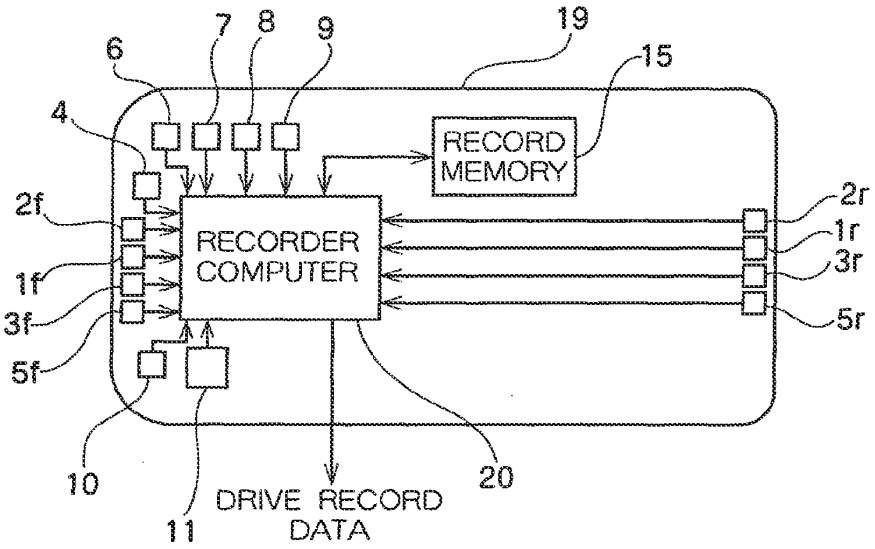

6
7
8
9
19
15
4
RECORD MEMORY
2f
RECORDER COMPUTER
2r
1r
3r
1f
3f
5f
5r
10
11
DRIVE RECORD DATA
20

FIG. 3

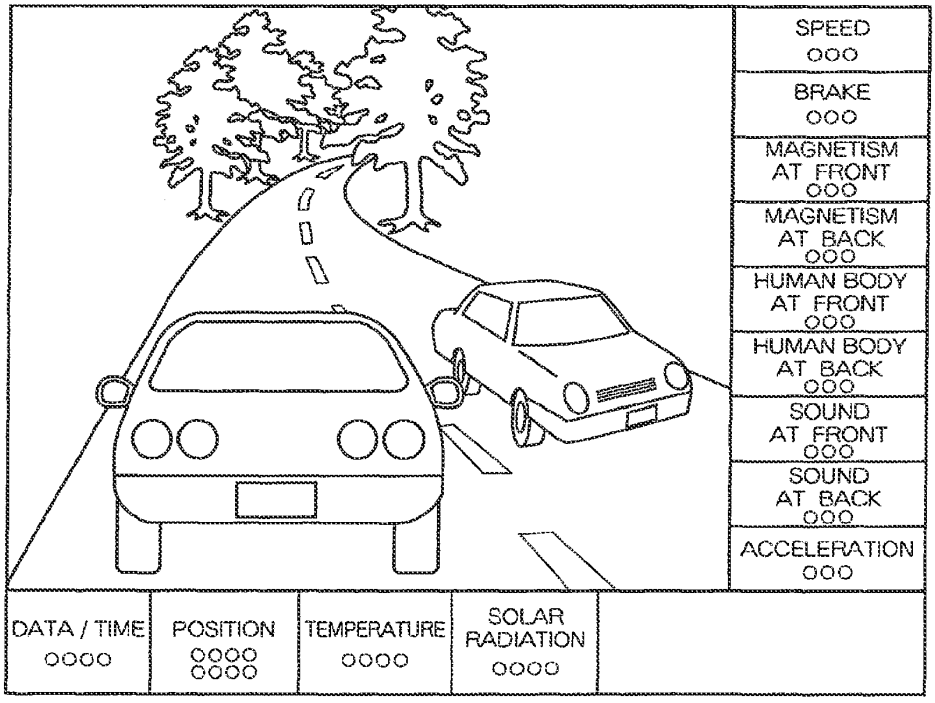
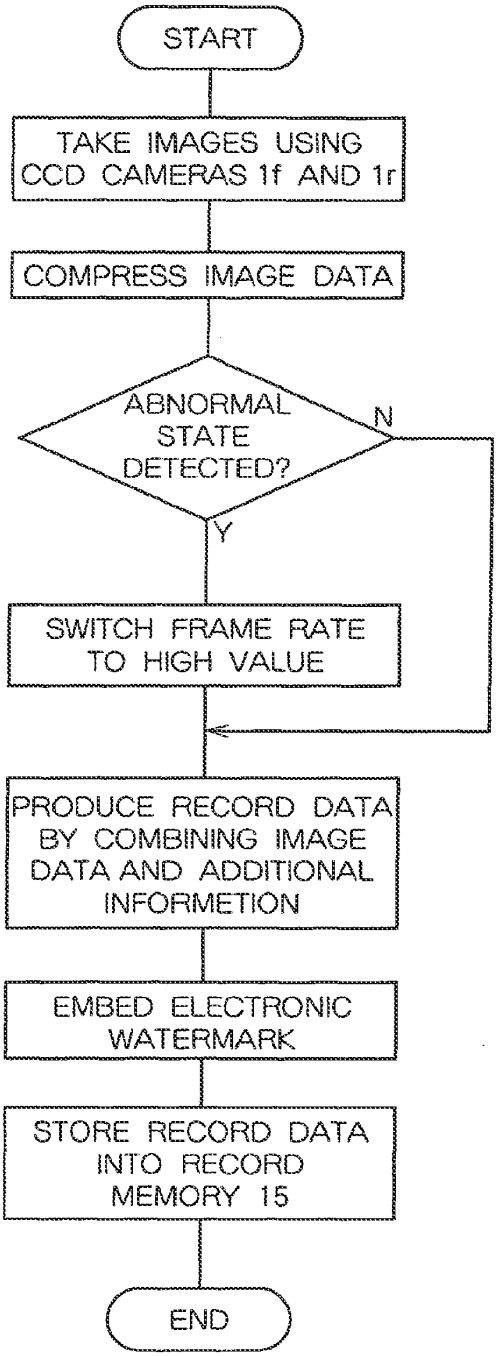

SPEED
BRAKE
MAGNETISM AT FRONT
MAGNETISM AT BACK
HUMAN BODY AT FRONT
HUMAN BODY AT BACK
SOUND AT FRONT
SOUND AT BACK
ACCELERATION
DATA / TIME
POSITION
TEMPERATURE
SOLAR RADIATION

FIG. 4


START
TAKE IMAGES USING CCD CAMERAS 1f AND 1r
COMPRESS IMAGE DATA
ABNORMAL STATE DETECTED?
N
Y
SWITCH FRAME RATE TO HIGH VALUE
PRODUCE RECORD DATA BY COMBINING IMAGE DATA AND ADDITIONAL INFORMETION
EMBED ELECTRONIC WATERMARK
STORE RECORD DATA INTO RECORD MEMORY 15
END

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2000006854 A **[0002] [0010]**
- JP 2003203285 A **[0005] [0010]**
- JP 2005057661 A **[0007] [0010]**
- JP 2001063500 A **[0008] [0012]**
- JP 11183613 A **[0009] [0013]**

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Title: **RADIO TERMINAL, IN-VEHICLE RADIO TERMINAL HOLDER, SERVER AND DRIVE RECORDER SYSTEM**

Japanese Patent JP2008244674 Kind Code: A

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Abstract: PROBLEM TO BE SOLVED: To provide a drive recorder system which is to be easily spread at a low cost and accelerates the utilization of a public mode function further.

SOLUTION: The radio terminal comprises a photographing part 110 for continuously photographing still images or moving images, a terminal storage part 120 for successively storing photographed data, a terminal communication part 114 for communicating with the server, an acceleration sensor 116 for detecting an accident, and a terminal control part 112. When detecting the accident by the acceleration sensor 116, the terminal control part 112 continues photographing by the photographing part 110 for at least the prescribed time further from the time of detecting the accident, stores the photographed data in the terminal storage part 120, and transmits the data photographed before and after the time of detecting the accident and stored in the terminal storage part 120 to the server 200 using the terminal communication part 114.

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Related Results for **RADIO TERMINAL, IN-VEHICLE RADIO TERMINAL HOLDER, SERVER AND DRIVE RECORDER SYSTEM - KYOCERA CORP**:

1. Radio Holder — Gut Belts, Axe Sheaths, **Radio** Straps. Great Online Pricing. www.paulconwayshields.com
2. On The Radio Radio — Listen to On The **Radio Radio** 100% Free toolbar! Radio.Radiopt.com
3. Holder Radio Up To -75% — Buy cheap **Holder Radio** & save now at BEST-PRICE.com: the shop expert! www.Holder-Radio.BEST-PRICE.com
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Inventors: Takahashi, Naoto

Application Number: JP2007000080303

Publication Date: 10/09/2008

Filing Date: 03/26/2007

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Assignee: KYOCERA CORP

International Classes: *H04M1/00, B60R21/00, G07C5/00, H04B7/26, H04N5/225, H04N5/915, B62D41/00, G08G1/00*

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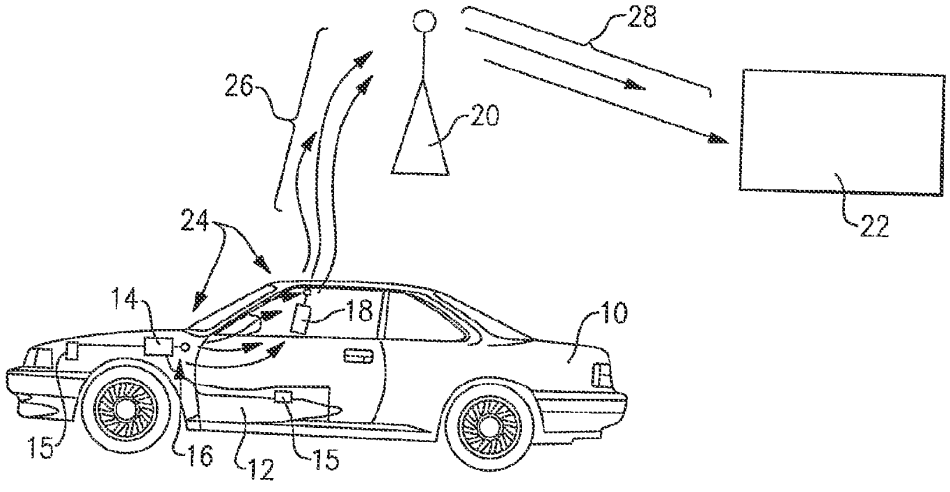
(74) Agent: **SLENZAK, Laura M.**; Siemens Corporation, 170 Wood Avenue South, Iselin, NJ 08830 (US).

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[Continued on next page]

(54) Title: VEHICLE PERFORMANCE DATA COMMUNICATION LINK



(57) Abstract: A method and device for communicating data indicative of vehicle performance includes a method of generating a low frequency wireless link, such as a bluetooth transmission, between a module within a vehicle and a cellular communication device disposed within that vehicle. The cellular communication device such as a cell phone is part of a network thereby eliminating the need to create an additional network connection with the vehicle. Data indicative of vehicle operating conditions is transmitted through the cellular network to a remote facility for processing, scheduling and notification of an operator. The wireless link between the module disposed within the vehicle and a wireless communication device provides for early notification and scheduling of maintenance of the vehicle to maintain desired operating parameters and conditions .

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Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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VEHICLE PERFORMANCE DATA COMMUNICATION LINK

CROSS REFERENCE TO RELATED APPLICATION

The application claims priority to U.S. Provisional Application No. 60/683,541 filed May 20, 2005 and U.S. Provisional Application No. 60/702,522 filed July 26, 2005.

BACKGROUND OF THE INVENTION

This invention generally relates to vehicle diagnostic systems. More particularly, this invention relates to a method of communicating vehicle diagnostic information to a remote location.

Automobiles and other modern vehicles are controlled at least partially by electronic controls that receive information from a plurality of sensors and other devices installed throughout the vehicle. A controller receives information from the sensors that is utilized to control the vehicle operations. Further, the controller utilizes the sensors to detect faults in various operating systems. The controller typically includes a connection port where a diagnostic computer can be connected to receive information indicative of vehicle performance or fault conditions such as a trouble code, for example. The information received from the controller such as the trouble code aids a technician in service and repair of the vehicle.

Disadvantageously, vehicle performance parameters such as the trouble codes that are communicated through the physical connection made between the diagnostic computer and the controller require an operator to bring the vehicle to a service center. Failure of a vehicle system is often predictable based on changes in performance parameters. Shifts in operating performance are not necessarily detectable by an operator and therefore can go unnoticed. In many instances, the fault is not of such a magnitude as to alert an operator, and continues without remedy. As appreciated, small problems easily fixed, if unattended can result in large problems that are more difficult and costly to remedy.

Accordingly, it is desirable to design and develop a diagnostic system that provides early notification of a possible failure of a vehicle system.

SUMMARY OF THE INVENTION

An example vehicle performance data link includes a device that is disposed within the vehicle that collects information indicative of vehicle performance. This information is then transmitted through a low frequency wireless link to a wireless communication device such as a cellular phone disposed within the vehicle. The cellular phone transmits this information through to a central customer care or maintenance facility where this data is processed.

The example method utilizes an existing cellular or other wireless communication link to transmit information indicative of vehicle conditions. In this manner a separate communication device and link is not required to be installed within a vehicle. Instead the vehicle will include a device that will transmit through a low frequency wireless link data indicative of vehicle performance to the existing communication device. The communication device such as a cellular phone utilized by the operator of the vehicle is then utilized to transmit through a cellular network or other communication network the vehicle performance data to a central facility. The central facility will then utilize the vehicle performance data to determine if maintenance is required.

The determination of maintenance can be simply communicated to the operator of the vehicle that a detected trouble code has been transmitted and the vehicle requires services. Further, raw data indicative of vehicle performance may also be transmitted and then analyzed at the central location to determine if maintenance is required within a desired time period. In this way, preventive maintenance can be scheduled and performed prior to a failure of a vehicle system that would require and causes undesired and unscheduled down time.

Accordingly, the system and method according to this invention utilizes existing communication devices to transmit vehicle performance data utilized to communicate trouble codes and schedule maintenance to prevent undesired and unscheduled vehicle failures.

These and other features of the present invention can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic representation of a vehicle including an example device according to this invention.

Figure 2 is a schematic representation of a system and method according to this invention for communicating vehicle diagnostic information to a central location.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figure 1, an example vehicle 10 is illustrated including a vehicle system 12 such as an engine, transmission or suspension system. The system 12 is monitored by a plurality of sensors 15 or other devices that obtain and measure data that is indicative of performance and operation of the vehicle 10. This information is routed to a module 14. The example module 14 includes a low frequency (LF) antenna 16. The LF antenna 16 generates a low frequency link with a communication device disposed within the vehicle 10. In the illustrated example communication device is a cellular phone 18 carried by an operator of the vehicle. The cellular phone 18 provides a link to a communication network 20. The communication network 20 then transmits a signal to a desired remote location 22. The remote location 22 can be a service center or any other center that is designed and set up to receive the data sent from the vehicle 10.

The example module 14 receives data indicative of vehicle performance and can either pass along this data or generate a data trouble code that is indicative of a defined fault condition of one of the vehicle systems 12. This data is transmitted to the remote location 22 through the cellular network 20 and is communicated to a dealer or other maintenance facility.

The example module 14 generates a low frequency wireless link such as a Bluetooth transmission. This LF transmission is of a configuration that is common to many devices. The cellular phone 18 is configured to receive such communications. As appreciated, the low frequency wireless link such as the Bluetooth communication is designed to provide a communication link to other such capable devices within a limited area. Accordingly, the module 14 is not required to include the devices or systems that are required to communicate with the cellular

network 20. Further, most cellular networks 20 require a paid subscriptions or other identification requiring a subscription and incurring an additional cost. The module 14 communicates with an existing cellular device such as the cell phone 18 that already includes a subscription thereby eliminating the requirement for an additional subscription and cellular network communication device.

The example module 14 will upon receipt of a data trouble code or other information that is indicative of a vehicle fault condition generate a signal to link with the cellular phone 18 or other compatible portable communication device. If the cell phone 18 is in use by the operator such a link will not be made or completed. However, once the cellular phone 18 is not in use the module 14 will generate the link and transmit the data trouble code or other data indicative of vehicle performance through to the wireless communication device 18.

Once the cell phone 18 has received this information, the information is automatically forwarded through the cellular network 20 to the remote location 22. Forwarding of data through the cellular phone 18 may also be selected by the operator, as a prompt. The cellular phone 18 will prompt the user to allow the user to determine if sending such a communication is desired. Further, the transmission including the data may be stored for transmission in selected desired intervals.

Once the transmission including the data indicative of vehicle performance is received at the remote location 22, the detected data trouble code can be translated and a notification to the vehicle operator or owner can be made to schedule maintenance or otherwise communicate the vehicle fault to the operator. This advanced vehicle fault detection and communication provides early detection of potential problems with the vehicle. The advanced early warning provides for early preventive maintenance that can substantially eliminate and reduce the frequency of costly repairs caused by ignoring or not detecting problems at early stages.

The diagnostic system of this example can be part of a warranty service. If the vehicle is under warranty the communication link between the module 14 through the cellular phone 18 and cellular network 20 can be automatically conducted such that the operator is not required to make any selection or be involved with the communication in any way. The diagnostic download of the data trouble code will be free of charge to the customer as part of the vehicle warranty. This will

allow the dealer to be proactive in the maintenance of the vehicle to improve customer satisfaction and performance of the vehicle under warranty.

In another example method, a vehicle not under warranty may still communicate vehicle performance information for diagnosis and maintenance by a dealership or other remote maintenance facility. The module 14 generates and creates the wireless link with the cellular phone 18 and then prompts the operator if the detected trouble code should be forwarded to the remote location 22 for processing by a maintenance center or customer care facility. The download of information and the resulting diagnosis may be a service provided by a dealership or central facility for a charge to the operator. An operator would incur the charge to alert a maintenance facility or dealership of the current failures to expedite repair and maintain the vehicle in a desired operating condition.

Referring to Figure 2 another example method utilizes the module 14 within the vehicle 10 to transmit raw data indicative of operation. The example vehicle 10 can be part of a fleet operated by a commercial carrier. As appreciated, a commercial carrier operates many vehicles to provide consistent and reliable delivery. Any unexpected vehicle failures create undesired down times for the equipment which incurs additional undesired costs. Further many carriers ship and transport items that are perishable and that can be detrimentally affected by unexpected vehicle failures.

The system schematically illustrated in Figure 2 includes the vehicle 10 that includes the module 14 and the LF transmitter 16. The module 14 accumulates data indicative of vehicle operating conditions and transmits this information by way of the low frequency wireless link through the low frequency antenna 16 to a Bluetooth, or other low frequency compatible wireless communication device, such as the cellular phone 18. The cellular phone 18 is not part of the vehicle 10 and is of a type typically carried by an operator. By using the existing wireless communication link provided by the cell phone 18, additional subscriptions and devices are not required to be installed in the vehicle.

The low frequency transmitter provides communication within a localized area with other LF compatible devices. Data received from the control module 14 by the cellular phone 18 is then transmitted through the cellular network 30 to the

remote location 22. The remote location 22 includes a data analysis device 34. The data analysis device 34 utilizes known vehicle operation parameters to compare the actual data received from a vehicle to determine if a failure condition or future failure condition exists. The continual prognostic procedure aids in preventing unexpected vehicle failures.

As appreciated, in many instances vehicle operating parameters will indicate the future failure condition of a specific vehicle system. Analysis can provide for the scheduling of maintenance for such systems to prevent vehicle operations from being affected. The advanced notice of potential failure modes is utilized to schedule maintenance of the vehicle.

Accordingly, the method and system of this invention provides for the early detection and communication of vehicle operating conditions and potential problems through an existing cellular communication link without the need for additional subscriptions or costs incurred by additional transmitters disposed within a vehicle. Further, the method utilizes an existing cellular network and wireless link compatibility to provide a predictive method of maintaining desired vehicle operation.

Although a preferred embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

CLAIMS

1. A method of communicating data indicative of vehicle performance comprising the steps of:

a) detecting data indicative of a vehicle condition;

b) detecting a presence of a communication device in proximity to the vehicle;

c) communicating with the communication device the data indicative of a vehicle condition; and

d) sending a signal communicating the data to a remote location with the communication device

2. The method as recited in claim 1, wherein step a) comprises detecting a data trouble code.

3. The method as recited in claim 1, including the step of determining if the communication device is in use, and performing the step c) responsive to the communication device not being in use.

4. The method as recited in claim 1, wherein the communication device comprises a cellular phone.

5. The method as recited in claim 1, wherein the remote location comprises a maintenance facility.

6. The method as recited in claim 1, wherein step d) comprises sending the signal to a customer care center responsive to the vehicle being within a warranty period.

7. The method as recited in claim 1, wherein step d) comprises sending the signal to a customer care center responsive to operator approval.

8. The method as recited in claim 1, wherein step d) comprises sending the signal including vehicle identification information.

9. The method as recited in claim 1, wherein the communications device and the controller communicate through a short range wireless connection.

10. The method as recited in claim 1, wherein the remote location includes a system for predicting a probability of failure based on the data indicative of vehicle condition.

11. A method of reporting a data trouble code comprising the steps of:

a) detecting a data trouble code for a vehicle;

b) generating a wireless link between a controller of the vehicle and a wireless communications device proximate to the vehicle;

c) transmitting a first signal from the controller to the wireless communication device including the data trouble code; and

d) transmitting a second signal from the wireless communications device to a customer care center.

12. The method as recited in claim 11, wherein step b) comprise checking that the wireless communications device is not in use and generating the wireless link responsive to the wireless communications device not being in use.

13. The method as recited in claim 11, wherein the first signal is a wireless link comprises a short range wireless connection.

14. The method as recited in claim 11, wherein the wireless communication device comprising a cellular phone.

15. The method as recited in claim 11, wherein step d) comprises transmitting the second signal responsive to an operator approving the transmission.

16. The method as recited in claim 11, including the step of assessing a fee to an operator for transmitting the second signal to a customer care center.

17. A method of maintaining a vehicle comprising the steps of:

a) monitoring vehicle performance data indicative of current operating performance;

b) communicating the performance data to a wireless communications device proximate to the vehicle;

c) communicating the performance data from the wireless communication device to a remote location; and

d) identifying a potential failure within a desired time based on the communicated performance data.

18. The method as recited in claim 17, including scheduling preventive maintenance of the vehicle based on the identified potential failure and the desired time.

19. The method as recited in claim 17, wherein the remote location includes a diagnostic system that utilized the performance data to predict a probability of a potential failure.

20. The method as recited in claim 17, wherein the vehicle includes a module for receiving data from the vehicle system and transmitting that data to the wireless communication device.

21. The method as recited in claim 20, wherein the wireless communication device comprises a cellular phone.

22. A system for communicating vehicle performance data comprising:

a module receiving data indicative of performance from at least one vehicle system;

a transmitter for communicating data from the module to a wireless communication device proximate the vehicle; and

a remote location for receiving a transmission from the wireless communication device including data indicative of performance of at least one vehicle system.

23. The system as recited in claim 22, wherein the remote location includes a system for processing data indicative of vehicle performance.

24. The system as recited in claim 23, wherein the system determines a probability of vehicle failure based on data received indicative of vehicle performance.

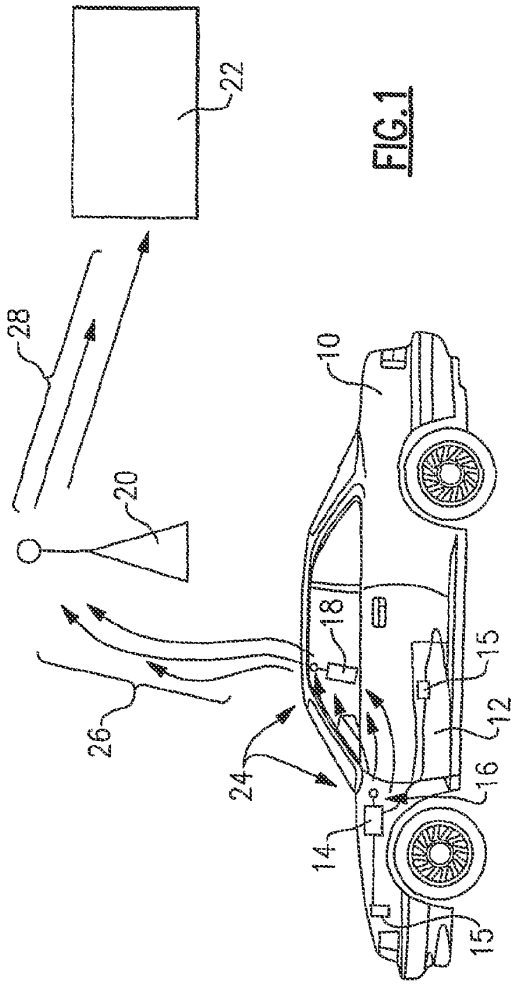

22
28
20
26
24
10
18
15
12
16
14
15

FIG.1

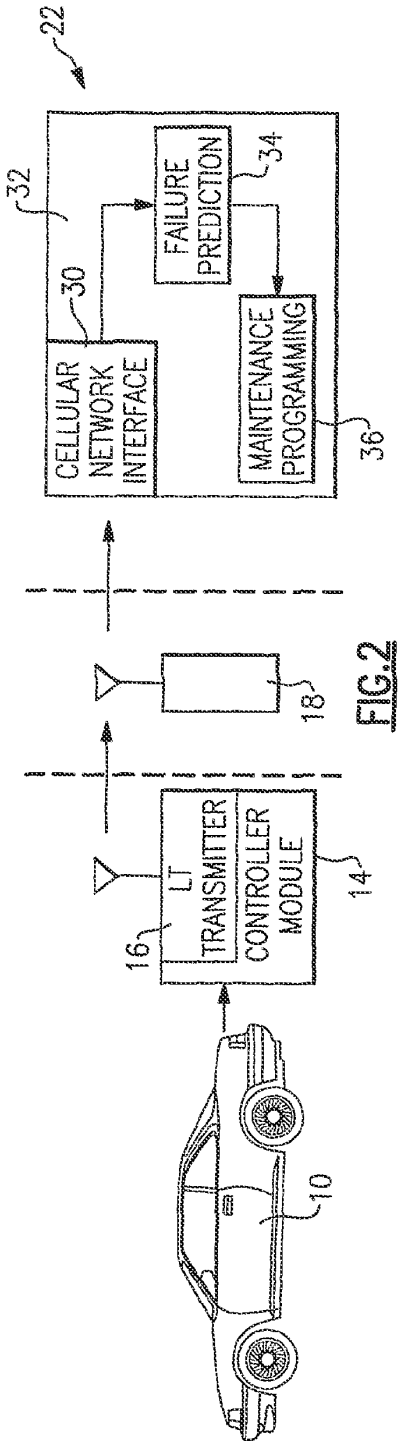

22
32
CELLULAR NETWORK INTERFACE
30
FAILURE PREDICTION
34
MAINTENANCE PROGRAMMING
36
18
LT TRANSMITTER
CONTROLLER MODULE
16
14
10

FIG.2

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2006/019610

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L29/08 H04L12/28 G07C5/00

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)
H04L G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, COMPENDEX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 388 666 A (* FORD GLOBAL TECHNOLOGIES LLC; * FORD GLOBAL TECHNOLOGIES, LLC) 19 November 2003 (2003-11-19) page 6, line 13 - page 7, line 13 page 7, line 31 - page 8, line 7 page 8, line 30 - page 10, line 18 page 11, line 25 - page 12, line 33 page 14, line 25 - page 17, line 34 page 20, line 5 - page 22, line 2	1-24
X	US 2003/114965 A1 (FIECHTER CLAUDE-NICOLAS ET AL) 19 June 2003 (2003-06-19) paragraph [0029] - paragraph [0030] paragraph [0032] - paragraph [0040] paragraph [0052] - paragraph [0057] paragraph [0097] - paragraph [0106]	1-24

-/---

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 October 2006	18/10/2006

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European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Kesting, Volker

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GARG A; DIRLENBACH H; QUADT A: "Enabling Business Opportunities in Post Block Exemption Era - MYCAREVENT" ECHALLENGES E-2004, 27.-29.10.2004, VIENNA, AUSTRIA, 27 October 2004 (2004-10-27), pages 1-8, XP002401957 abstract sections 1., 3. and 4.	4,7-9, 13-15, 20,21,23
A	GEHLEN G; WEISS E; QUADT A: "Service Oriented Middleware for Automotive Applications and Car Maintenance" PROCEEDINGS OF THE 1ST WORKSHOP ON WIRELESS VEHICULAR COMMUNICATIONS AND SERVICES FOR BREAKDOWN SUPPORT AND CAR MAINTENANCE, NICOSIA, CYPRUS, 10 April 2005 (2005-04-10), pages 42-46, XP002401958 abstract section II. figures 2,3	4,9,13, 14,20,21
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Information on patent family members

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(54) Mobile Kommunikationseinheit, Halterung für eine mobile Kommunikationseinheit und Ereignisdatenschreibersystem für Fahrzeuge

(57) Eine erfindungsgemäße Mobile Kommunikationseinheit umfasst:

- mindestens eine Kamera (12) zum Aufnehmen von Ereignisbildern,
- eine Uhr (25) zum Ausgeben eines Datums und/oder einer Uhrzeit,
- mindestens einen Speicher (16) zum Speichern der aufgenommen Ereignisbilder sowie des Datums und/oder der Uhrzeit,
- eine mit der Kamera (12), der Uhr (25) und dem Speicher (16) verbundene Steuereinheit (14), welche aufgenommenen Ereignisbildern Datum und/oder Uhrzeit zuordnet und den Speichervorgang steuert,
- einen Beschleunigungssensor (22) zum Messen von Beschleunigungen und zum Ausgeben von Beschleunigungsdaten oder einen Beschleunigungsdateneingang zum Verbinden mit einem Beschleunigungssensor und
- eine zum Empfang von Beschleunigungsdaten mit dem Beschleunigungssensor (22) oder dem Beschleunigungsdateneingang verbundene und zum Ausgeben eines einen Speichervorgang auslösenden Auslösesignals in Abhängigkeit von den empfangenen Beschleunigungsdaten ausgestaltete Auslöseeinheit (15).

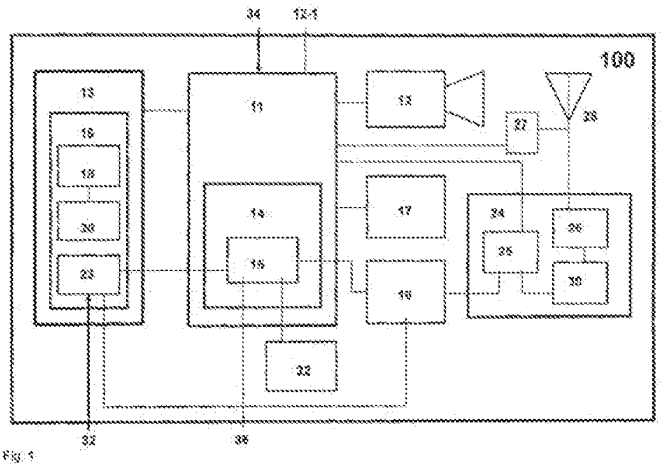


Fig. 1

EP 1 615 178 A2

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Beschreibung

[0001] Die Erfindung betrifft eine mobile Kommunikationseinheit, eine Halterung für eine mobile Kommunikationseinheit sowie ein Ereignisdatenschreibersystem für Fahrzeuge zur Dokumentation von Ereignissen, insbesondere Verkehrsereignissen, welches sowohl Daten und Bilder eines Unfallgeschehens beim Führen oder Halten von Fahrzeugen" als auch Nötigungstatbestände, Parkschäden, und Vandalismusschäden aufzeichnet. Unter Fahrzeugen sollen hierbei nicht nur Kraftfahrzeuge (KFZ) sondern alle Arten von Fahrzeugen, mit denen eine Fortbewegung zu Land, Luft oder Wasser möglich ist, also bspw. auch Fahrräder oder Wasserfahrzeuge, zu verstehen sein.

[0002] Bei Unfällen bspw. mit Kraftfahrzeugen kommt es immer wieder vor, dass es für den Geschädigten schwierig ist, seine Unschuld zu beweisen, den Unfall sachlich richtig darzustellen oder seine Darstellung vor Gericht glaubhaft zu machen. Selbst bei gutem Willen aller Beteiligten ist es oft unmöglich, den Unfallhergang eindeutig zu rekonstruieren, da das individuelle Erleben des Tathergangs vom objektiven Geschehen abweichen kann.

[0003] Da heutzutage Mobiltelefone mit Kameras verbreitet sind und diese in der Regel immer verfügbar sind, ist es im Vergleich zu früher häufiger möglich, nach einem Unfall den Unfallort in Bildern festzuhalten. Derartige Bilder liefern jedoch nur eine Momentaufnahme der Unfallsituation, nachdem diese ihr Endstadium erreicht hat.

[0004] Im Gegensatz zum Straßenverkehr hat es sich im Luftverkehr durchgesetzt, bei Passagierflugzeugen Flugschreiber einzusetzen, die alle wichtigen Daten des Fluges laufend registrieren. Auch bei Kraftfahrzeugen sind Geräte bekannt, die eine Reihe unfallrelevanter technischer Daten, wie z.B. die Beschleunigung und/oder die Geschwindigkeit des Fahrzeuges, die Zeit, etc. registrieren. Solche Geräte sind beispielsweise als Unfalldatenspeicher in Kraftfahrzeugen fest installiert. Im Falle eines Unfalls können die im Unfalldatenspeicher gespeicherten Daten zu Beurteilung des Unfallhergangs herangezogen werden und in einem juristischen Verfahren als Mittel zur Glaubhaftmachung verwendet werden.

[0005] Für die Beurteilung eines Unfallherganges sind insbesondere visuell wahrnehmbare Daten, also Bilder, von hoher Aussagekraft. Sie erlauben in den meisten Fällen eine Beurteilung des Verhaltens der Verkehrsteilnehmer in der Situation, die zu dem Unfall geführt hat, ohne dass es einer Auswertung der Daten durch einen Fachmann bedarf. Geräte, die sowohl Bild-, als auch beispielsweise Beschleunigungsdaten speichern, sind ebenfalls bekannt. In DE 42 21 280 und DE 198 27 622 sind Vorrichtungen zum Abspeichern von Videobildern zur Dokumentation von Verkehrssituationen bzw. zur Unfallregistrierung beschrieben, bei denen für die Verkehrssituation relevante Daten in einem temporären Speicher gespeichert werden und auf ein Auslösesignal hin in einen permanenten Speicher übertragen werden. Beschleunigungssensoren überwachen die Fahrzeugbeschleunigungen und veranlassen bei Überschreiten einer bestimmten Beschleunigungsschwelle die Ausgabe des Auslösesignals. Zu den gespeicherten Daten gehören u.a. auch Datums- und Zeitangaben.

[0006] Gegenüber dem Stand der Technik ist es sowohl Aufgabe der vorliegenden Erfindung, eine vorteilhafte mobile Kommunikationseinheit mit erweitertem Anwendungsspektrum zur Verfügung zu stellen.

[0007] Eine weitere Aufgabe der vorliegenden Erfindung ist es, eine vorteilhafte Fahrzeughalterung für eine mobile Kommunikationseinheit mit Kamera zur Verfügung zu stellen.

[0008] Außerdem ist es eine Aufgabe der vorliegenden Erfindung, ein vorteilhaftes Ereignisdatenerfassungssystem für Fahrzeuge zur Verfügung zu stellen.

[0009] Diese Aufgabe wird durch eine mobile Kommunikationseinheit nach Anspruch 1, die zweite Aufgabe durch eine Fahrzeughalterung nach Anspruch 25 und die dritte Aufgabe durch ein Ereignisdatenschreibersystem nach Anspruch 31 gelöst. Die abhängigen Ansprüche enthalten vorteilhafte Ausgestaltungen der Erfindung.

[0010] Im Folgenden soll ausschließlich Bezug genommen werden auf den die Ereignisdatenaufzeichnung betreffenden Teil der mobilen Kommunikationseinheit.

[0011] Eine erfindungsgemäße mobile Kommunikationseinheit umfasst mindestens eine Kamera zum Aufnehmen von Bildern, welche im Folgenden Ereignisbilder genannt werden sollen. Außerdem umfasst die erfindungsgemäße mobile Kommunikationseinheit eine Uhr zum Ausgeben eines Datums und/oder einer Uhrzeit, mindestens einen Speicher zum Speichern der aufgenommenen Ereignisbilder sowie des Datums und/oder der Uhrzeit und eine mit der Kamera, dem Speicher und dem Uhrenmodul in Verbindung stehende Steuereinheit, welche aufgenommenen Ereignisbildern Datum und/oder Uhrzeit zuordnet und den Speichervorgang steuert. Als mobile Kommunikationseinheit kommen dabei alle Formen von tragbaren Kommunikationseinheiten, bspw. Notebooks, PDAs (Personal Digital Assistant), insbesondere aber Mobiltelefone in Frage. Die erfindungsgemäße mobile Kommunikationseinheit zeichnet sich dadurch aus, dass sie einen Beschleunigungssensor zum Messen von Beschleunigungen und zum Ausgeben von Beschleunigungsdaten oder einen Beschleunigungsdateneingang zum Verbinden mit einem Beschleunigungssensor sowie eine zum Empfang von Beschleunigungsdaten mit dem Beschleunigungssensor oder dem Beschleunigungsdateneingang verbundene und zum Ausgeben eines einen Speichervorgang auslösenden Auslösesignals in Abhängigkeit von den empfangenen Beschleunigungsdaten ausgebildete Auslöseeinheit aufweist. Die Auslöseeinheit kann beispielsweise als eigener Mikroprozessor realisiert sein oder kann in die Steuereinheit integriert sein. Zudem ist es möglich, die Auslöseinheit in Form einer geeigneten Software zu realisieren. Das Auslösesignal kann bspw. bei Erreichen oder Überschreiten einer Beschleunigungs-

schwelle ausgegeben werden.

[0012] Optional kann die mobile Kommunikationseinheit eine oder mehrere Erfassungseinheiten aufweisen oder mit solchen verbindbar sein, mit denen sich Ereignisdaten, etwa die Fahrzeuggeschwindigkeit, die Bremsfunktion, die Fahrzeugbeleuchtung, Lenkbewegungen, Beschleunigungsverläufe etc. erfassen lassen. Die Ereignisdaten können von der Steuereinheit den Ereignisbildern zugeordnet und in Kombination mit den Ereignisbildern gespeichert werden. Dabei ist es auch möglich, die Ereignisdaten den Ereignisbildern in Form graphischer Darstellungen zuzuordnen bzw. die Ereignisbilder in Form graphischer Darstellungen zu speichern. Wenn im Folgenden von Ereignisbildern die Rede ist, soll daher auch immer der Fall mit umfasst sein, dass ggf. weitere Ereignisdaten erfasst und gespeichert werden, auch wenn die Ereignisdaten keine explizite Erwähnung findet.

[0013] Die erfindungsgemäße mobile Kommunikationseinheit bietet in Verbindung mit einer geeigneten Fahrzeughalterung eine Alternative zu Unfalldatenschreibern nach Stand der Technik, die im Fahrzeug fest eingebaut und an die Fahrzeugelektrik angebunden werden. Außerdem erfordern Unfalldatenschreiber nach Stand der Technik in der Regel ein Bedienteil, welches nicht nur Platz im Innenraum des Fahrzeuges, sondern auch einen zusätzlichen Installationsaufwand erfordert. Mobile Kommunikationseinheiten - und insbesondere Mobiltelefone - mit mindestens einer Kamera gehören dagegen heute zur Standardausrüstung des mobilen modernen Menschen, und es ist üblich, dass die mobile Kommunikationseinheit im Fahrzeug in einer Fahrzeughalterung platziert wird, durch welche sie im Fahrzeug fixiert und an eine Freisprecheinrichtung, Außenantenne und Stromversorgung angebunden ist. Außerdem besitzen mobile Kommunikationseinheiten in der Regel ein Bedienteil, beispielsweise in Form einer Tastatur, mit dem Einstellungen vorgenommen werden können.

[0014] Das Ausstatten einer mobilen Kommunikationseinheit mit einem Beschleunigungssensor bzw. einem Beschleunigungsdateneingang und einer Auslöseeinheit zum Ausgeben eines Auslösesignals zur Speicherung von Ereignisbildern führt zu einem integrierten Ereignisdatenrecorder. Dieser ist platzsparend und vermeidet den Erwerb und Einbau eines separaten Unfalldatenschreibers. Außerdem kann dieselbe mobile Kommunikationseinheit in verschiedenen Fahrzeugen Verwendung finden, sofern diese mit einer geeigneten Halterung versehen sind. So kann die mobile Kommunikationseinheit bspw. beim Umsteigen von einem KFZ in ein anderes KFZ aus dem ersten KFZ entfernt und in die Halterung im zweiten KFZ eingesetzt werden.

[0015] Bspw. ein herkömmliches Kamera-Mobiltelefon besitzt außerdem schon einen Teil der Komponenten eines Unfalldatenschreibers, wie Kamera, unabhängige Stromversorgung, Uhr, Mikroprozessor und Speicher oder Speicherkarten, so dass sich redundante Installationen im Fahrzeug vermeiden lassen. Etwa das am Markt befindliche Siemens S65 Business weist die oben genannten Komponenten bereits auf.

[0016] Eine noch bessere Anwendungsmöglichkeit ergibt sich aus der Integration des Ereignisdatenrecorders in ein Dual-Kamera-Mobiltelefon, wie z.B. das Siemens U15. Hierbei können bei geeigneter Positionierung des Hellers sowohl das vordere, als auch das hintere Verkehrsgeschehen und darüber hinaus der Fahrzeuginnenraum erfasst werden.

[0017] Während bekannte Unfalldatenschreiber zur Auswertung entweder ausgebaut oder zumindest Speicher entnommen und an externe Geräte angeschlossen werden müssen, kann bei der erfindungsgemäßen mobilen Kommunikationseinheit die Bildsequenz des Ereignisses ggf. vor Ort wie ein Film im Display der Kommunikationseinheit betrachtet werden. Alternativ kann die mobile Kommunikationseinheit oder ihr Speicher zum Weiterleiten der Daten entnommen werden. Außerdem ist es möglich, die Daten per Kabel oder drahtlos, bspw. per, Infrarot- oder Bluetooth-Verbindung, an einen PC übertragen. Ggf. kann alternativ das Wechselspeichermedium der mobilen Kommunikationseinheit mit einem Lesegerät ausgelesen werden.

[0018] Die erfindungsgemäße mobile Kommunikationseinheit kann zum Einstellen der Uhrzeit entweder eine manuelle Einrichtung oder ein Uhrenmodul mit einem Empfänger zum Empfang eines Funkzeitsignals sowie einer Synchronisationseinheit zum Synchronisieren des Datums und/oder der Uhrzeit mit dem Funksignal aufweisen. Es ist auch möglich, die mobile Kommunikationseinheit gleichzeitig sowohl mit der manuellen Stelleinrichtung als auch mit dem Empfänger und der Synchronisationseinheit auszustatten.

[0019] Quarzgesteuerte Uhrenmodule, welche bisher zum Steuern von Datums- und Zeitstempeln zur Anwendung kommen, haben zwar eine geringe, gleichwohl jedoch existierende Gangungenauigkeit, welche nach längerer Zeit durchaus im Bereich von mehreren Sekunden liegen kann. Bei Unfällen, bei denen es auf die genaue Abfolge zeitlich relevanter Faktoren ankommt, kann diese Ungenauigkeit unter Umständen jedoch nicht mehr zu vernachlässigen sein. Als Beispiel sei hier etwa der Nachweis einer bestimmten Ampelphase während des Unfallzeitpunktes genannt. Zudem sind diese Uhrenmodule nicht oder nur mit entsprechender Softwaresteuerung in der Lage, eine automatische Umschaltung zwischen Sommer- und Winterzeit vorzunehmen. Außerdem weisen Quarzuhren eine externe Einstellmöglichkeit auf, um die Gangungenauigkeit ausgleichen, d.h. die Uhr stellen zu können. Derartige externe Zugriffsmöglichkeiten bieten jedoch auch die Möglichkeit der Manipulation, indem z.B. ein selbstverschuldeter Unfall zu einem späteren Zeitpunkt noch einmal mit für den Anwender günstigeren Voraussetzungen nachgestellt wird und dabei die Uhr auf diejenige Zeit eingestellt wird, bei der der ursprüngliche Unfall stattgefunden hat.

[0020] Die Manipulierbarkeit der gespeicherten Daten ist im Vergleich zu Ereignisdatenschreibern mit Quarz-

uhren deutlich verringert, wenn der Datums- und Zeitstempel mit einer Kennung versehen wird, die ausweist, ob es sich bei der protokollierten Zeit um die manuell eingestellte, oder über Funksignal erlangte Zeit handelt. Die Stelleinrichtung kann in der erfindungsgemäßen mobilen Kommunikationseinheit darüber hinaus vorzugsweise auch die Steuerung der Uhr übernehmen.

[0021] Mit Hilfe der funkgesteuerten Stelleinrichtung lässt sich außerdem ein automatisches Umschalten zwischen Sommer- und Winterzeit realisieren, ohne dass die Stelleinrichtung dazu eine besondere Software benötigte oder der Benutzer das Umstellen per Hand vornehmen müsste.

[0022] Vorteilhaft ist die erfindungsgemäße mobile Kommunikationseinheit mit der aufgrund der Synchronisation mit dem Funkzeitsignal ganggenauen Uhr auch im Hinblick auf die Möglichkeit, die Echtheit von Daten im zeitlichen Zusammenhang zu bestätigen. Dies kann beispielsweise für das Verifizieren der Ampelphase über einen Plausibilitätsabgleich mit den Daten der zuständigen Verkehrsleitzentrale, wo die Ampelphasen in Form von Dateien und Ampelschaltplänen protokolliert vorliegen, von Bedeutung sein.

[0023] Das Uhrenmodul kann zusätzlich einen quarzgesteuerten Freilaufmodus aufweisen. So kann es bei einem vorübergehenden Verlassen des Sendebereichs des Funkzeitsignals in den quarzgesteuerten Freilaufmodus übergehen und damit auch dann, wenn das Funkzeitsignal nicht empfangen werden kann, eine hinreichende Genauigkeit der Datums- und/oder Zeitangabe gewährleisten. Sobald das Funkzeitsignal wieder empfangen werden kann, kann dann das Uhrenmodul gegebenenfalls wieder gestellt werden bzw. kann die Steuerung des Uhrenmoduls wieder von der Stelleinrichtung übernommen werden.

[0024] In einer vorteilhaften Weiterbildung der erfindungsgemäßen mobilen Kommunikationseinheit ist die Stelleinrichtung zum Empfang einer Mehrzahl von Empfangsfrequenzen ausgestaltet. Dies kann beispielsweise dadurch realisiert sein, dass die Stelleinrichtung mehrere Empfänger umfasst. Alternativ ist es auch möglich, die Stelleinrichtung mit einem Empfänger auszustatten, welcher sich auf verschiedene Empfangsfrequenzen einstellen lässt. Dabei ist es auch möglich, dass der Empfänger einen automatischen Suchlauf aufweist, mit dem er jeweils dasjenige Funkzeitsignal einstellt, welches (am Besten) zu empfangen ist. Mit der beschriebenen Weiterbildung kann der integrierte Ereignisdatenschreiber problemlos auch im Ausland mit funkgenauer Zeit funktionieren werden, wo die Funkzeitsignale auf anderen Frequenzen gesendet werden.

[0025] Um die Authentizität einzelner Ereignisdateneinheiten, beispielsweise einzelner Bilder, besser dokumentieren zu können, kann die Steuereinheit derart ausgestaltet sein, dass sie jedem einzelnen Ereignisbild ein Datum und/oder eine Uhrzeit und/oder ein Kennungssignal für das empfangene Funkzeitsignal zuordnet.

[0026] Um Eingriffe in die Elektronik der mobilen Kommunikationseinheit erkennbar zu machen, können das Uhrenmodul, die Steuereinheit und der Speicher in einem versiegelten oder verplombten Gehäuse angeordnet sein.

[0027] In einer vorteilhaften Weiterbildung der mobilen Kommunikationseinheit umfasst diese einen Referenzspeicher zum Speichern ereignistypischer Beschleunigungsverläufe, d.h. ereignistypischer Veränderungen der Beschleunigung über eine bestimmte Zeitspanne. Die Auslöseeinheit ist dann derart ausgestaltet, dass sie die erfassten Beschleunigungsdaten mit den im Referenzspeicher gespeicherten Beschleunigungsverläufen vergleicht und in Abhängigkeit vom Vergleichsergebnis ein Auslösesignal ausgibt oder nicht.

[0028] Während bei der beschriebenen Weiterbildung der mobilen Kommunikationseinheit das Speichern der Ereignisbilder (und ggf. von Ereignisdaten) durch einen bestimmten Beschleunigungsverlauf ausgelöst wird, erfolgt das Auslösen der Aufnahme im Stand der Technik bei Überschreiten eines Beschleunigungsschwellenwertes. Es ist bekannt, dass Unfallereignisse mit einem Anstoß rund eine Zehntelsekunde dauern. Innerhalb dieser Zeit steigen die Beschleunigungskräfte (G-Kräfte) extrem an, bevor sie im Rahmen der Auslaufbewegung wieder abfallen. Sämtliche andere Situationen im Straßenverkehr, beispielsweise starkes Bremsen, abruptes Ausweichen, aber auch das Treffen einer Bordsteinkante beim unvorsichtigen Einparken, haben eine völlig andere, wesentlich langsamere Anstiegscharakteristik. In all diesen Fällen kann jedoch ein relativ hoher Beschleunigungswert erreicht werden. Bei sportlich ambitionierten Fahrern können zudem hohe Beschleunigungskräfte sowohl in Längs- als auch in Querrichtung des Fahrzeuges aufgrund der Fahrweise aufgebaut werden. Diese können somit bei Ereignisdatenschreibern nach Stand der Technik das Problem haben, dass wiederholt Speicherungen von Ereignisbildern und/oder von Ereignisdaten wegen Überschreitens des Schwellenwertes aufgrund der sportlichen Fahrweise ausgelöst werden, obwohl es zu keinem relevanten Ereignis gekommen ist. Um dies zu vermeiden kann im Stand der Technik die auslösende Beschleunigungsschwelle heraufgesetzt werden, sodass die durch die sportliche ambitionierte Fahrweise auftretenden Beschleunigungskräfte nicht mehr zu einem Auslösen der Speicherung führen. Eine vergleichsweise hoch eingestellte Auslöseschwelle kann jedoch dazu führen, dass an sich speicherungswürdige Ereignisse, wie beispielsweise ein leichter Anstoß, nicht gespeichert werden, weil die beim Abstoß auftretenden Beschleunigungskräfte aufgrund der hohen Auslöseschwelle nicht zum Auslösen der Speicherung führen. Außerdem treten bei sehr schweren Fahrzeugen, wie beispielsweise LKW oder Bussen, aufgrund der viel höheren Trägheit und des bei gleicher Geschwindigkeit höheren Impulses nur vergleichsweise geringe Beschleunigungs- oder Verzögerungskräfte auf. Auch in diesen Fällen kann es daher vorkommen, dass an sich speicherungswürdige Ereignisse aufgrund der gewählten Be-

schleunigungsschwelle nicht zur Speicherung gelangen.

[0029] In der vorteilhaften Ausgestaltung der erfindungsgemäßen mobilen Kommunikationseinheit können dagegen entweder ausschließlich oder zusätzlich zu einer Beschleunigungsschwelle Beschleunigungsverläufe zum Auslösen des Speichems herangezogen werden. Der Vergleich mit einem Beschleunigungsverlauf anstatt nur mit einer Beschleunigungsschwelle, die überschritten werden muss, ermöglicht ein viel präziseres Bestimmen eines speicherungswürdigen Ereignisses. Insbesondere ist es auch möglich, Beschleunigungsverläufe für unterschiedliche Ereignisse bereitzuhalten. So kann beispielsweise auch erreicht werden, dass neben Unfallereignissen auch Nötigungstatbestände, die sich beispielsweise durch abrupte Lenkbewegungen oder hartes Bremsen auszeichnen, zu einem Auslösen der Speicherung führen können.

[0030] Die erfindungsgemäße mobile Kommunikationseinheit kann vorteilhafterweise außerdem eine Eingabeeinrichtung zum Eingeben von ereignistypischen Beschleunigungsverläufen aufweisen. Auf diese Weise kann bspw. vom Fahrer vorab festgelegt werden, welche Ereignisse zu einer Speicherung von Ereignisbildern führen sollen, und welche nicht. Insbesondere können in den Referenzspeicher Beschleunigungsverläufe eingegeben werden, die an die Fahrweise des jeweiligen Fahrers angepasst sind.

[0031] Die erfindungsgemäße mobile Kommunikationseinheit kann auch eine Erfassungseinheit zum Erfassen der fahrertypischen Beschleunigungsverläufe und eine mit der Erfassungseinheit verbundene lernfähige Einrichtung, bspw. basierend auf einem neuronalen Netzwerk, zum Aktualisieren der im Referenzspeicher gespeicherten ereignistypischen Beschleunigungsverläufe unter Berücksichtigung der erfassten fahrertypischen Beschleunigungsverläufe umfassen. Im Auslieferungszustand ist eine solche mobile Kommunikationseinheit vorzugsweise auf Standartwerte für einen normalen Fahrbetrieb, d.h. für im normalen Fahrbetrieb auftretende G-Kräfte, konfiguriert. Im Betrieb speichert und interpoliert die lernfähige Einrichtung dann über einen längeren Zeitraum die auftretenden G-Kräfte und ermittelt daraus diejenigen Beschleunigungsverläufe, die unter Berücksichtigung des spezifischen Fahrverhalten des Fahrers nicht zum Auslösen der Speicherung führen sollen. Die so weitergebildete mobile Kommunikationseinheit kann sich daher selbständig an verschiedene Fahrstile anpassen.

[0032] Weiterhin kann die mobile Kommunikationseinheit einen Fahrmodus und einen Ruhemodus aufweisen, wobei sich der Fahrmodus und der Ruhemodus zumindest durch die jeweilige Empfindlichkeit mindestens eines Beschleunigungssensors, etwa in der Höhe einer Beschleunigungsschwelle und/oder der Form der Beschleunigungsverläufe voneinander unterscheiden. Der Ruhemodus dient dabei u.a. dazu, Bagatellschäden, die häufig durch unvorsichtiges Ein- und Ausparken entstehen, zu dokumentieren. Insbesondere Fahrzeuge neuerer Bauart weisen keine klassischen Stoßstangen mehr auf, sondern stoßabsorbierende Teile an Front und Heck, die überwiegend als lackierte Kunststoffteile ausgeführt und vom Design her in die Karosserieform integriert sind. Insbesondere bei begrenztem Parkraum können fremde Fahrzeuge die stoßabsorbierenden Teile beschädigen. Die erfindungsgemäße Ausgestaltung der mobilen Kommunikationseinheit ermöglicht es, im Parkmodus insbesondere solche Beschädigungen zu dokumentieren, bei denen der Verursacher in Folge Entfernens von der Unfallstelle anders nicht zur Verantwortung gezogen werden könnte.

[0033] Die Unfalldatenschreiber nach Stand der Technik bieten dagegen nicht die Möglichkeit, den Hergang von Beschädigungen während der Ruhephase des Fahrzeugs zu dokumentieren, weil die Speicherung von Ereignisbildern lediglich bei Überschreiten vorgegebener, für den Fahrbetrieb eingestellter Beschleunigungsschwellen ausgelöst wird. Bei den genannten Bagatellschäden werden diese Beschleunigungsschwellen jedoch in der Regel nicht überschritten. Des Weiteren kann sich der Ruhemodus vom Fahrmodus auch in der Aufnahmerate, mit der die Ereignisbilder aufgenommen werden, voneinander unterscheiden. So kann im Ruhemodus die Bildrate etwa auf ein Bild pro Sekunde herabgesetzt werden. Dadurch kann bei gleichbleibender Datenmenge der Aufzeichnungszeitraum vergrößert werden, sodass auch bei langsamen Vorgängen, wie etwa dem Ein- oder Ausparken, eine gute Chance besteht, dass das Verursacherfahrzeug auf mindestens einem Bild weit genug vom beschädigten Fahrzeug entfernt ist, damit das Kennzeichen des Verursacherfahrzeugs zu erkennen ist.

[0034] Die Funktion der Auslöseeinrichtung kann im Ruhemodus auch von einer Alarmeinrichtung übernommen werden. Die mobile Kommunikationseinheit kann daher über die Fahrzeughalterung zusätzlich einen Signaleingang zum Anbinden von Alarmeinrichtungen umfassen.

[0035] Um im Ruhemodus auch Vandalismusschäden dokumentieren zu können, bspw. ein Zerkratzen des Lackes, kann das Fahrzeug mit einer UHF-Auslöseeinheit, bestehend aus einem Ultrahochfrequenzsender (UHF-Sender) zum Aufbauen eines Ultrahochfrequenzfeldes (UHF-Feldes) und einem Field-Disturbance-Sensor zum Detektieren von bewegten Gegenständen innerhalb des UHF-Feldes und/oder einen Schwingungssensor zum Detektieren von Karosserieschwingungen umfassen. Die Auslösung erfolgt dann über den vorgenannten Signaleingang.

[0036] Die mobile Kommunikationseinheit kann darüber hinaus eine automatische Justiereinheit umfassen, welche im Ruhemodus die Lage des Fahrzeugs erfasst und die Nullstellung mindestens eines Beschleunigungssensors an die erfasste Lage des Fahrzeuges anpasst, um die Wahrscheinlichkeit einer fälschlichen Ausgabe eines Auslösesignals im Ruhemodus zu verringern. Außerdem kann sie eine Kalibriereinheit zum Kompensie-

ren einer ungenauen Einbaulage des Beschleunigungssensors, bspw. aufgrund unterschiedlicher Einbaulagen der Fahrzeughalterungen für die mobile Kommunikationseinheit in verschiedenen Fahrzeugen umfassen.

[0037] In einer vorteilhaften Weiterbildung der erfindungsgemäßen mobilen Kommunikationseinheit ist die Kamera derart ausgestaltet, dass sie fortlaufend Ereignisbilder aufnimmt und dass als Speicher ein temporärer Speicher zum temporären Zwischenspeichern der fortlaufend aufgenommenen Ereignisbilder sowie ein permanenter Speicher vorhanden sind. Die Steuereinheit ist dann derart ausgestaltet, dass sie auf ein Auslösesignal hin die Aufnahme von Ereignisbildern nach Ablauf einer vorbestimmten Zeitspanne beendet und dann ein Übertragen des Inhalts des temporären Speichers in den permanenten Speicher veranlasst. Wenn dabei die vorbestimmte Zeitspanne im Hinblick auf die Speicherkapazität des temporären Speichers geeignet gewählt ist, befinden sich im Speicher nach Beendigung der Aufzeichnung sowohl noch Ereignisbilder, die vor dem auslösenden Ereignis aufgenommen worden sind, als auch Ereignisbilder, die in der Zeitspanne zwischen dem auslösenden Ereignis und dem Beenden der Aufzeichnung aufgenommen worden sind. Dies ermöglicht eine besonders gute Rekonstruktion des Ereignisherganges.

[0038] In einer vorteilhaften Ausgestaltung dieser Weiterbildung umfasst die mobile Kommunikationseinheit auch eine Einstelleinrichtung zum Einstellen der vorbestimmten Zeitspanne, nach deren Ablauf die Aufnahme der Ereignisbilder beendet und der Inhalt des temporären Speichers in den permanenten Speicher übertragen wird. Durch geeignetes Einstellen der Zeitspanne lässt sich dann beeinflussen, wie viel Speicherplatz des temporären Speichers zum Zeitpunkt der Übertragung in den permanenten Speicher von Ereignisbildern, die vor dem Ereignis aufgenommen worden sind, und wie viel Speicherplatz des temporären Speichers von Ereignisbildern, die nach dem Ereignis aufgenommen worden sind, belegt ist. Mit anderen Worten, es lässt sich bei einer bestimmten Aufnahmerate der von den Ereignisbildern umfasste, vor dem Ereignis liegende Zeitabschnitt relativ zum von den Ereignisbildern umfassten, nach dem Ereignis liegenden Zeitabschnitt einstellen. Außerdem kann die erfindungsgemäße mobile Kommunikationseinheit auch eine manuelle Einstelleinrichtung zum Einstellen der Empfindlichkeit des Beschleunigungssensors umfassen.

[0039] Eine erfindungsgemäße mobile Kommunikationseinheit kann einen Anschluss und/oder einen Signaleingang zum Anschließen an externe Systeme und/oder an ein Bordsystem des Fahrzeuges umfassen, so dass die Kapazitäten dieses Systems, wie z.B. die Übermittlung von GPS-Daten aus dem bordeigenen Navigationssystem genutzt werden können. Der Anschluss kann an eine Kontaktleiste einer Fahrzeughalterung für die mobile Kommunikationseinheit angepasst sein. Er kann alternativ oder zusätzlich zudem als drahtlose Schnittstelle, wie z.B. mit Bluetooth Technologie ausgebildet sein.

[0040] Die erfindungsgemäße mobile Kommunikationseinheit kann zusätzlich eine Einrichtung zum Ermitteln oder zum Empfangen von Positionsdaten, bspw. ein GPS-Modul (GPS: globales Positionierungssystem), oder einen Anschluss zum Anschließen einer solchen Einrichtung umfassen, wobei die Steuereinheit derart ausgelegt ist, dass sie den aufgenommen Ereignisbildern die ermittelten oder empfangenen Positionsdaten zuordnet. Alternativ zur GPS-Methode kann die Positionsbestimmung auch über ein sog. MPC (Mobile Positioning Centre) erfolgen, welches dies anhand der durch die mobile Kommunikationseinheit zuletzt genutzten Sende- und Empfangseinrichtungen im Kleinzellennetz bewerkstelligt.

[0041] Die mobile Kommunikationseinheit kann in einer vorteilhaften Ausgestaltung darüber hinaus zum Weiterleiten von Ereignisbildern an eine entfernte Zentralstelle, beispielsweise eine Notrufzentrale, ausgestaltet sein. Das Weiterleiten kann bspw. im Wege eines automatischen Anrufes erfolgen. Diese Notrufzentrale kann dann gegebenenfalls sogar anhand der Ereignisbilder auf die Art und Schwere des Unfalles zurückschließen. Anhand der den Ereignisbildern zugeordneten Positionsdaten kann die Zentralstelle dann eine Lokalisierung des Ereignisses vornehmen und gegebenenfalls geeignete Hilfsmaßnahmen einleiten.

[0042] Eine erfindungsgemäße Fahrzeughalterung für eine erfindungsgemäße mobile Kommunikationseinheit mit mindestens einer Kamera ist derart ausgestaltet, dass sie das Sichtfeld der mindestens einen Kamera nicht blockiert und die mobile Kommunikationseinheit bei unfallüblichen Beschleunigungskräften sicher in der Halterung verbleibt. Insbesondere kann sie eine Aussparung für eine nach vorne und gegebenenfalls auch für eine nach hinten gerichtete Kamera der mobilen Kommunikationseinheit aufweisen und im Fahrzeug so positioniert sein, dass das mobile Kommunikationsgerät so steht, dass die eine Kamera geradeaus nach vorne zeigt und die gegebenenfalls zweite Kamera nach hinten in den Fahrzeuginnenraum und/oder für die Aufnahme des rückwärtigen Verkehrsgeschehens durch die Heckscheibe.

[0043] Die erfindungsgemäße Fahrzeughalterung wird im Fahrzeug an geeigneter Stelle befestigt. Die Verbindung mit dem Fahrzeug erfolgt mittels einer Verbindungseinrichtung, die derart ausgestaltet ist, dass die Halterung bei unfallüblichen Beschleunigungswerten am Fahrzeug fixiert bleibt. Mit Vorteil kann die Fahrzeughalterung mit einer Klebehalterung, z.B. mit einer Klebefläche zur Fixierung an Windschutzscheibe, als Verbindungseinrichtung ausgestattet sein, jedoch sind auch andere Befestigungsorte, wie z.B. der Dachhimmel in der Nähe des Rückspiegels, der Rückspiegelhalter, oder das Armaturenbrett, und andere Befestigungsmethoden, z.B. Verschrauben, geeignet. Zum leichteren Ausrichten beim Einbau kann z.B. eine kleine Libelle und/oder Wasserwaage und/oder eine Markierung, welche in der Halterung integriert ist bzw. sind, dienen.

[0044] Die Funktion "Ereignisdatenrecorder in Aufnahmemodus" wird aktiviert, wenn die mobile Kommunikationseinheit in der Halterung arretiert ist, was zum Beispiel über das halterungsseitige Schließen zweier Kontakte an der Kontaktleiste der mobilen Kommunikationseinheit technisch leicht zu bewerkstelligen ist. Dies kann gegebenenfalls gemeinsam mit den anderen üblichen Funktionen, wie z.B. Freisprechen, Außenantenne oder Aufladen erfolgen. In diesem Modus arbeitet die mobile Kommunikationseinheit als Ereignisdatenrecorder, während die anderen Funktionen, wie z.B. das Telefonieren bei einem Mobiltelefon weiterhin aktiv bleiben. Gegebenenfalls können über eine ebenfalls an der Fahrzeughalterung vorhandene Datenleitung noch weitere Parameter in die Datensequenz eingespielt werden, wie z.B. Geschwindigkeit des Fahrzeuges, Betätigung der Bremsen oder/und der Lenkung und/oder der Hupe und Beleuchtungszustand des Fahrzeuges.

[0045] Ausgestaltungen der mobilen Kommunikationseinheit können in Abhängigkeit vom Umfang der Ausgestaltungen Platz benötigen. Es kann daher auch sein, dass bei besonders kleinen Ausführungen der mobilen Kommunikationseinheit nicht alle Ausgestaltungen im Gerät selber Platz haben, bzw. es nicht sinnvoll ist, alle Ausgestaltungen in der mobilen Kommunikationseinheit selbst zu platzieren. Insbesondere wenn die mobile Kommunikationseinheit mit einem Beschleunigungsdateneingang ausgestattet ist, kann die Halterung daher einen integrierten Beschleunigungssensor umfassen. Dieser liefert dann die Beschleunigungsdaten für die mobile Kommunikationseinheit. Ein in die mobile Kommunikationseinheit integrierter Beschleunigungssensor ist dann nicht nötig, wodurch die Baugröße der mobilen Kommunikationseinheit verringert werden kann. Außerdem kann die Fahrzeughalterung auch einen Empfänger zum Empfang eines Funkzeitsignals und eine mit der Uhr einer mobilen Kommunikationseinheit verbindbaren Synchronisationseinheit zum Synchronisieren der Uhr mit dem Datum und/oder der Uhrzeit des Funksignals umfassen. Auch diese Einheiten brauchen dann nicht in die mobile Kommunikationseinheit integriert zu sein, was ebenfalls das Verringern der Baugröße der mobilen Kommunikationseinheit ermöglicht. Darüber hinaus können zur Reduktion der Baugröße der mobilen Kommunikationseinheit auch weitere elektronische Bauteile oder Speicherkarten in die Fahrzeughalterung integriert sein. Die Fahrzeughalterung kann aber auch derart ausgestaltet sein, dass bordeigene Bauteile eines Fahrzeuges über die Fahrzeughalterung an die mobile Kommunikationseinheit anschließbar sind. Nicht in die mobile Kommunikationseinheit integrierte Funktionen und Einheiten werden dann bei Arretierung in der Fahrzeughalterung über die Kontaktleiste automatisch angebunden.

[0046] Ein erfindungsgemäßes Ereignisdatenschreibersystem für Fahrzeuge umfasst eine erfindungsgemäße mobile Kommunikationseinheit und eine erfindungsgemäße Fahrzeughalterung.

[0047] Weitere Merkmale, Eigenschaften und Vorteile der vorliegenden Erfindung ergeben sich aus der nachfolgenden Beschreibung eines Ausführungsbeispiels unter Bezugnahme auf die beiliegenden Zeichnungen.

Fig. 1 zeigt ein erstes Ausführungsbeispiel für die Erfindung.

Fig. 2 zeigt ein zweites Ausführungsbeispiel für die Erfindung.

Fig. 3 zeigt ein drittes Ausführungsbeispiel für die Erfindung.

Fig. 4 zeigt die auftretende Beschleunigung bei einem Anstoß in Abhängigkeit von der Zeit.

Fig. 5 zeigt die auftretende Beschleunigung bei einer Vollbremsung in Abhängigkeit von der Zeit.

[0048] Als ein erstes Ausführungsbeispiel für die Erfindung ist in Figur 1 eine als Mobiltelefon 100 ausgebildete mobile Kommunikationseinheit als Blockdiagramm dargestellt. Das dargestellte Mobiltelefon 100 kann gleichzeitig als Ereignisdatenschreiber in einem Fahrzeug dienen. Dabei wird eine im Mobiltelefon 100 vorhandene Kamera 12 als Aufnahmeeinheit zum Aufnehmen von Videobildern als Ereignisbildern vom Verkehrsgeschehen genutzt. Das Mobiltelefon 100 kann darüber hinaus weitere Kameras umfassen. Außerdem können außer Videobildern auch akustische Ereignisse, Beschleunigungskräfte und Datum/Uhrzeit sowie weitere Daten, die von verschiedenen Sensoren oder Gebern des Fahrzeugs über eine Fahrzeughalterung für das Mobiltelefon 100 geliefert werden, gleichzeitig mit den Videobildern als Ereignisbildern gespeichert werden. Beispiele für Daten, die von Sensoren oder Gebern des Fahrzeugs geliefert werden, sind: Geschwindigkeit des Fahrzeuges, Betätigung der Bremsen oder/und der Lenkung und/oder der Hupe und Beleuchtungszustand des Fahrzeuges. Bspw. die Registrierung akustischer Ereignisse kann bei einem Unfall wichtig sein, wenn ein Verkehrsteilnehmer ein KFZ bei einem Überholmanöver streift, ohne dass das Fahrzeug dabei einen Stoß erhält. Aber auch die akustische Aufzeichnung von Hupsignalen kann die nachträgliche Bewertung der Verkehrssituation erleichtern. Weiterhin umfasst das Mobiltelefon 100 eine Steuereinheit 14, einen auf dem Speicher 13 für die Funktion Ereignisdatenspeicher vorgesehenen Speicher 16, welcher wiederum einen temporären Speicher 18 und einen permanenten Speicher 20 umfasst, mindestens einen Beschleunigungssensor 22 zum Erfassen von Beschleunigungsdaten sowie ein Uhrenmodul 24. Das Uhrenmodul 24 umfasst eine Uhr 25, die entweder manuell über die Tastatur des Mobiltelefons 100 eingestellt wird, oder kann in einer hier bereits skizzierten, vorteilhaften Ausgestaltung einen mit einer Empfangsantenne 28 verbundenen Empfänger 26 zum Empfang eines Funkzeitsignals sowie eine Synchronisationseinheit 30, die so-

wohl mit der Uhr 25 als auch mit dem Empfänger 26 in Verbindung steht und dazu dient, die Uhr 25 zu steuern und mit dem empfangenen Funkzeitsignal zu synchronisieren, umfassen.

[0049] Die Steuereinheit 14 steht mit der Kamera 12, mit dem Speicher 16, mit dem Uhrenmodul 24, mit dem Beschleunigungssensor 22, einer Mobilfunkeinheit 27 sowie optional wie in der skizzierten vorteilhaften Ausgestaltung mit einem Referenzspeicher 23, dessen Funktion weiter unten erläutert ist, in Verbindung und steuert die Funktion des Mobiltelefons 100. Die Steuereinheit 14 weist darüber hinaus einen Anschluss 34 auf, mit dem das Mobiltelefon 100 über die Fahrzeughalterung an das Bordsystem eines Fahrzeuges angeschlossen werden kann.

[0050] Im bereits vorteilhaft ausgestalteten Ausführungsbeispiel gemäß Fig. 1 ist eine Auslöseeinheit 15 in die Steuereinheit 14 integriert, die sowohl mit dem Beschleunigungssensor 22 als auch mit dem Referenzspeicher 23 in Verbindung steht und die vom Beschleunigungssensor 22 fortlaufend gemessene Beschleunigungswerte mit im Referenzspeicher 23 abgelegten Beschleunigungsverläufen und/oder Beschleunigungsschwellen vergleicht. Die Beschleunigungsverläufe stellen dabei typische Beschleunigungsverläufe für ein zu detektierendes Ereignis, bspw. einen Unfall, dar. Das zu detektierendes Ereignis wird im Folgenden Triggerereignis genannt. Die Auslöseeinheit kann, alternativ zum in Fig. 1 dargestellten Fall, auch als eigenständige Einheit des Mobiltelefons 100 ausgebildet sein. Ein Ausführungsbeispiel ohne die vorteilhafte Ausgestaltung mit dem Referenzspeicher 23 kann die Überschreitung von vorher eingestellten, absoluten Beschleunigungswerten als Triggerereignis registrieren.

[0051] Während des Betriebs des Mobiltelefon 100 als Ereignisdatenschreiber nimmt die Kamera 12 fortlaufend Bilder (und die ggf. vorhandenen weiteren Erfassungseinheiten ihre entsprechenden Ereignisdaten) auf und gibt diese an die Steuereinheit 14 weiter, welche sie in den temporären Speicher 18 schreibt. Jedes Bild und ggf. jede weitere aufgenommene Ereignisdateneinheit, bleibt über einen bestimmten Zeitraum, im folgenden Zeitfenster genannt, im temporären Speicher 18 gespeichert und wird anschließend von einem neuen Bild bzw. ggf. von neuen Ereignisdaten überschrieben. Die Größe des Zeitfensters ist dabei an die zu bewältigenden Datenmengen angepasst. Mindestgrößen für das Zeitfenster sowie die Bildrate und die Auflösung, mit der ein Ereignis aufgezeichnet wird, ergeben sich aus dem aufzuzeichnenden Ereignis. Für Verkehrssituationen werden z.Z. ein Zeitfenster von 30 Sekunden und eine Bildrate von 5 Bildern pro Sekunde als ausreichend angesehen. Höhere Bildraten und größere Zeitfenster sind dabei aber grundsätzlich auch möglich und - wegen der umfassenderen Dokumentation - sogar vorteilhaft, werden aber aus Gründen der Wirtschaftlichkeit heutzutage oft nicht realisiert. In der Zukunft dürfte sich jedoch ein Trend hin zu höheren Auflösungen, Bildraten etc. und zu größeren Zeitfenstern ergeben.

[0052] Der Speicherplatz, den eine Aufzeichnung des Ereignisses im temporären Speicher 18 erfordert, ergibt sich aus der Größe des Zeitfensters der Auflösung und der Bildrate, ggf. in Verbindung mit weiteren Größen, wie etwa der Farbtiefe, und der zusammen mit der Aufnahme zu speichernden Daten, bspw. Beschleunigungsdaten, Datums- und Zeitdaten, ggf. Positionsdaten etc.

[0053] Im erfindungsgemäßen Mobiltelefon 100 kann die Rate, mit der die Beschleunigungswerte aufgezeichnet werden, höher als die Bildrate sein. Sie kann insbesondere um ein Vielfaches höher sein und bspw. ca. 100 Hz betragen. Dies ermöglicht eine exakte zeitliche Rekonstruktion des Ablaufes des aufgezeichneten Ereignisses, etwa im Rahmen eines Gutachtens. Bspw. lassen sich so auch Abläufe mit mehreren Anstößen, die vielleicht in den aufgezeichneten Bildern nicht alle enthalten sind, rekonstruieren.

[0054] Wenn der Vergleich der vom Beschleunigungssensor 22 fortlaufend gemessenen Beschleunigungswerte mit den im Referenzspeicher 23 abgelegten Beschleunigungsschwellen und/oder Beschleunigungsverläufen ergibt, dass eine bestimmte Beschleunigungsschwelle überschritten ist und/oder die gemessenen Beschleunigungswerte einen bestimmten Verlauf aufweisen, d.h. dass ein Triggerereignis vorliegt, gibt die Auslöseeinheit 15 ein Auslösesignal, im folgenden Triggersignal genannt, aus, was dazu führt, dass die Steuereinheit 14 die Aufnahme der Bilder nach einer vorgegeben Zeitspanne anhält und dann die Übertragung des Inhaltes des temporären Speichers 18 in den permanenten Speicher 20 veranlasst. Entsprechendes gilt gegebenenfalls für andere aufgenommene Ereignisdaten. Die vorgegebene Zeitspanne, nach deren Ablauf das Speichern von Bildern (oder anderen Ereignisdaten) im temporären Speicher 18 eingestellt wird, ist derart gewählt, dass zu diesem Zeitpunkt im temporären Speicher 18 sowohl Bilder gespeichert sind, die innerhalb eines kurzen Zeitabschnitts vor dem Triggerereignis aufgenommen worden sind, als auch solche Bilder, die in die Zeitspanne zwischen der Ausgabe des Triggersignals und dem Beenden des Speicherns aufgenommen worden sind. Wenn das Zeitfenster wie im obigen Beispiel eine Länge von 30 Sekunden aufweist, kann die Zeitspanne bspw. eine Länge von 15 Sekunden aufweisen. Es ist dann zum Zeitpunkt der Übertragung des Inhaltes des temporären Speichers 18 in den permanenten Speicher 20 eine Bildsequenz im temporären Speicher 18 gespeichert, welche die Bilder der letzten 15 Sekunden vor dem Triggerereignis sowie die in den auf das Triggerereignis folgenden 15 Sekunden umfasst.

[0055] Das Verhältnis der Länge der Zeitspanne, nach der das Speichern eingestellt wird, zur Länge des Zeitfensters muss keine fest vorgegebene Größe sein. So ist es beispielsweise für die Unfallaufzeichnung im innerörtlichen Verkehr sinnvoll, beispielsweise den größeren Teil des Zeitfensters (bei einer Länge des Zeitfensters von 30 Sekunden bspw. 20 Sekunden) für die Aufzeich-

nung von Ereignisbildern und ggf. von Ereignisdaten, die vor dem Triggerereignis aufgenommen worden sind, zu verwenden, um auch bei den städtischen langsamen Geschwindigkeiten ein plausibles Nachvollziehen der Situation zu ermöglichen. Im obigen Beispiel würde dies bedeuten, dass die Vorgegebene Zeitspanne 10 Sekunden beträgt. Dagegen ist es auf der Autobahn bei höheren Geschwindigkeiten sinnvoll, einen mindestens gleichgroßen oder sogar größeren Teil des Zeitfensters für die Aufzeichnung von Bildern, die nach dem Triggerereignis aufgenommen worden sind, zu verwenden, weil die gerade bei den hohen Geschwindigkeiten lange andauernden Auslaufbewegungen eines teilweise oder ganz außer Kontrolle geratenen Fahrzeuges wertvolle Hinweise auf den Unfallhergang liefern können. Das Mobiltelefon 100 kann daher vorzugsweise auch mit einer Einstelleinrichtung zum Einstellen der Dauer der Zeitspanne, nach der das Speichern von Ereignisbildern und ggf. Ereignisdaten in den temporären Speicher 18 eingestellt und die Übertragung des Inhaltes des temporären Speichers 18 in den permanenten Speicher 20 vorgenommen wird, umfassen. Die Einstellung kann insbesondere auch automatisch, bspw. in Abhängigkeit von der Fahrzeuggeschwindigkeit, erfolgen.

[0056] Eine alternative Ausgestaltung des temporären Speichers umfasst mindestens zwei Speichereinheiten. Diese können physisch vorhanden sein oder virtuell durch Partitionierung eines einzigen Speicherbausteins ausgeführt sein. Beispielsweise bei Verwendung von zwei Speichereinheiten werden diese abwechselnd beschrieben und gelöscht, d.h. während die eine Speichereinheit beschrieben wird, erfolgt das Löschen der anderen Speichereinheit. Eine geeignete Steuerung stellt dabei sicher, dass immer mindestens die Ereignisdatensätze eines Zeitfensters in einer der Speichereinheiten vollumfänglich gespeichert sind. Bspw. kann die Steuerung derart ausgelegt sein, dass das Löschen des einen Speichers erst dann erfolgt, wenn im anderen Speicher mindestens die Ereignisdatensätze des aktuellen Zeitfensters gespeichert sind.

[0057] Nach einem Triggerereignis, bspw. einem Unfall, können die Ereignisbilder aus dem permanenten Speicher 20 ausgelesen werden und der Unfall sofort auf dem Display 17 des Mobiltelefons 100 oder mittels eines Computers auf einem Monitor betrachtet werden. Wenn außer Bildern weitere Ereignisdaten gespeichert worden sind, kann der Unfall nicht nur optisch bewertet werden, sondern zumindest ein Fachmann kann dann aus den gespeicherten Daten den Unfallhergang rekonstruieren. Insbesondere Daten über Verzögerungen bzw. Beschleunigungen können wichtige Erkenntnisse zur Beurteilung von Unfällen und die Festsetzung von Schadensersatzansprüchen liefern.

[0058] Der permanente Speicher 20 kann insbesondere derart ausgestaltet sein, dass er eine Mehrzahl von Inhalten des temporären Speichers 18 speichern kann. Bei vollem permanenten Speicher 20 wird der jeweils älteste im Speicher 20 enthaltenen Datensatz gelöscht, um für einen aktuellen Datensatz Platz zu schaffen.

[0059] Im vorliegenden Ausführungsbeispiel können sowohl über den Anschluss 32, als auch über das Bedienteil 19 (Tastatur) Beschleunigungsverläufe in den Referenzspeicher 23 eingegeben werden. Dies ermöglicht es, das Mobiltelefon 100 an verschiedene Fahrstile oder verschiedene Fahrzeugklassen anzupassen. Beispielsweise kann es bei einem sportlichen Fahrer vorkommen, dass Beschleunigungsschwellen überschritten werden und/oder Beschleunigungsverläufe auftreten, die bei einem verhaltenen Fahrer nur aufgrund von zu einem scharfen Bremsen oder Beschleunigen veranlassenden Nötigungstatbeständen auftreten. Je nach Fahrstil des Fahrers können daher verschiedene Beschleunigungsschwellen und/oder Beschleunigungsverläufe in den Referenzspeicher 23 eingegeben werden. Außerdem können sich aufgrund der Massenunterschiede die Beschleunigungsverläufe und/oder -schwellen für schwere Fahrzeuge von denen leichter Fahrzeuge unterscheiden.

[0060] Aber auch dann, wenn im Referenzspeicher 23 nur eine fest vorgegebene Anzahl von Beschleunigungsverläufen gespeichert ist und diese nicht geändert werden können, bietet das Verwenden von Beschleunigungsverläufen gegenüber einer reinen Beschleunigungsschwelle Vorteile. So kann anhand des Beschleunigungsverlaufes beispielsweise zwischen einem Anstoß gegen ein anderes Fahrzeug und einer Vollbremsung unterschieden werden. Dies ist nicht immer möglich, wenn die vom Beschleunigungssensor erfassten Beschleunigungen lediglich mit einer Beschleunigungsschwelle verglichen werden. Der Unterschied in den Beschleunigungsverläufen eines Anstoßes und einer Vollbremsung ist in den Figuren 4 und 5 graphisch dargestellt. Figur 4 zeigt dabei den Beschleunigungsverlauf bei einem Anstoß und Figur 5 den Beschleunigungsverlauf bei einer Vollbremsung. Würde die Auslöseeinheit 16 bspw. lediglich anhand des Vergleiches mit einer Beschleunigungsschwelle von -0,8 g das Triggersignal ausgeben, so würde sowohl im in Fig. 4 dargestellten Fall, als auch im in Fig. 5 dargestellten Fall ein Triggersignal ausgegeben. Wenn dagegen das Triggersignal nur bei Vorliegen eines Beschleunigungsverlaufes mit einer scharfen Spitze, wie er in Figur 4 dargestellt ist, ausgegeben wird, so erfolgt die Ausgabe des Triggersignals im vorliegenden Beispiel nur beim Anstoß, nicht jedoch bei der Vollbremsung. Im vorliegenden Beispiel werden daher nur solche Ereignisse als Triggerereignisse akzeptiert, bei denen innerhalb einer Zehntelsekunde eine Veränderung der Beschleunigung von mindestens 0,8 g eintritt. Damit ist gewährleistet, dass nur Fahrzeuganstöße aufgezeichnet werden, nicht aber bloße Vollbremsungen.

[0061] Wünscht der Anwender ferner auch die Aufzeichnung von Nötigungstatbeständen, die sich durch abrupte Fahrmanöver mit wesentlich langsamerem Aufbau von Beschleunigungskräften auszeichnen, so kann er die Detektionsempfindlichkeit, ab der ein Triggersignal

generiert wird, entsprechend dem Fahrzeug, den Fahrgewohnheiten und dem gegenwärtigen Anwendungszweck durch die Eingabe geeigneter Beschleunigungsverläufe über das Bedienteil oder den Anschluss 32 konfigurieren. Besonders vorteilhaft kann hier außerdem eine lernfähige Software zum Einsatz kommen, die über einen längeren Zeitraum Werte wie etwa die Drosselklappenposition, die Fahrzeuggeschwindigkeit, das Brems- und Beschleunigungsverhalten, die Last, etc. speichert und interpoliert. Das Mobiltelefon 100 ist dann im Auslieferungszustand auf Standardwerte für im normalen Fahrbetrieb auftretende Beschleunigungsverläufe konfiguriert. Im Betrieb speichert und interpoliert die Software über einen Zeitraum die auftretenden Beschleunigungsverläufe und bildet daraus Schwellenwerte, die unter Berücksichtigung des spezifischen Fahrverhaltens des Fahrers nicht überschritten werden dürfen, ohne dass ein Triggersignal ausgegeben wird.

[0062] Zum Dokumentieren von Verkehrsgefährdungen oder Nötigungen durch andere Verkehrsteilnehmer, bei denen kein Triggerereignis auftritt, kann das Mobiltelefon 100 außerdem ein internes und/oder externes Betätigungselement umfassen, welches ein manuelles Ausgeben eines Triggersignals zur Speicherung der Verkehrsituation ermöglicht, um polizeiliche Ermittlungen zu erleichtern. Ein Beispiel für ein internes Betätigungselement ist ein Soft-Key des Mobiltelefons 100. Bei externer Betätigung bietet es sich an, den Eingang am Mobiltelefon 100 zum Auslösen eines manuellen Triggersignals über die Kontaktleiste der Halterung an den Hupschalter zu koppeln, da dieser im unmittelbaren Bedienumfeld des Fahrers liegt und bei Verkehrsgefährdungen und/oder Nötigungen oft reflexartig betätigt wird. Das manuelle Auslösen eines Triggersignals kann zudem auch bei Unfällen sinnvoll sein, bei denen die Auslöseschwelle der Sensoren für das Triggersignal nicht erreicht wird, oder bei Unfällen, bei denen der Fahrer Ereignisbilder speichern möchte, ohne dass er selbst am Unfall beteiligt war.

[0063] Im erfindungsgemäßen Mobiltelefon 100 wird durch geeignete Maßnahmen sichergestellt, dass bei einem Ausfall der Stromversorgung das Mobiltelefon 100 mindestens so lange weiterläuft, dass ein ggf. abzulegender Datensatz sowohl im permanenten Speicher 20 abgelegt werden kann, als auch ggf. ein Notruf versendet werden kann. Dies kann z.B. durch die Nutzung der Batterie des Mobiltelefons erreicht werden.

[0064] Der permanente Speicher 20 kann als in das Mobiltelefon 100 integrierter Flash - EPROM, EEPROM oder RAM mit Batteriepufferung ausgebildet sein. Alternativ ist es auch möglich, den permanenten Speicher 20 als in einen Kartenleser des Mobiltelefons 100 oder der Fahrzeughalterung 10 einzusetzende Speicherkarte oder als ein sonstiges Wechselspeichermedium auszubilden. Insbesondere wenn er als Speicherkarte ausgestattet ist, kann der Fahrer nach einem Unfall die Karte mit den gespeicherten Ereignisbildern oder das ganze Mobiltelefon 100 aus der Fahrzeughalterung entnehmen und die Videoaufnahmen zusammen mit gegebenenfalls weiteren Daten auf dem Display 17 des Mobiltelefons 100, einem PC oder einem Notebook, unter Umständen sogar schon am Unfallort, begutachten und bewerten. In vielen Fällen wird dies schon zur Aufklärung der Schuldfrage ausreichen.

[0065] Die Bedienung der Funktion Ereignisdatenschreiber im Mobiltelefon 100 erfolgt über die Tastatur des Mobiltelefons 100 in einem Untermenü. Empfehlenswert ist dabei der Einbau im vom Fahrzeugführer von Hand leicht erreichbaren Umfeld.

[0066] Das erfindungsgemäße Mobiltelefon 100 kann vorteilhafterweise auch über die Halterung an eine oder mehrere externe Kameras anschließbar sein. Sinnvoll ist zum Beispiel die Anbringung eines Kameramoduls in der Heckscheibe zur Erfassung der rückwärtigen Verkehrssituation, oder eine Kamera, die zum Fahrgastraum hin gerichtet ist und zu dessen Überwachung dient. Es ist aber auch möglich, das Mobiltelefon 100 mit zwei oder mehr Kameras auszustatten. Das bereits am Markt befindliche Siemens U15 ist ein Mobiltelefon mit zwei Kameramodulen, je eines auf der Vorder- und Rückseite. Dies kann insbesondere für Taxen von Interesse sein, um bei Straftaten, wie z.B. Fahrgeldprellung, Nötigung, Bedrohung, Überfall, etc., den Tathergang festhalten und den Täter identifizieren zu können. Die taxispezifische Ausführung der Halterung des Mobiltelefon 100 ist dabei vorzugsweise zusätzlich mit einem versteckten Knopf, entweder im Multifunktionslenkrad, im Fußraum oder an einem anderen Platz verbunden, der zum Ausgeben eines manuellen Triggersignals dient und vom Fahrer ungesehen erreicht werden kann. Im Fußraum kann der Schalter auch als Fußschalter ausgestaltet sein.

[0067] Um gerichtsverwertbares Datenmaterial zu erhalten, ist es unabdingbar, dass die Ereignisdatensequenz bzw. die Ereignisdatensequenzen, die im permanenten Speicher 20 gespeichert ist bzw. sind, nicht verändert werden kann. Dies kann in einer vorteilhaften Ausgestaltung der Erfindung durch die Kombination folgender Sicherheitsmaßnahmen erreicht werden:

> Die Ereignisbilder und ggf. die Ereignisdaten werden in einem nicht editierbaren Format, beispielsweise im PDF-Format (portable data format) abgespeichert.

[0068] Um die Manipulierbarkeit gespeicherter Ereignisbilder durch Nachstellen von Unfallsituation vermeiden zu können, weist in der bereits skizzierten, vorteilhaften Ausgestaltung das Uhrenmodul 24 zum Stellen der Uhr 25 zusätzlich den mit der Empfangsantenne 28 gekoppelten Empfänger 26 sowie die Synchronisationseinheit 30 auf (s. Fig. 1). Die Synchronisationseinheit 30 synchronisiert dabei die Uhr 25 mit dem vom Empfänger 26 empfangenen Funkzeitsignal. Dies geschieht automatisch und fortwährend, ohne dass ein manuelles Einstellen von Zeit und Datum erforderlich ist. In Deutschland steht als Funkzeitsignal ein DCF-77-Signal zur Ver-

fügung, das von einer Caesium-Uhr im Deutschen Physikalischen Institut Braunschweig abgestrahlt wird. Zusätzlich kann das Uhrenmodul 24 weitere Empfänger zum Empfang von Funkzeitsignalen mit anderen Frequenzen aufweisen. Alternativ ist es auch möglich den Empfänger 26 mit einer Frequenzwahleinrichtung auszustatten. Dies ist insbesondere von Vorteil, wenn das Fahrzeug über einen großen räumlichen Bereich eingesetzt wird, in dem Funkzeitsignale auf verschiedenen Frequenzen gesendet werden. Falls das Mobiltelefon 100 bei Fahrten durch verschiedene Zeitzonen eingesetzt wird, ist es vorteilhaft im Datensatz neben dem Datum und der Uhrzeit auch festzuhalten, welche lokale Zeit dem Datum bzw. der Uhrzeit zu Grunde liegt.

[0069] Das Uhrenmodul 24 gibt das Datum und die Uhrzeit an die Steuereinheit 14 aus, die jedem Ereignisbild das Datum und die Uhrzeit, zu dem sie aufgenommen worden ist, hinzufügt, bevor das Ereignisbild in den temporären Speicher 18 geschrieben wird. Zusätzlich kann die Steuereinheit 14 jedem Ereignisbild eine digitale Signatur, welche beispielsweise die Seriennummer oder die IMEI Nummer des Mobiltelefons 100 umfasst, hinzufügen, um auch später noch eine Zuordnung der Ereignisbilder zu einem bestimmten Mobiltelefon 100 zu ermöglichen.

[0070] Das Mobiltelefon 100 kann in zwei Modi betrieben werden, einem sog. Fahrmodus und einem sog. Ruhemodus. Der Ruhemodus unterscheidet sich vom Fahrmodus dadurch, dass die Empfindlichkeit des Beschleunigungssensors 22 oder der Beschleunigungssensoren erhöht wird. Dies hat zur Folge, dass auch Anstöße bei Parkvorgängen, die zumeist nur einen sehr geringen Impuls aufweisen, die Ausgabe eines Triggersignals veranlassen können und damit zur Dokumentation des auslösenden Ereignisses führen. Des Weiteren ist im Ruhemodus die Bildrate der Kamera 12 gegenüber dem Fahrmodus herabgesetzt, im vorliegenden Ausführungsbeispiel auf ein Bild pro Sekunde. Der Aufzeichnungszeitraum vergrößert sich daher und umfasst bei geeigneter Einstellung der Zeitspanne, nach der das Aufnehmen beendet wird, im Verhältnis zum Zeitfenster bspw. einen Bereich von 60 Sekunden vor bis 60 Sekunden nach dem Auslösezeitpunkt. Außerdem wird im Ruhemodus die automatische Justiereinheit aktiviert.

[0071] Ein zweites Ausführungsbeispiel für die Erfindung ist in Fig. 2 in einem Blockdiagramm dargestellt. Auch dieses Ausführungsbeispiel ist als Mobiltelefon ausgestaltet. Elemente, die sich nicht von denen des ersten Ausführungsbeispiels unterscheiden, sind in Fig. 2 mit denselben Bezugsziffern wie die entsprechenden Elemente in Fig. 1 bezeichnet. Das Mobiltelefon 200 des zweiten Ausführungsbeispiels unterscheidet sich vom Mobiltelefon 100 des ersten Ausführungsbeispiels dadurch, dass es an einen UHF-Sender 38 und einen Field-Disturbance-Sensor 40 angeschlossen werden kann. Field-Disturbance-Sensoren detektieren bewegte Gegenstände innerhalb eines begrenzten UHF-Feldes auf der Basis des Dopplereffektes. Sie sind an sich bekannt und im freien Handel erhältlich. Mittels des UHF-Senders wird im Ruhemodus ein UHF-Feld um das Fahrzeug aufgebaut. Wenn sich ein Objekt von ausreichender Masse, z.B. eine Person, in diesem Feld bewegt, so wird dieses Objekt vom Field-Disturbance-Sensor 40 registriert und löst einen Triggerimpuls für das Übertragen der im temporären Speicher 18 gespeicherten Ereignisdaten, und insbesondere von Bildinformationen, in den permanenten Speicher 20 aus. In Falle von Vandalismus besteht so die Aussicht, dass ein Bild des Täters gespeichert wird. Alternativ zum UHF-Sender 38 und zum Field-Disturbance-Sensor 40 kann das Mobiltelefon 200 auch mit einer Alarmanlage gekoppelt sein, welche die Ausgabe eines Triggersignals auslösen kann. Der Anschluss einer Alarmeinrichtung erfolgt dann über den Signaleingang 36.

[0072] Lackkratzer, die mit scharfen Gegenständen, häufig Fahrzeugschlüsseln, vorgenommen werden, führen zu spezifischen Schwingungen (Körperschall) im Karosseriebisch, die sich in der gesamten Karosserie fortpflanzen. Daher kann zusätzlich oder alternativ zum Field-Disturbance-Sensor 40 mindestens ein Schwingungssensor vorhanden sein, der auf die typische Frequenz des Kratzens mit einem spitzen Gegenstand auf einer lackierten Karosseriefläche ausgelegt ist und ein Triggersignal ausgibt, wenn er eine derartige Schwingung detektiert. In einer weiterführenden Ausgestaltung kann zudem eine Vergleichseinheit vorhanden sein, welche die detektierten Schwingungen mit gespeicherten Referenzmustern vergleicht und das Triggersignal in Abhängigkeit vom Vergleichsergebnis ausgibt.

[0073] Das Mobiltelefon 200 des zweiten Ausführungsbeispiels kann optional zusätzlich zur Abgabe eines Notfallsignals ausgestaltet werden. Das Abgeben des Notrufs kann beispielsweise in Form einer automatischen Notrufanwahl durch die Mobilfunkeinheit 27 des Mobiltelefons 200 realisiert sein. Außerdem ist die Mobilfunkeinheit 27 über den CPU mit der Steuereinheit 14 verbunden. Die Steuereinheit 14 steht darüber hinaus mit einer externen GPS-Einheit 42 in Verbindung, von der sie fortlaufend die aktuelle Position des Fahrzeuges mitgeteilt bekommt. Die Position des Fahrzeuges wird den Ereignisdatensätzen vor dem Speichern im temporären Speicher 18 hinzugefügt. Wenn nun ein Triggersignal ausgegeben wird und daraufhin der Inhalt des temporären Speichers 18 in den permanenten Speicher 20 übertragen wird, so gibt die Steuereinheit 14 einen Impuls an die Mobilfunkeinheit 27 aus, welcher diesen veranlasst, per Anruf die aktuellste Ereignisdatensequenz an die Notfallzentrale zu übermitteln. Vorteilhafterweise wird nur dann ein Notfallsignal ausgelöst, wenn der Beschleunigungssensor 22 bzw. die Beschleunigungssensoren, Beschleunigungswerte oder Beschleunigungsverläufe detektiert bzw. detektieren, bei welchen üblicherweise Personenschäden zu erwarten sind. Statt einer externen GPS-Einheit 42 kann auch ein in das Mobiltelefon 200 integriertes GPS-Modul vorhanden sein.

[0074] Fig. 3 zeigt ein weiteres Ausführungsbeispiel

für die Erfindung in einem Blockdiagramm. Abgebildet ist ein Mobiltelefon 300 und eine Fahrzeughalterung 310, wobei der DCF-77 Empfänger, die Synchronisationseinheit, sowie der Beschleunigungssensor in der Halterung 310 und die Field-Disturbance Einheit extern im Fahrzeug eingebaut sind.

[0075] In allen Ausführungsbeispielen kann die erfindungsgemäße mobile Kommunikationseinheit über die Halterung eine optionale Schnittstelle 34 zum Anbinden an ein Bordsystem eines Fahrzeuges umfassen. Derartige Bordsysteme sind heute in vielen Fahrzeugen serienmäßig vorhanden und umfassen häufig Bildschirme, Telefone, Hifi-Anlagen, Fernsehgeräte, Navigationsgeräte etc. Diese Geräte können alle zum Realisieren oder Unterstützen einer oder mehrerer Funktionen der erfindungsgemäßen mobilen Kommunikationseinheit herangezogen werden, ohne dass diese Funktion in der erfindungsgemäße mobilen Kommunikationseinheit selber realisiert sein müsste. Beispielsweise kann das Navigationssystem als Quelle für die GPS-Daten Verwendung finden. Bildschirme, beispielsweise von Navigationssystemen oder Fernsehgeräten, können zur Ausgabe von Bildinformationen herangezogen werden. Die Konfiguration und die Bedienung der Ereignisdatenschreiberfunktionen in der erfindungsgemäßen mobilen Kommunikationseinheit können über die Funktionstasten des Bordsystems erfolgen. In die erfindungsgemäße mobile Kommunikationseinheit oder ihre Halterung muss daher lediglich mindestens eine Kamera 12 und die für die Funktion Ereignisdatenschreiber unerlässlichen Funktionen eingebaut werden. Diese Funktionen umfassen z.B. den Speicher 16, das Uhrmodul 24, den Beschleunigungssensor 22 und die Steuereinheit 14. Für die Schnittstelle zum Bordsystem kann eines der gängigen Datenprotokolle verwendet werden, beispielsweise das RS-232-Protokoll. Mit Vorteil kann für die Datenübertragung zwischen der erfindungsgemäße mobile Kommunikationseinheit und den externen Komponenten auch Bluetooth-Technologie zum Einsatz kommen.

[0076] Die zusätzlichen, nicht direkt in die erfindungsgemäße mobile Kommunikationseinheit eingebauten externen Kameras können in allen Bereichen des Fahrzeugs angebracht sein. Insbesondere ist es möglich, eine Mehrzahl von Kameras so anzubringen, dass das gesamte horizontale Umfeld des Fahrzeuges aufgezeichnet werden kann. Dabei kann durch geeignetes Anbringen von Prismen und/oder Spiegeln die Zahl der benötigten Kameras reduziert werden, ohne den mit den Kameras erfassten Ausschnitt des horizontalen Umfeldes zu reduzieren.

[0077] Um zu ermöglichen, dass der Beschleunigungssensor bzw. die Beschleunigungssensoren weitgehend parallel zur Längs- und Querachse des Fahrzeuges ausgerichtet werden können, kann die Halterung der erfindungsgemäßen mobilen Kommunikationseinheit mit einer Markierung und/oder einer kleinen Libelle/Wasserwaage versehen sein, welche die optimale Einbaulage der Halterung kennzeichnet und die Installation vereinfacht.

[0078] Um die aus einer ungenauen Einbaulage der erfindungsgemäßen mobilen Kommunikationseinheit resultierenden Verfälschungen der durch die Beschleunigungssensoren registrierten Längs- und Querbeschleunigungswerte zu mindern, umfasst die erfindungsgemäße mobile Kommunikationseinheit vorzugsweise eine Kalibrierungsmöglichkeit, die es ermöglicht, die erfindungsgemäße mobile Kommunikationseinheit in einem oder mehreren Schritten zu kalibrieren, wobei diese Schritte manuell in verschiedenen Zuständen des Fahrzeuges und im Fahrmodus der erfindungsgemäßen mobilen Kommunikationseinheit, ausgelöst werden.

[0079] Im ersten Schritt steht das Fahrzeug auf einer ebenen Fläche. Nach einmaliger Betätigung eines Kalibrierknopfes werden die bei Abweichung der Längs- und Querachse des Beschleunigungssensors 22 von der Längs- und Querachse des Fahrzeuges durch die Erdbeschleunigung induzierten Beschleunigungswerte gemessen und bspw. im permanenten Speicher 20 als absolute Korrekturwerte abgelegt.

[0080] Im zweiten Schritt wird das Fahrzeug auf der ebenen Fläche aus einer gleichmäßigen, geradlinigen Vorwärtsbewegung heraus leicht abgebremst. Während der Verzögerung wir der Kalibrierknopf ein zweites Mal betätigt. Dadurch werden bei Abweichung der Längsachse des Beschleunigungssensors 22 von der Längsachse des Fahrzeuges die in Längs- und Querrichtung auftretenden Verzögerungswerte gemessen und im permanenten Speicher 20 als relative Korrekturwerte abgelegt.

[0081] Im Fahrmodus der erfindungsgemäßen mobilen Kommunikationseinheit korrigiert eine geeignete Software alle gemessenen Beschleunigungswerte auf der Basis der im permanenten Speicher 20 abgelegten absoluten und relativen Korrekturwerte. Zuerst wird der Einfluss der Erdbeschleunigung ausgeglichen, indem die jeweiligen absoluten Korrekturwerte zu den gemessenen Längs- und Querbeschleunigungswerten hinzuaddiert bzw. von ihnen abgezogen werden. Anschließend wird der Einfluss einer Abweichung der Längsachse des Fahrzeuges von der der erfindungsgemäßen mobilen Kommunikationseinheit ausgeglichen, indem die verbleibenden Längs- und Querbeschleunigungswerte mit einem Faktor multipliziert werden, der sich aus dem Verhältnis der im permanenten Speicher 20 abgelegten relativen Korrekturwerte ergibt.

[0082] In einer vorteilhaften Weiterbildung werden die absoluten und relativen Korrekturwerte, welche eine ungenaue Einbaulage des Beschleunigungssensors im Fahrzeug korrigieren, beim Übergang in den Ruhemodus außer Kraft gesetzt, und eine Justiereinheit ermittelt die Abweichung der Längs- und der Querachse des Beschleunigungssensors von der Horizontalen. Abweichungen der Längs- und der Querachse von der Horizontalen können aufgrund der Fahrzeuglage entstehen, bspw. wenn das Fahrzeug an einem Hang abgestellt ist. Aufgrund der ermittelten Abweichung berechnet die Justiereinheit dann Lagekorrekturwerte, welche die Abwei-

chung der Längs- und der Querachse von der Horizontalen in den im Ruhemodus auftretenden Beschleunigungswerten kompensieren, d.h. welche die Fahrzeuglage berücksichtigen. Auf diese Weise kann eine hohe Empfindlichkeit auf schwache Anstöße, bei denen nur geringe Beschleunigungswerte auftreten, in jeder Fahrzeuglage aufrechterhalten werden. Beim Übergang in den Fahrmodus werden dann die absoluten und relativen Korrekturwerte wieder in Kraft gesetzt.

[0083] In der erfindungsgemäßen mobilen Kommunikationseinheit sollten vorzugsweise die folgenden Größen der Funktion Ereignisdatenspeicher konfigurierbar sein:

- Die Beschleunigungsschwelle oder die Beschleunigungsprofile für den Fahrmodus und/oder für den Ruhemodus.
- Das Verhältnis der Zeitspannen des Zeitfensters.

[0084] Die Konfiguration dieser Parameter kann durch den Nutzer auf drei Wegen erfolgen:

1. Über die Tastatur der erfindungsgemäßen mobilen Kommunikationseinheit.

2. Mittels eines Laptops, der mit der erfindungsgemäßen mobilen Kommunikationseinheit bspw. über USB ein Kabel verbunden werden kann und auf dem sich eine Konfigurationssoftware befindet.

3. Mittels der Anwendersoftware über eine entnehmbare Speicherkarte, auf der neben den Ereignisdaten die Konfigurationsparameter in einer Konfigurationsdatei gespeichert sind. Bei jeder Inbetriebnahme prüft der Ereignisdatenrecorder, ob sich diese Datei auf der Speicherkarte befindet. Wenn ja, übernimmt er die dort abgespeicherten Daten, falls nein, behält er die werksseitig eingestellten Werte bei. Die Konfigurationsdatei lässt sich mit der Anwendersoftware auf der Speicherkarte erstellen.

[0085] Das Betriebssystem der erfindungsgemäßen mobilen Kommunikationseinheit kann in einem schreibgeschützten Abschnitt des permanenten Speichers oder in einem zusätzlichen Festwertspeicher gespeichert sein. Letzteres gilt insbesondere, wenn der permanente Speicher als entnehmbarer Speicher ausgestaltet ist.

Patentansprüche

1. Mobile Kommunikationseinheit mit

   - mindestens einer Kamera (12) zum Aufnehmen von Ereignisbildern,
   - einer Uhr (25) zum Ausgeben eines Datums und/oder einer Uhrzeit,
   - mindestens einem Speicher (16) zum Speichern der aufgenommen Ereignisbilder sowie des Datums und/oder der Uhrzeit und
   - einer mit der Kamera (12), der Uhr (25) und dem Speicher (16) verbundene Steuereinheit (14), welche aufgenommenen Ereignisbildern Datum und/oder Uhrzeit zuordnet und den Speichervorgang steuert,

   dadurch gekennzeichnet, dass die mobile Kommunikationseinheit außerdem aufweist:
   - einen Beschleunigungssensor (22) zum Messen von Beschleunigungen und zum Ausgeben von Beschleunigungsdaten oder einen Beschleunigungsdateneingang zum Verbinden mit einem Beschleunigungssensor und
   - eine zum Empfang von Beschleunigungsdaten mit dem Beschleunigungssensor (22) oder dem Beschleunigungsdateneingang verbundene und zum Ausgeben eines einen Speichervorgang auslösenden Auslösesignals in Abhängigkeit von den empfangenen Beschleunigungsdaten ausgebildete Auslöseeinheit (15).

2. Mobile Kommunikationseinheit nach Anspruch 1, **gekennzeichnet durch**, ein Uhrenmodul (24), welches neben der Uhr (25) mindestens einen Empfänger (26) zum Empfang eines Funkzeitsignals und einer Synchronisationseinheit (30) zum Synchronisieren des Datums und/oder der Uhrzeit mit dem Funksignal umfasst.

3. Mobile Kommunikationseinheit nach einem der vorangehenden Ansprüche,
   dadurch gekennzeichnet, dass die Auslöseeinheit (15) derart ausgestaltet ist, dass sie das Auslösesignal ausgibt, wenn die empfangenen Beschleunigungsdaten einen vorgegebenen Beschleunigungsschwellenwert überschreiten.

4. Mobile Kommunikationseinheit nach einem der vorangehenden Ansprüche,
   dadurch gekennzeichnet, dass sie einen Referenzspeicher (29) zum Speichern ereignistypischer Beschleunigungsverläufe umfasst und dass die Auslöseeinheit (15) zum Vergleich der empfangenen Beschleunigungsdaten mit den gespeicherten Beschleunigungsverläufen und zum Ausgeben des Auslösesignals in Abhängigkeit vom Vergleichsergebnis ausgelegt ist.

5. Mobile Kommunikationseinheit nach Anspruch 3 oder 4 **gekennzeichnet durch** eine mit dem Referenzspeicher verbundenen Eingabeeinrichtung (19, 32) zum Eingeben von ereignistypischen Beschleunigungsschwellenwerten bzw. Beschleunigungsverläufen.

6. Mobile Kommunikationseinheit nach Anspruch 3, 4 oder 5, **gekennzeichnet durch** eine Erfassungsein-

heit zum Erfassen der fahrertypischen Beschleunigungsverläufe und eine mit der Erfassungseinheit verbundene lernfähige Einrichtung zum Aktualisieren der ereignistypischen Beschleunigungsschwellen bzw. Beschleunigungsverläufe unter Berücksichtigung der erfassten fahrertypischen Beschleunigungsverläufe.

7. Mobile Kommunikationseinheit nach einem der Ansprüche 3 bis 6, **dadurch gekennzeichnet, dass** er einen Fahrmodus und einen Ruhemodus aufweist, wobei sich der Fahrmodus und der Ruhemodus zumindest durch die jeweilige Empfindlichkeit des Beschleunigungssensors (22) und/oder durch die für den Vergleich verwendeten Beschleunigungsereignisdaten voneinander unterscheiden.

8. Mobile Kommunikationseinheit nach Anspruch 7, **dadurch gekennzeichnet, dass** sie eine automatische Justiereinheit zum Erfassen der Lage des Fahrzeuges im Ruhemodus und zum Einstellen des Nullstellung des mindestens einen Beschleunigungssensors an die erfasste Lage des Fahrzeuges umfasst.

9. Mobile Kommunikationseinheit nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie mindestens eine Erfassungseinheit zum Erfassen von Ereignisdaten aufweist oder mit mindestens einer solchen Erfassungseinheit verbindbar ist und dass die Steuereinheit derart ausgestaltet ist, dass sie den Ereignisbildern die erfassten Ereignisdaten zuordnet.

10. Fahrzeughalterung für eine mobile Kommunikationseinheit (300) mit mindestens einer Kamera (12) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** sie derart ausgestaltet ist, dass sie das Sichtfeld der mindestens einen Kamera (12) nicht blockiert und die mobile Kommunikationseinheit(300) bei unfallüblichen Beschleunigungskräften sicher in der Fahrzeughalterung verbleibt.

11. Fahrzeughalterung nach Anspruch 10, **gekennzeichnet durch** eine Verbindungseinrichtung zum Verbinden mit einem Fahrzeug, welche derart ausgestaltet ist, dass die Fahrzeughalterung bei unfallüblichen Beschleunigungswerten am Fahrzeug fixiert bleibt.

12. Fahrzeughalterung nach Anspruch 10 oder 11, **gekennzeichnet durch** einen integrierten Beschleunigungssensor.

13. Fahrzeughalterung nach einem der Ansprüche 10 bis 12, **gekennzeichnet durch** einen Empfänger (26) zum Empfang eines Funkzeitsignals und eine mit der Uhr (25) einer mobilen Kommunikationseinheit verbindbaren Synchronisationseinheit (30) zum Synchronisieren der Uhr (25) mit dem Datum und/oder der Uhrzeit des Funksignals.

14. Ereignisdatenschreibersystem für Fahrzeuge mit einer mobilen Kommunikationseinheit nach einem der Ansprüche 1 bis 9 und einer Fahrzeughalterung nach einem der Ansprüche 10 bis 13.

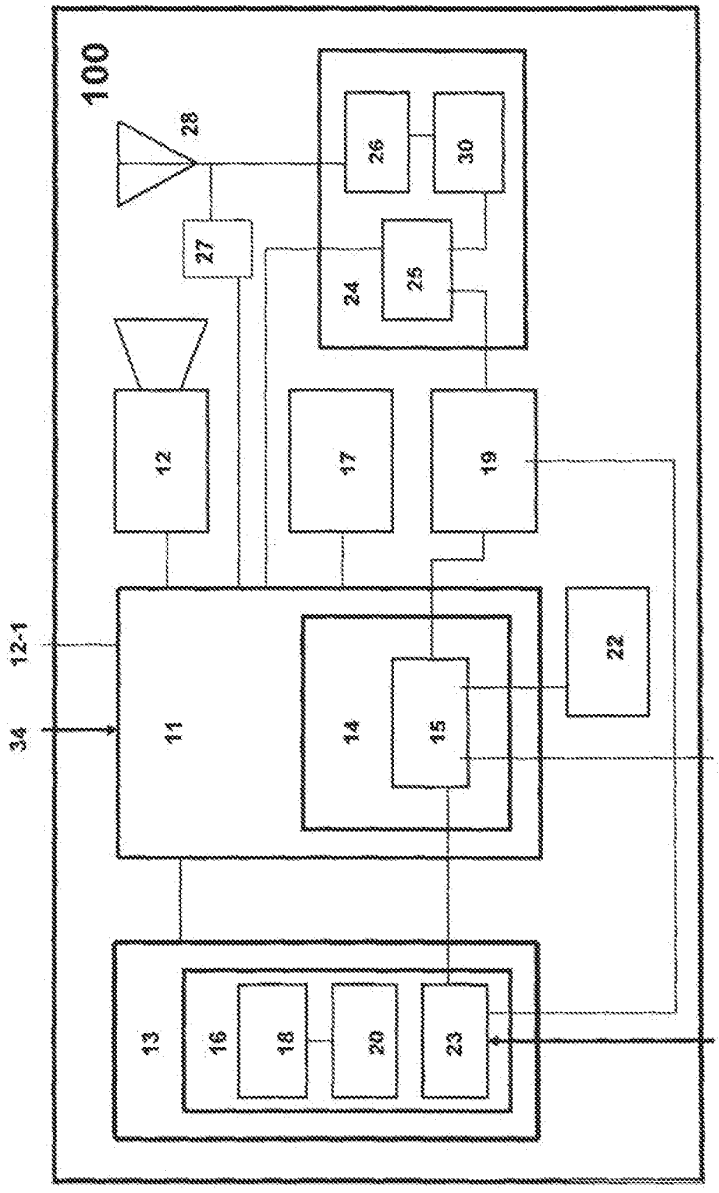


Fig. 1

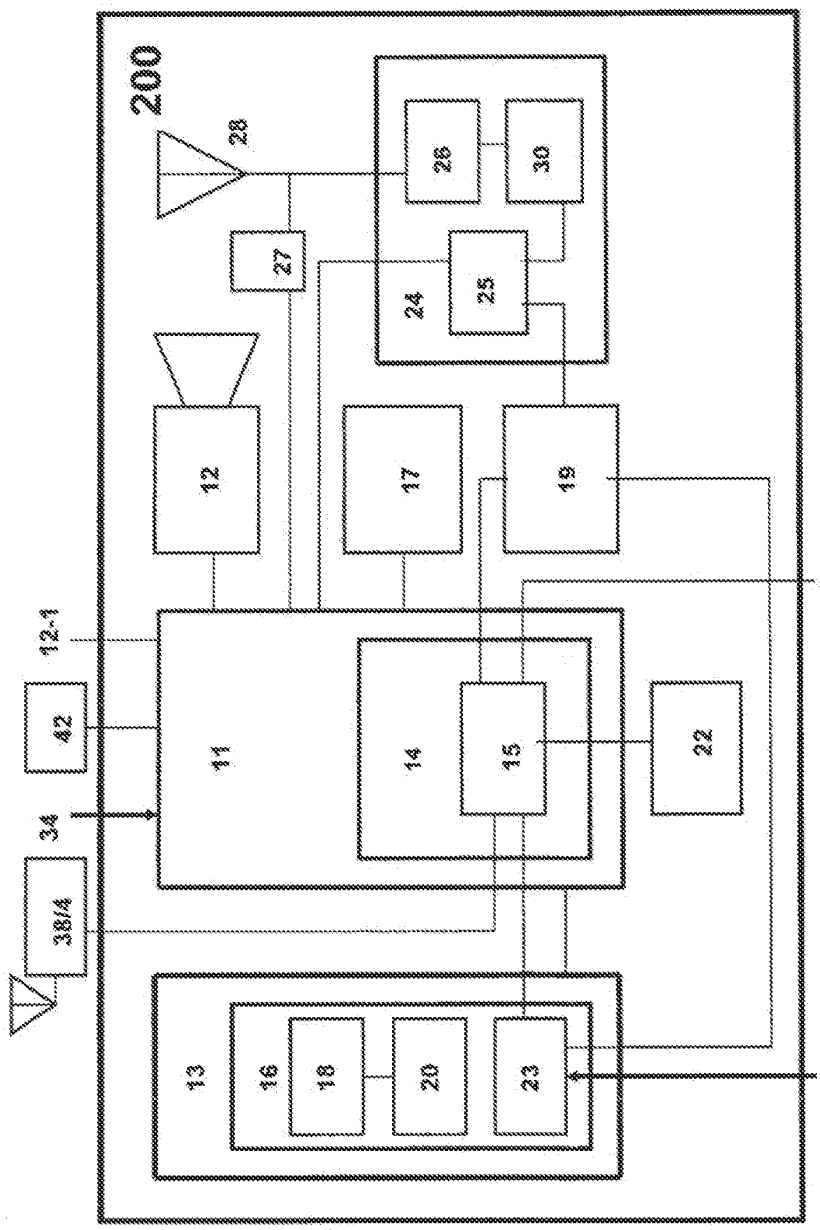

200
28
26
30
27
24
25
12
17
19
36
12-1
42
11
14
15
22
34
38/4
13
16
18
20
23
32

Fig. 2

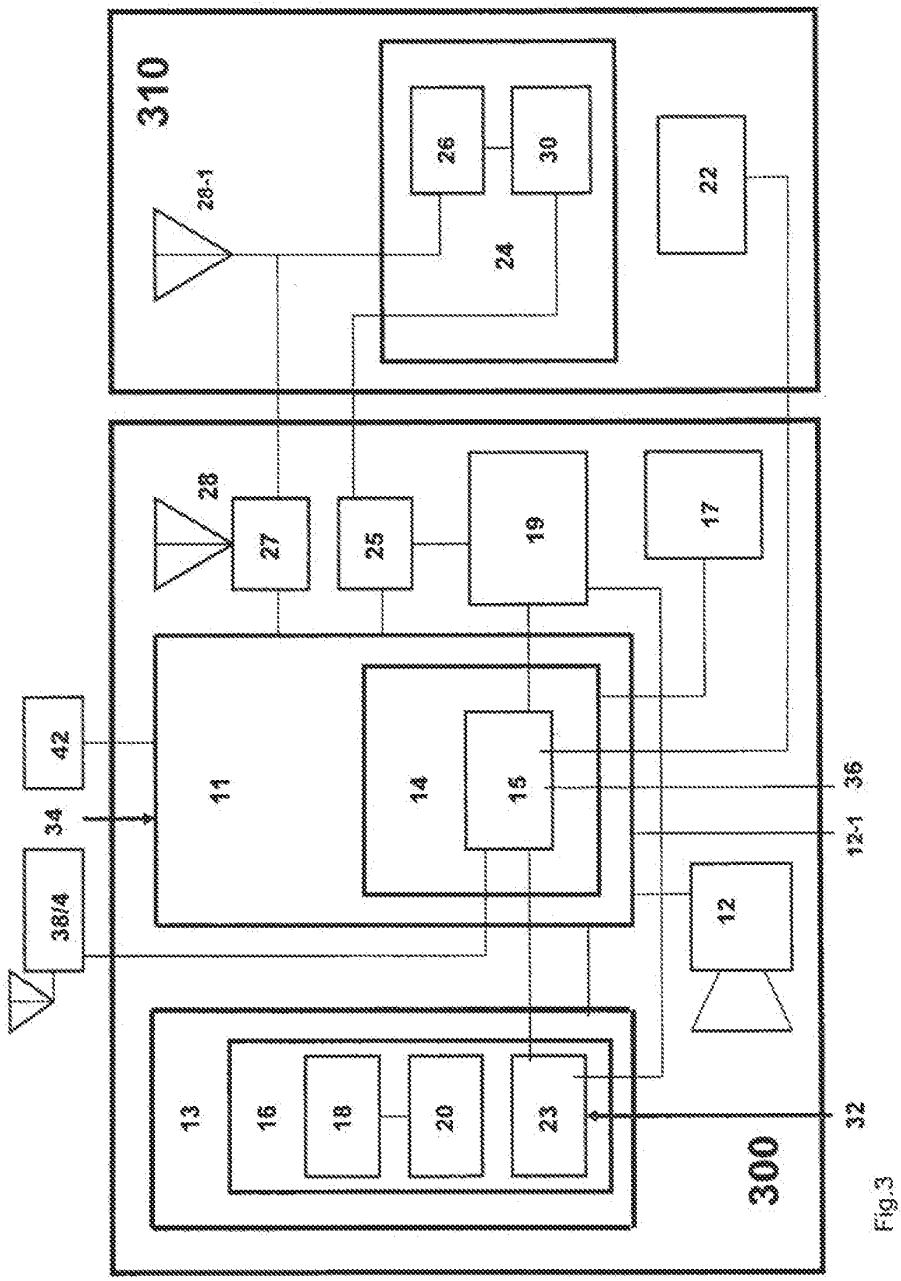

310
28-1
26
30
24
22
28
27
25
19
17
42
34
11
14
15
36
12-1
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16
18
20
23
32
300

Fig.3

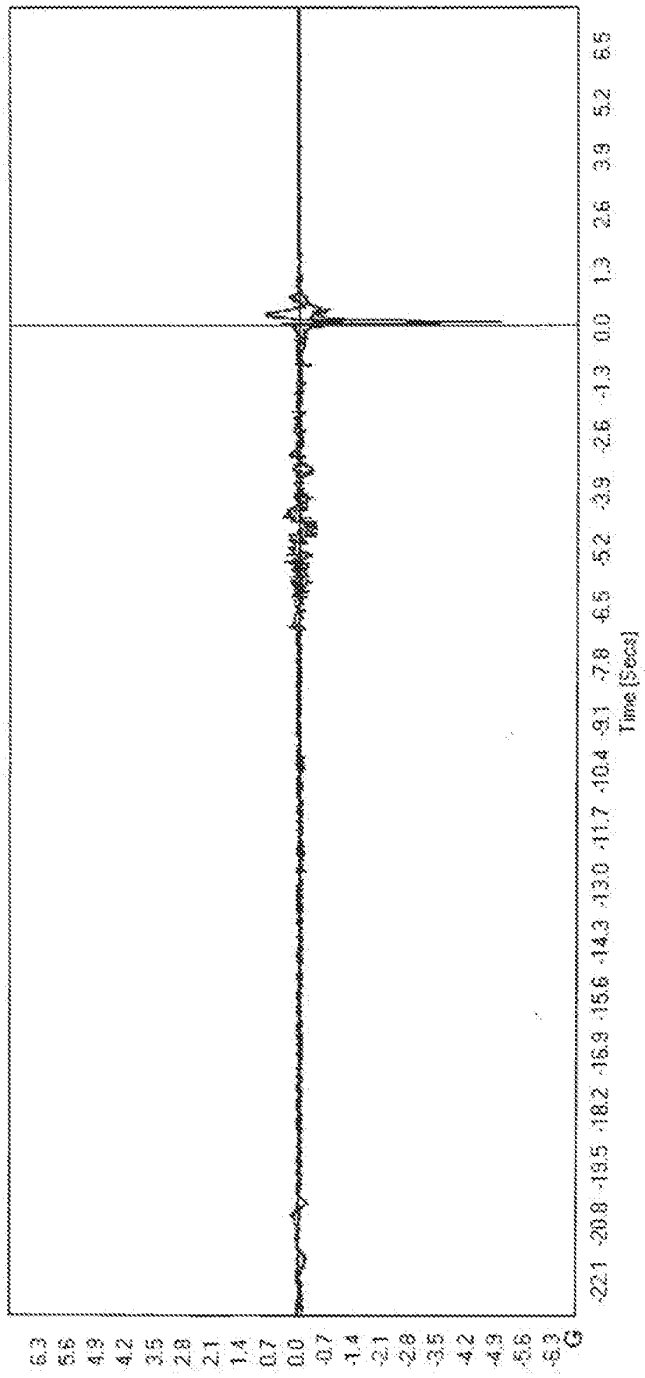

6.5
5.2
3.9
2.6
1.3
0.0
-1.3
-2.6
-3.9
-5.2
-6.5
-7.8
-9.1
-10.4
-11.7
-13.0
-14.3
-15.6
-16.9
-18.2
-19.5
-20.8
-22.1
Time (Secs)
6.3
5.6
4.9
4.2
3.5
2.8
2.1
1.4
0.7
0.0
-0.7
-1.4
-2.1
-2.8
-3.5
-4.2
-4.9
-5.6
-6.3
G

Fig. 4

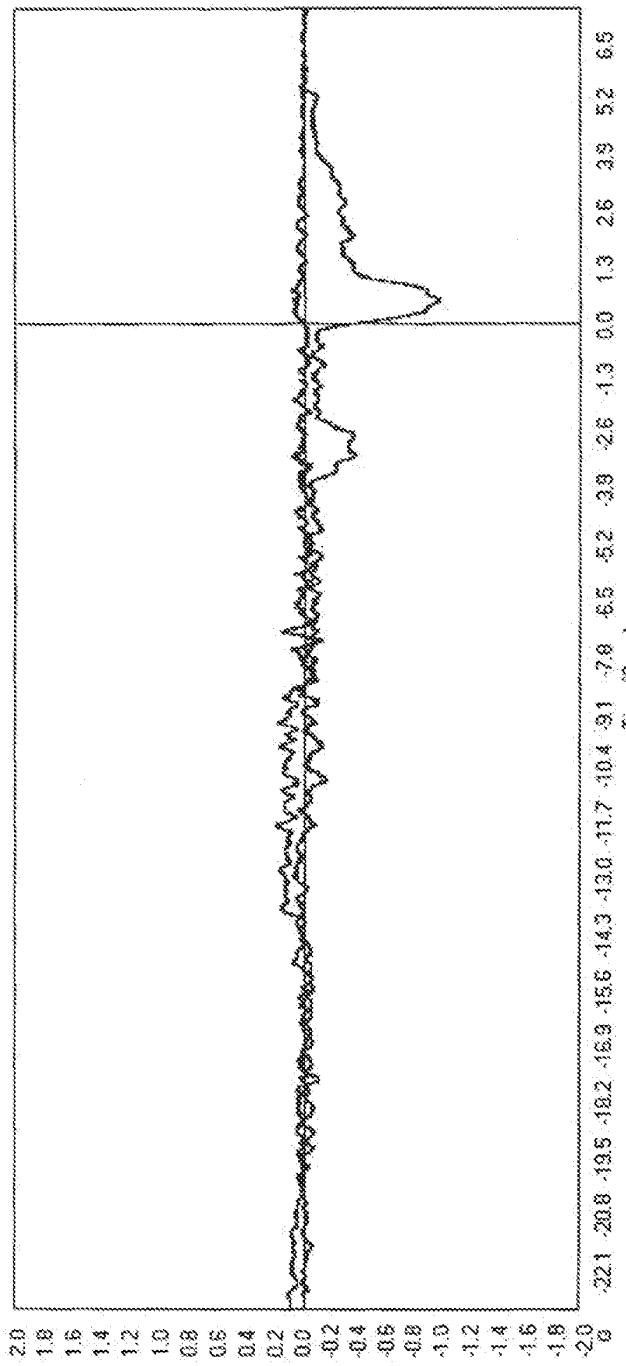

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1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
0
-22.1
-20.8
-19.5
-18.2
-16.9
-15.6
-14.3
-13.0
-11.7
-10.4
-9.1
-7.8
-6.5
-5.2
-3.9
-2.6
-1.3
0.0
1.3
2.6
3.9
5.2
6.5
Time (Secs)

Fig. 5

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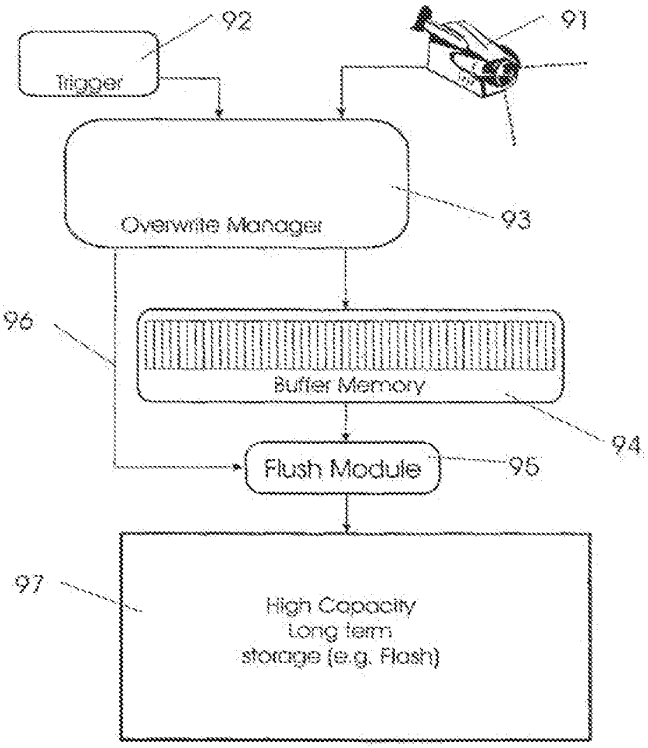
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[Continued on next page]

(54) Title: MEMORY MANAGEMENT IN EVENT RECORDING SYSTEMS



(57) Abstract: A vehicle event recorder is provided that includes a camera for capturing a video as discrete image frames, and that further includes a managed loop memory and a management system for generating a virtual 'timeline dilation' effect. To overcome size limits in the buffer memory of the video event recorder, the maximum time extension of a video series is increased by enabling a reduction in temporal resolution in exchange for an increase in the temporal extension. Memory cells are overwritten in an 'interleaved' fashion to produce a reduced frame rate for the recording of certain time periods connected to an event moment. In time periods furthest from the event moment, the resulting frame rate is minimized while in time periods closest to the event moment, the resulting frame rate is maximized.

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MEMORY MANAGEMENT IN EVENT RECORDING SYSTEMS

Field Of The Invention

The following invention relates to electronic storage of data. More particularly, the present invention relates to systems and methods for memory allocation and writing in devices recording vehicle events.

Background of the Invention

Video recording systems are commonly used to monitor places where it may be desirable to monitor security levels. For example, in a security zone, breaches of security may be recorded if video monitors are arranged around the space to be monitored. When an incident occurs, a video record of the related activity is available from the recording system.

During periods when no breaches of security occur, a considerable amount of data is still generated by the video recording system, which has little or no value. Thus, such data can be readily discarded without loss. The act of 'discarding' data amounts to merely rewriting new data over old recorded data. Indeed, most

video security systems are arranged with a recording medium that is reused continuously.

When a video camera generates an amount of image data sufficient to fully consume the available memory, newly collected data is recorded at the beginning of the memory. Therefore, the act of writing newly acquired data causes old data to be discarded; that is, the old data is lost to the 'write' operation of the newly collected data.

In old videotape systems, this is sometimes called a 'round robin' arrangement. A memory medium fashioned as a tape in a continuous loop provides data storage for those video security systems. In such systems the tape has no end and no beginning, but instead the tape continuously passes by a recording head where new images are written to the tape and at the same time old images are discarded.

When an incident of interest occurs, the tape may be stopped to prevent loss of data which relates to the relevant incident. The related images may be recovered from the tape and transferred to a permanent medium, while the tape is returned to the video system for further recording. Such re-use of memory is well known in the prior art.

In a round-robin scheme, the data that is overwritten, or discarded, is the data which came into the system earliest, or was 'first in' the system. This arrangement is sometimes referred to as "first-in, first overwritten," which is analogous to the "first-in, first-out" arrangement in electronic buffer systems. In both cases, we will refer to this method as FIFO.

A FIFO base system is generally a very good system for buffer management, because the oldest data in

a buffer is typically the least valuable. Therefore, the oldest data, or the least valuable data, may be discarded without regard for its loss. However, in buffer systems the earliest received data, or the 'first-in' data, may not always be the least valuable data. In some instances it may be advisable not to overwrite the oldest data, but rather to provide an overwrite scheme which preserves certain portions of interest of the oldest data.

With specific reference to the monitoring of vehicle activities, vehicle event recorders are video recorder systems mounted within the vehicle to provide a video record related to the environment surrounding a vehicle during its operation. These systems are known in the art and are employed, for example, in conjunction with police activity. Many police departments in the United States are equipped with vehicle event recorders, which capture activity, sometimes criminal, occurring in the proximity of a police vehicle.

The application of vehicle event recorders is not limited to police vehicles. More and more commercial vehicles are now equipped with systems that record activity associated with the use of the vehicle and within the environments in which the vehicle is used. These systems are particularly advantageous with fleet vehicles that are subject to heavy professional use and frequent incidents, including traffic accidents, theft, and vandalism, among others. With a video record, vehicle fleet managers are better equipped to manage and control costs associated with operations of large vehicle fleets. Safety is improved, driver performance is improved, a better understanding of accidents is achieved, and other benefits are derived from the use of vehicle recorder systems.

Vehicle recorder systems are described, for example, in U.S. Patent Nos. 6,389,340, 6,405,112, 6,449,540, and 6,718,239, all to Rayner. In general, these inventions relate to a small device mounted on the vehicle rearview mirror to capture video images of traffic incidents ahead of the vehicle.

In particular, the '112 patent discloses a system that includes a vehicle operator performance monitor, which records a video of the vehicle operator, and which may be used to determine how the operator's actions affect use of the vehicle.

The '540 patent instead is an event recorder mounted in a vehicle, which includes one or more wave pattern detectors for detection and recognition of a predetermined wave produced outside the vehicle, and for producing a trigger signal denoting the presence of the predetermined wave. In particular, a detective wave is a wave of the type produced by a police or fire department emergency vehicle. Detection of this wave triggers a capture function which stores video images a long-term storage memory.

The '329 patent includes a video recorder system having a one-way hash function to perform a validation function. This way, the integrity of the recorded video data can be protected.

Finally, the '340 patent teaches a recording system having a certain relationship between two different types of memory. A first memory is arranged to store video for the short-term and to transfer some of that stored video in response to a trigger event. Data from this short term memory is transferred to a more durable and long-term memory, and the short term memory is continuously overwritten in a scheme described by

Rayner as "first-in, first-overwritten". This way, Rayner teaches the coupling of a high-speed, high-performance volatile semiconductor memory with a flashlight memory good for long-term storage of large amounts of data even when power is removed. As will be described in detail later, Rayner's first in first overwritten scheme necessarily creates a loss of important and valuable data.

While systems and inventions in the prior art are designed to achieve particular goals and objectives, these inventions also include limitations which prevent their use in more extended applications, and cannot be used to realize the advantages and objectives of the inventions taught hereinafter.

Summary Of The Invention

It is an object of the present invention to provide high-performance memory allocation systems for vehicle event recorders.

It also is an object of the present invention to provide for set memory allowances and for extended recording periods.

It is a further object to provide memory overwrite schemes that provide a time dilation on either end of a recording period.

These and other objects of the present invention are accomplished by apparatus and methods for allocating memory in vehicle event recording systems that provide improved memory allocation and writing schemes to preserve data over extended time periods, thereby improving prior art devices and methods that cannot record events over a large time range when equipped with a memory of a predetermined size.

One difference between memory allocation of the present invention and the prior art can be seen in relation to time dilation, which may be applied on the extremities of discrete capture periods. In one embodiment, a memory of limited size is subject to an advanced managed loop memory allocation scheme and the rate of storage frame is adjusted throughout a predetermined capture time period. At the extremities of a time period, a frame capture process is subject to a reduced frame rate. In the proximity to an event of interest, or an 'event moment', the frame rate is increased to improve detail around that particular time, enabling a greater temporal range at the expense of temporal resolution. Losses in temporal resolution are however pushed away from the event moment and allocated to the extremities of the capture time period.

An overwrite scheme selects which frames are expired and subject to being discarded. At any random moment, video is continuously captured at a maximum frame rate. However, these frames are not stored into memory in a conventional first-in, first overwritten manner, but rather, these frames are added to the memory locations which are determined to be available in accordance with the overwrite scheme. Therefore, the oldest frames are not necessarily those that are overwritten. Quite to the contrary, an overwrite action may be applied to a frame which is newer than at least one other frame stored in the memory.

As a result, newly acquired frames are placed into memory in processes which necessarily cause older frames to be discarded. However, the newly captured frames are written to memory positions in an 'interleaved' fashion, whereby some of older frames are

preserved. When a capture event occurs, data in the memory may be transferred to a more permanent storage. When data is transferred, a timeline is reconstructed. The recorded timeline is unique in that it contains various frame rates over the capture period. At both the beginning and at the end of the capture period, the frame rate is modest. At the point of greatest interest in the capture period, the frame rate is the highest. This throttling of frame rate provides for a memory of given size to accommodate a timeline of greater temporal extent.

Brief Description of The Drawings

These and other objects and advantages of the present inventions will become better understood upon consideration of the following description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a timeline illustration in conjunction with a graphic that illustrates a plurality of memory bin units;

Figure 2 is a timeline illustration and memory graphic illustrating an overwrite operation;

Figure 3 illustrates the overwrite operation in conjunction with a trigger event;

Figure 4 illustrates particular memory bins with various levels of importance associated therewith;

Figure 5 illustrates an advanced overwrite scheme to protect certain 'high-value' video frames;

Figure 6 further illustrates this overwrite scheme near the end of memory space;

Figure 7 illustrates memory allocation with pointers to memory bins to be saved and pointers to those bins to be erased;

Figure 8 illustrates four alternative timeline illustration in different embodiments of the invention;

Figure 9 is a block diagram of one embodiment of the invention;

Figure 10 is a block diagram representing an embodiment of a methods for memory management; and

Figure 11 is a more detailed block diagram of the method of Figure 10.

Detailed Description Of The Invention

The present invention relates to apparatus and methods are provided for overwriting memory in vehicle event recorder systems. Embodiments are described hereinafter that are constructed in accordance with the principles of the present invention. In order to facilitate the understanding of the described embodiments, definitions are provided for terms that may not be readily available in popular dictionaries.

Vehicle Event Recorders: Video image recording systems which are responsive to triggers indicative of some event of interest.

Time Dilation: An expansion of a video sequence timeline by way of frame rate manipulation.

Trigger: Electronic means for setting some instant in time associated with a particular event of interest and further for causing initiation of some associative processes.

Expanded Timeline Definition: A prescribed set of rules which sets forth and defines a timeline associated with a video frames sequence having more than one frame rate associated with any particular portion of the timeline.

Overwrite Manager: A computer module determining, in accordance with an expanded timeline definition, which data recorded in memory and associated with a particular video frame is to be discarded and may be overwritten with data from a newly collected video frame.

Video event recorder systems are typically built around and deployed with memories of limited sizes, in order to contain cost. While mass storage and mass storage management may be included in such devices, for example, a computer-type hard drive, these types of components remains quite expensive, causing overall systems to double in cost if such memories were included. Instead, a 'lightweight' memory solution is envisioned in the present invention, in which an abbreviated memory or memory buffer is used to temporarily store information collected during a predetermined time of service, for example a day, of a vehicle equipped with this type of video event recorder. Upon return to base, a vehicle may transfer the information collected to a different memory for management and analysis. Accordingly, the present invention makes it possible to equip vehicles with video event recorders having very inexpensive cameras and memory.

Memories of such video event recording systems are preferably handled in the following manner. A memory system is divided into two portions: a fast, managed loop memory buffer, and a temporary mass storage memory.

Video continuously received from a video camera may be put into the fast memory buffer. However, the amount of data generated by a video system is quite extensive and most of the time totally uninteresting, but certain portions of the video may become of great

interest. For example, when a vehicle is involved in a traffic accident, the captured video may yield important clues as to fault, cause, identity, and response, among others. In this event, it is important to preserve video data associated with these select video capture periods.

To this end, a trigger is arranged, whereby the occurrence of some incident of interest, such as an automobile accident, causes data stored in the memory buffer to be transferred to a more permanent memory facility. Old data in the memory buffer is continuously overwritten by new data received from the video camera in real-time. In common and simplistic versions, this step is performed in a "first-in, first-overwritten" manner.

Because the memory buffer is limited in its capacity to store video frames, "first in first overwritten" schemes provide a timeline of limited extent. For example, at a frame rate of four frames per second, a given memory buffer may be suitable for storing 30 seconds of video frame data, or a 30 second video timeline. In 'first-in, first overwritten' schemes, this timeline may be arranged as 15 seconds of continuous video before a trigger event and 15 seconds of continuous video after a trigger event.

However, a continuous frame rate throughout the entire event capture period need not be maintained. It is possible to have a modest frame rate at times associated with the capture period extremities, and a high frame rate during periods around an event trigger. Therefore, the storage frame rate may be adjusted throughout a prescribed capture time period, allowing for an extended temporal range. Instead of a 30 second timeline, is entirely possible to have a 48 second timeline for the same memory. Such a timeline may be embodied as 12

seconds of video at a frame rate of one frame per second for the periods of time furthest apart from the event trigger, both before and after. In addition, the video sequence may include video for 24 continuous seconds, 12 seconds before and 12 seconds after an event trigger, at a video frame rate of four frames per second. This way, the temporal range is extended but the temporal resolution is compromised in the time periods furthest from the trigger event.

To create such a managed loop memory buffer management system, an overwrite scheme is provided to select which frames are 'expired' and no longer part of the particular extended timeline scheme. It should be remembered that video is continuously captured at all times, and that video is captured at the maximum frame rate, because it is not known in advance when an event trigger will occur. Accordingly, the system always captures video at the maximum frame rate as the capture frame rate cannot be adjusted in view of any event trigger which may come in the future.

Video captured at the maximum frame rate is put into the memory and as it is put in the memory it displaces previously recorded video frames. These frames are added to the memory locations determined to be available in accordance with a prescribed overwrite scheme such as the one mentioned above. However, this step is provided differently from a first in first overwritten scheme. In the presently described embodiment, most frames being overwritten are actually newer than at least one other frame stored elsewhere in the memory buffer. Newly captured frames are written to memory positions in a pseudo-'interleaved' fashion while some of older frames are preserved.

When a trigger event occurs, data in memory is transferred from the memory buffer to a memory of more permanent nature. When such data is transferred, an expanded timeline is reconstructed as a timeline having at least two frame rates. At the extremities of the capture period timeline, the frame rate is reduced. At and about the point of greatest interest (trigger event) the frame rate is maximized during the capture period. This 'throttling' of frame rate provides for a memory of preset size to accommodate a timeline of greater temporal extent, although in some places resolution may be reduced.

Referring now to Figure 1, a first timeline is shown that is associated with a memory system divided into a plurality of memory bins. For exemplary purposes, some arbitrary numbers for memory size, number of bins, video frame rates, etcetera, have been selected. It is to be understood that these are not necessarily preferred values, but values selected to promote an understanding of the example provided.

The memory related to Figure 1 is a high-speed, high-performance memory of limited extent, and is arranged as a buffer. This memory communicates with incoming video data recorded by a video camera, and its output is directed to another means for data storage means, such as a memory system having a greater capacity but lower speed, for example a semiconductor DRAM type memory. Alternatively, the memory of Figure 1 may be a non-volatile, high-performance memory based on ferromagnetic principles, which can respond in real-time to video collected by a video camera, but is of limited size and not suitable for saving the mass amounts of data generated by video image systems.

In general, the memory of Figure 1 may be limited to a few megabytes and may temporarily hold a limited number of video frames, which may or may not be transferred to a more permanent memory in a transfer operation. In particular, the memory may be divided into 120 bins, with each bin be sufficient for storing the data associated with a single video frame.

A timeline 1 is associated timeline 1 with this memory, and is comprised of a 30 second time interval. The timeline is marked in the Figure from 0 to 30. A one second interval 2 is illustrated at the beginning of the timeline. Further, that one second interval is divided into quadrants, representing a quarter of a second interval 3. For the video systems of immediate interest, this quarter of a second interval nicely accommodates a single video frame (implicitly setting a frame rate of four frames per second). While most modern video systems have far higher performance than recording four frames per second, four frames per second is a useful rate for vehicle recorder systems, which tend to have limited memories in the interest of maintaining a low cost. Further, the kinds of events being recorded in vehicle recorder systems are appropriately captured with frame rates of a few frames per second.

When video images are captured by a camera, frame-by-frame, each frame images can be recorded into a memory bin 4. A first frame is recorded and put into a first memory bin. Thereafter, a quarter of second later, a second frame is recorded and put into an another memory bin, for example, an adjacent bin. This frame-by-frame recording scheme may continue for up to 30 seconds before all memory bins becomes full and the supply of empty bins is exhausted. In Figure 1, the first 116 memory bins are

shaded to indicate that one frame each of video data has been written to those bins. This is equivalent to recording of a video signal 5 of four frames per second for 29 seconds. Figure 1 also illustrates four empty memory bins 6, which would be filled in the next second of video recording. Because the recording of video images in this manner is known in the art, Figure a is labeled as prior art.

Figure 2 illustrates a similar timeline 21 in conjunction with a graphical illustration of a memory having 120 memory bins. As in Figure 1, a time interval equivalent to one second 22 as well as a time interval of one quarter second 23 is illustrated for reference. The graphical depiction of the memory includes lightly shaded areas 24 and 25. The memory bins presented as 24 represent those bins having data written thereto from a video which was collected from a time t = 14 up to a time t = 30. The demarcation indicated as dotted line 26 indicates time t = 14. At time t = 30, the memory is completely full. Video data collected for 30 seconds at four frames per second fills 120 memory bins. The video data collected at time t = 31 cannot be saved to memory unless a portion of the memory already allocated and consumed in a previous data write step is overwritten. Thus, in the graphic of Figure 2, memory bins indicated by 25 on a second line represent that video frame data that is recorded in these memory bins at the expense of data captured 30 seconds prior. Accordingly, for the time period indicated, i.e. video data collected from t = 0 to t = 14, that video data is lost to an overwrite step. In Figure 2, those bins shaded dark are indicated as 27, representing the over-written bins. This illustrates the so-called 'round-robin' or 'first-in,

first-overwritten' FIFO memory management schemes. Since these schemes are also known in the art, Figure 2 is also labeled as prior art.

The FIFO memory management scheme is very useful. When a new video frame is collected by the video camera, it is placed into memory at the same location as the oldest frame in the memory which is discarded in the overwrite step. Therefore, the FIFO memory management scheme implies that the oldest video information in the memory is the least valuable.

The memory described is a buffer memory, that is, this memory temporarily holds the data of a video series for some specified time, but also continuously discards previously recorded information. When the buffer contains a data set associated with an important event, that data is transferred from the buffer memory to a more permanent memory before becoming subject to being lost by overwrite actions. A video series becomes 'important' when a detectable event occurs which implicitly indicates video is valuable; for example, if a vehicle is involved in a traffic accident, accelerometers can detect the accident and trigger a transfer of data from the buffer memory to a permanent memory.

In those vehicle event recorder systems, a trigger is sometimes arranged to indicate that such an event has occurred, that is, an event for which the video images associated therewith may be of extreme importance. In this case, the short term buffer memory of 120 video frames should be transferred to a more permanent long-term memory for example, a durable flash type memory.

Figure 3 is directed at illustrating a timeline which includes an event moment. Figure 3 includes a timeline 31, and the dashed line 32 to indicate the 29th

second along with a marker 'X' 33 to indicate a trigger event has occurred at the 29th second. When a trigger event occurs, it is important to preserve the video data which occurred after the accident as well as the video data which occurred before the accident. Video images collected during a time period starting 15 seconds before the accident are in the bins indicated by 34; i.e. those video image frames collected between t = 14 and t = 29. Memory bins at the end of the time line indicated by 35 include four video frames collected during the first second after the accident. Video image frames collected between t = 30 and t = 44 are placed in the memory bins indicated by 36. Thus, the memory buffer contains video images for the 15 seconds prior to the accident and the 15 seconds after the accident. Because the memory is of limited size, it can only hold video image data which represents 30 seconds of video recording.

At this point in time, no new frames are recorded to memory; overwrite is prevented, and the memory buffer is "locked". Rather, the system pauses to transfer data in the buffer memory to a permanent flash memory. After data is successfully transferred to the flash memory, the buffer is "unlocked" and may be used again in the fashion described. As video data which was placed into buffer memory bins between time t = 30 and time t = 44, it caused older data to be displaced, overwritten and forever destroyed. Data which was recorded between t = 0 and t = 14 is completely lost and no access is possible any more to this information, which at one time resided in those memory bins, because that information was destroyed in the overwrite step. However, some of this information may be very valuable and, accordingly, it is quite undesirable to lose it

entirely; in fact, some of this data may be more important than data which saved in its place.

Since the moments leading to a vehicle accident can explain a great deal about the what actually happened, it is highly desirable to have at least some limited information that relates to the accident scene at t = 1, for example. If one can just see one frame at t = 1, that may be extremely valuable in explaining what happened in the accident. Therefore, the FIFO scheme may actually destroy critically useful data.

This is also apparent from Figure 4, which explicitly shows certain bins A ~ F associated with various points of the timeline 41 and with reference to trigger event 42 time at time t = 29. The following discussion further illustrates the importance of bins A ~ F.

In a FIFO system, all memory bins, indicated by reference numerals 44 and 45, are preserved in the memory buffer. Amongst the oldest recorded video frames remaining are those which reside in memory bins A and B, and which represent two adjacent frames, or frames captured within a quarter of a second from each other. Since these frames represent images very close in time, these frames are expected to be quite similar to each other. While it is sometimes desirable in video systems to have high temporal resolution, i.e. as many frames per second as possible, one will appreciate that at higher frame rates, a frame will contain very similar information as the frame closest thereto. Accordingly, where memory is limited, these adjacent frames lose their importance as most of the information contained in each frame is similarly contained in the adjacent frame.

Thus, if we keep frame A and discard frame B, most of the information of frame B can be known by examining frame A.

On the other hand, frames D, E and F, which are discarded in a FIFO system, may actually contain extremely important information. Frame D is separated in time from frame E by one second. In a video scene, there may be considerable differences between one frame captured an entire second later than another frame. Further, frame D occurs a full 29 seconds before the trigger event. In a traffic accident, it can be quite useful to know about what was happening at time periods before and after a trigger moment. Thus, it may be possible in a memory having a finite number of memory bins to trade some of the bins associated with less important time slots for bins associated with time slots having a greater importance. If we discard frame B, and preserve frame D, we may gain a greater overall understanding of the incident being recorded. In effect, we can trade some time resolution (frame rate) at t = 15, for improved overall temporal range to realize an extended timeline.

One skilled in the art will notice that if video data associated with a frame rate of one frame per second was preserved, in seconds 1 - 12, then 36 memory bins into would remain available, which would accommodate newly captured video data. Thus, rather than completely overriding the oldest video data in memory, one can perform an overwrite action on 3 of every 4 memory bins in the overwrite portion of the timeline, thereby maintaining $1/4^{th}$ of the oldest video data in those memory bins. That is to say, for the oldest video data in memory, it may be useful to save one frame per second. To this end, when the overwrite operation is executed,

new data is written to three memory bins, before one bin is skipped, and the process is repeated.

Timeline 51 includes a trigger event 52 at time t = 29. In one overwrite scheme of interest, it is required that a timeline be comprised of 12 seconds of low temporal resolution, 24 seconds full temporal resolution and a further 12 seconds of low temporal resolution. This is further defined in detail as: a 12 second period of one frame per second video, a 24 second period of four frames per second video, and finally a 12 second period of one frame per second; for a total video sequence of 48 seconds. Since it cannot be known at what time in the future an event trigger will occur, a data overwrite scheme must preserve data associated with various frames, of which a prescribed timeline is comprised. In the present example, continuous video data at a frame rate of four frames per second is preserved for a period of 12 seconds 54 before the trigger event; that data is in memory bins indicated by 53. While in the FIFO system one can preserve data at four frames per second for up to 15 seconds before and after the trigger event, in the system of the present embodiment only 12 seconds of four frames per second data be kept. However, it will be shown that the present embodiment enables the expansion of the total timeline of the video sequence to 48 seconds in contrast to the 30 second timeline of the FIFO system.

In the 31st second, the first overwrite operation begins. Whether or not a trigger has occurred, newly captured video data is written to every three out of four memory bins, leaving the fourth memory bin undisturbed. Therefore, old data is preserved, albeit at one quarter of the frame rate from which it was

originally recorded. Video data after the trigger event is recorded in the memory bins 55 at a frame rate of four frames per second. Just because some bins are skipped, the frame rate of video data collected after the trigger event is not necessarily reduced. This is readily understood in consideration of the time point indicated by 57 which indicates the time t = 41 seconds, while, without skipping bins, this point in memory would have been time t = 45. Careful observation will prove that the bins indicated by 55 will accommodate data at four frames per second for the entire 12 seconds after the event trigger.

After the time point indicated by 57, several memory bins remain available for further overwrite operation before reaching the memory bins which contain data to be preserved in agreement with the timeline definition 12/24/12. At least some of those memory bins up to the position indicated by 54 are available for overwrite. After the full 12 seconds of four frames per second video is recorded, it is desirable to continue recording video data at one frame per second for an additional 12 seconds. Data captured in this period can be stored in memory bins, which are scattered in various locations about the memory buffer. Figure 6 illustrates on example of such locations.

More particularly, Figure 6 illustrates memory bin locations which are available for overwrite as the memory approaches its full capacity for the particular schemes presented herein. Once a trigger event occurs, i.e. is set in time, it is possible to compute which video frames must be saved in accordance with the particular timeline definition, and which frames may be discarded. For example, 48 frames at four frames per

second may be preserved immediately before the trigger event. In addition, 12 frames at a video rate of one frame per second may be preserved for the time t = 5 up to t = 17. These frames must be protected from any further overwrite operation, and are marked "must be saved" in Figure 6. These frames are saved as they are included in the timeline definition.

All frames which precede t = 5 are in condition for being discarded. that is, such frame lie outside the time range which is to be preserved. Accordingly, frames indicated for example as 69 have aged sufficiently and are may be erased. These are the frames which originally were preserved in the overwrite operation as skipped frames.

Video frames captured after the trigger event are also saved in the memory. For 12 seconds after the trigger event, t = 29 to t = 41, video is captured at a rate of four frames per second. Such a video data 65 is put into memory in accordance with the need to save particular frames of the oldest video data. When all video frames from the period t = 29 to t = 41 are properly recorded, the system continues to record data at the frame rate of one frame per second. This is different from the earlier operation, in which the overwrite action resulted in the preservation of one frame per second.

For the time period 12 seconds after the event trigger up to 24 seconds after the event trigger, data is put into memory at the reduced frame rate of one frame per second. Other frames may be captured by the camera, but are discarded before entering the memory or instantly thereupon. Thus, the frames represented by 67 are put into memory bins which are available in accordance with the "OK to erase" label in the drawing. A person skilled

in the art will note that after three of these frames are placed in the memory, the fourth frame 68 cannot be placed into the memory in the same repeating geometric position. That is to say, those memory bins are not available for overwrite. Therefore, video captured after that time must be carefully managed and fit into the available memory bins.

Figure 7 illustrates the steps taken in the final filling of the remaining memory bins. In timeline 71, event trigger 72 is situated at time t = 29. In agreement with this exemplary timeline definition, video captured at a frame rate of four frames per second from t = 17 to t = 29 is stored in memory, as indicated by 73. Similarly, video captured for a 12 second period at a frame rate of four frames per second from t = 29 to t = 41 is stored in memory, as shown by reference numeral 74. Finally, video frames captured during a 12 second period from t = 42 to t = 54 at a frame rate of one frame per second include those particular frames represented as 75, which must be inserted into the memory bins remaining available for overwrite.

Arrows 76 indicate that these frames may be placed in locations near the beginning of the memory, where data had once been stored but is now expired because the trigger event occurs at t = 29. Once a trigger event is established, the bins which may be overwritten can be determined according to the particular rules defining the timeline.

The example of Figure 7 clearly illustrates that careful management of an overwrite scheme enables a memory buffer to dilate a timeline by manipulating which video frames are preserved and which are overwritten. Consequently, temporal resolution is sacrificed to extend

temporal range, that is, the frame rate of "saved data" is altered in order to make more space available for video frames captured further in time from the event trigger. Accordingly, the greatest amount of information can be preserved in a memory buffer of the limited size.

While the example of Figure 7 illustrates where the data may be written in memory, those skilled in the art will note that the physical positions of memory bins may be altered. Therefore, after a timeline definition is set, an algorithm may be developed defining the bins containing data that has expired and thus implicitly defining a bin available for overwrite at any moment in time.

While the example presented of Figures 5-7 illustrates one possible solution, it should be understood that other arrangements may provide for a time dilation in accordance with the spirit of the present invention, and that specific values may be used that are different from those presented in the above exemplary timeline definition. In another exemplary timeline definition, one might arrange a system whereby two periods of eight seconds are used to capture video of a high frame rate, and two periods of 28 seconds are used to capture data at a low frame rate, thus achieving a total expanded timeline of 72 seconds.

The advantages offered by the above examples do not depend upon the particular values chosen in these examples. One should also recognize that because capturing/saving video at two different frame rates enables a user one to expand the timeline, capturing/saving video at three different frame rates also enables a user to expand the timeline with greater flexibility. Accordingly, the memory may be manages to

preserve frames for some time periods at a rate of four frames per second, and in other time periods at a rate of two frames per second, and in still other time periods at a rate of one frame per second. This arrangement provides for very high temporal resolutions for the periods immediately surrounding an accident (trigger event), for medium level resolutions for periods further away from the trigger event, and finally for low temporal resolutions at the extremities of the time range.

In addition, asymmetric timeline definitions are possible, that is, the time periods on either side of the event trigger may not be equal in extent or in number. A timeline definition may be devised that has a long, high resolution period before the event trigger, and a short high resolution period after the event trigger. Figure 8 illustrates various timeline definitions of interest, and is related to several examples each working equally well within the common concept of timeline dilation. Figure 8 graphically illustrates a first memory buffer 81, which was discussed in detail in a previous example, and in which there are two frame rates, namely, a high video frame rate of four frames per second and a low video frame rate of one frame per second.

A trigger event 82 occurring at some instant in time implicitly sets the time periods for any particular example, and time period 83 starts immediately after the trigger event and extends for 12 seconds. A second time period 84 extends from the trigger event to 12 seconds prior to the trigger event. In both of these time periods, video is captured and put into the memory buffer at a rate of four frames per second.

The number of shaded memory bins reflects a frame rate of 4 frames per second. Time periods at the extremities of the timeline, periods 85 and 86, are each also configured to be 12 seconds in length. However, since only one frame per second is collected in those time periods, the number of memory bins consumed is considerably smaller, i.e. 1/4 of those consumed in the other time periods. This arrangement provides for a total timeline of 48 seconds, and in memory buffers that do not overwrite/store data at variable rates, the same memory size could only accommodate a timeline of 30 seconds. FIFO memories of the same size are restricted to 30 seconds.

A second example presented as 87 in Figure 8 suggests two high temporal resolution periods of 10 seconds each. In addition, there are two low temporal resolution periods of 20 seconds each. While there is a reduced overall period of high-resolution video data, the total timeline is extended to 60 seconds.

A third example is presented through the memory buffer of graphic 88, and illustrates that an asymmetric timeline definition may also be configured. The two periods with a high rate of video recording need not be the same in extent. In fact, video may be recorded at a high frame rate for a longer period after a trigger event than that in the period immediately preceding the trigger event. In the present example, video is recorded in the memory buffer for 16 seconds after the trigger event, but only for four seconds prior to the trigger event. Accordingly, the total high-resolution time period is the same as in the previous example, 20 seconds, but greatly favors preserving information after the trigger event, at the expense of information preceding the trigger event.

In a fourth example, there are six distinct time periods comprised in the timeline. Two 9 second periods occur symmetrically about an event trigger. In these time periods video may be captured a rate of four frames per second. Two additional periods each of 8 seconds may be used to record/overwrite data at a frame rate of two frames per second. Two additional 8 second periods are provided to store data at a frame rate of one frame per second. One skilled in the art will appreciate that in the timeline of this example, two of the 8 second periods are of different sizes with respect to memory capacity, i.e. greater number of bins, than the other two 8 second periods. This is consistent with the higher frame rate used in two of the 8 second periods.

One skilled in the art will also appreciate the great latitude available for managing a memory buffer of limited capacity to expand a timeline. One skilled in the art will further appreciates that where memory buffers deploy FIFO or 'round-robin' strategies for overwrite operations, very important data may be lost. FIFO and 'round-robin' strategies discriminate against the oldest data in a memory buffer, and in situations where the oldest data is not the least valuable, FIFO and round-robin systems are inferior to the system of the present invention.

Referring now to Figure 9, the fundamental elements of apparatus according to the present invention is described. Video camera 91 is operable for collecting optical energy and for converting the image of a scene into electrical signals, suitable for processing by common electronic means such as digital semiconductor memories and processors. In addition, these systems include a trigger mechanism 92.

In one embodiment, a trigger mechanism is the device arranged to provide an electrical signal that indo indicates that a particular video series should be transferred to permanent memory for long-term storage. A trigger may be an accelerometer operable for detecting abrupt changes in speed, for example, speed changes related to a traffic accident. Triggers may be activated by other events such as heavy braking or swerving maneuvers, and may be activated by means other than accelerometers. For example, a user panic button can be used to activate a trigger event.

When the user believes that a video series should be saved, he can hit a panic button to activate one type of trigger. It is not relevant what precisely causes a trigger to be activated, but rather how memory performs once a trigger event has occurred. Overwrite manager 93 is a control module that interfaces with the trigger and a video camera, and also with a buffer memory 94. An overwrite manager includes means where a timeline definition may be set and further means for executing overwrite operations in agreement with the stored timeline definitions. Further, an overwrite manager may additionally integrate with flush module 95.

When a trigger event occurs, overwrite manager 93 continues to overwrite data to buffer memory 94 in accordance with the timeline definition, by way of an overwrite pointer which is associated with a cell subject to an impending overwrite action. Overwrite manager 93 sends a signal 96 to flush module 95 that cause flush module 95 to copy buffer memory 94 and to transfer the video data set with the prescribed expanded timeline to high-capacity long-term storage 97. Overwrite manager 93 controls the algorithms and the necessary processing

components for writing to buffer memory 94 and save selected data while purging redundant data in accordance with a particular expanded timeline definition.

Figures 10 and 11 which illustrate the primary steps of methods in accordance with the present invention. In particular, Figure 10 describe such methods in the most general sense to include step 101, whereby frame data is received from a video camera, and step 102, whereby the newly received data is written over old data stored in the memory buffer according to an expanded timeline definition.

Figure 11 illustrates these methods in greater detail. Frame data 111 is received from a video camera in a first step. Buffer memory data write step 113 includes sub-step 114, in which the frame is written to a bin marked open. It is important that data be written in the buffer memory in an organized fashion, without disturbing particular data frames, necessary to fill the prescribed expanded timeline definition. Therefore, a bin is marked 'open' when it no longer contains frame data necessary for the expanded timeline definition.

In second sub-step 115, a determination is made as to which memory bin contains frame data that is no longer needed in agreement with the timeline definition. This determination made during each cycle. For every new frame entering the buffer memory, another frame becomes no longer necessary at the same instant.

Finally, in third sub-step 116, the bin which contained data that is no longer required is marked 'open'. In following cycle 112, the next incoming frame is written to the appropriate bin. It is helpful to set a buffer memory pointer to direct the incoming frame to a bin marked 'open'.

One skilled in the art will appreciate that advanced memory management schemes may be deployed to expand a recorded timeline in memory buffers having limited capacity.

While embodiments of the invention have been described above, it will be apparent to one skilled in the art that various changes and modifications may be made. The appended claims are intended to cover all such changes and modifications that fall within the true spirit and scope of the invention.

What is Claimed is:

1. A vehicle event recorder comprising:

a camera;

a managed loop buffer memory; and

an overwrite device,

the camera being operable for converting optical images into electronic signals suitable for recording in the managed loop buffer memory,

the managed loop buffer memory being a random access, rewritable, electronic storage medium of finite size suitable for storing data, including data arranged as discrete video frame data, and

the overwrite device being electronically coupled to the managed loop buffer memory and arranged to manage data overwrite operations,

whereby a first video frame older than a second video frame is saved in the managed loop buffer memory while the second video frame is overwritten.

2. The vehicle event recorder of claim 1, wherein the overwrite device being is arranged to overwrite data associated with a frame that is not the oldest frame in memory.

3. The vehicle event recorder of claim 1, wherein the overwrite device is arranged to overwrite data in an interleaved fashion, thereby causing an effective frame rate to be preserved by performing overwrite operations on alternate frames or frame sets.

4. The vehicle event recorder of claim 1, wherein the overwrite device further comprises an overwrite pointer arranged to point to a cell to be overwritten in a future overwrite action.

5. The vehicle event recorder of claim 1, wherein the overwrite device further comprises a timeline definition, which defines an expanded timeline and virtual frame rates and periods for those frame rates.

6. The vehicle event recorder of claim 5, wherein the timeline definition includes one timeline having three distinct periods and an event moment at the timeline midpoint, and wherein the frame rates associated with the periods at the timeline extremities are lower than the frame rate associated with the period including the event moment.

7. The vehicle event recorder of claim 5, wherein the timeline definition includes one timeline having five distinct periods and an event moment at the timeline midpoint, wherein the frame rates associated with the periods at the timeline extremities are the lowest, and wherein the frame rate associated with the period including the event moment is the highest.

8. The vehicle event recorder of claim 5, wherein the timeline definition includes an asymmetry, and wherein the frame rate is different for the periods after an event moment than the periods before an event moment.

9. The vehicle event recorder of claim 1, further comprising a high capacity long-term memory coupled to the managed loop buffer memory.

10. The vehicle event recorder of claim 9, further comprising an event trigger arranged to cause a transfer of data from the managed loop buffer memory, wherein the said high capacity long-term memory in an expanded timeline format.

11. The vehicle event recorder of claim 9, wherein the transfer of data step resets the managed loop memory into an initial state and a new timeline is initiated.

12. The vehicle event recorder of claim 9, wherein data in high capacity long-term memory is not overwritten in successive data transfer steps because the high capacity long-term memory includes capacity sufficient for a plurality of events.

13. A method of dilating a timeline of a video series in a vehicle event recorder, the video recorder comprising a managed loop buffered memory, the method comprising:

receiving electronic signal data associated with video frames from a video camera; and

overwriting previously written data with newly received data, whereby the previously written data is comprised of data belonging to a frame that is not the oldest frame in the memory.

14. The method of claim 13, wherein overwriting previously written data includes overwriting data in an interleaved fashion, and wherein successive frames are skipped to effect a reduced frame rate.

15. The method of claim 14, further comprising moving an overwrite pointer to a cell not a member of a timeline definition.

16. The method of claim 15, further comprising applying an overwrite operation to the cell associated with the pointer and further moving the overwrite pointer to another cell not part of the timeline definition.

17. A managed loop memory of a vehicle event recorder system comprising:

a coupling to a video camera output causing images from the video camera to be received at the managed loop memory;

a plurality of memory cells each being associated with a single video frame;

an overwrite pointer associated with one memory cell; and

a timeline definition directing the overwrite pointer to be associated with a cell that no longer remains a member of the timeline definition, thus subjecting the cell to an impending overwrite action.

18. The managed loop memory of claim 17, the timeline definition comprising two 12 second periods of 1 frame per second and one 48 second period of 4 frames per second, either of the 12 second periods falling before and after the 48 second period.

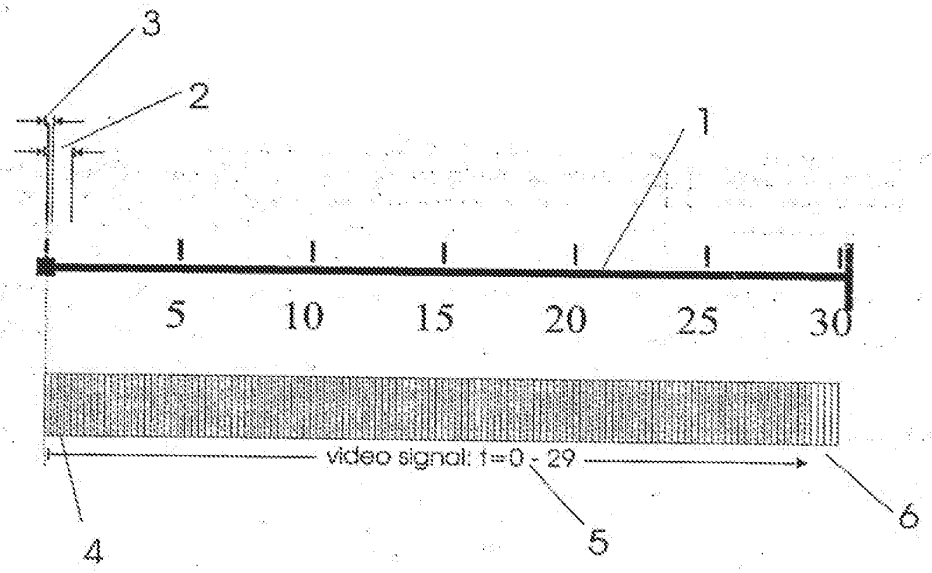


Fig 1
(prior art)

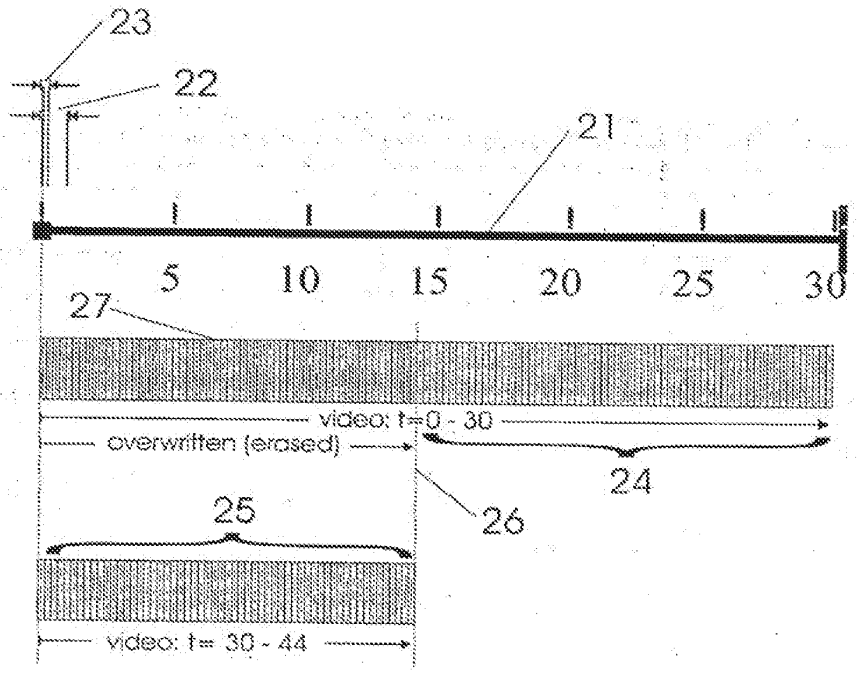


Fig 2
(prior art)

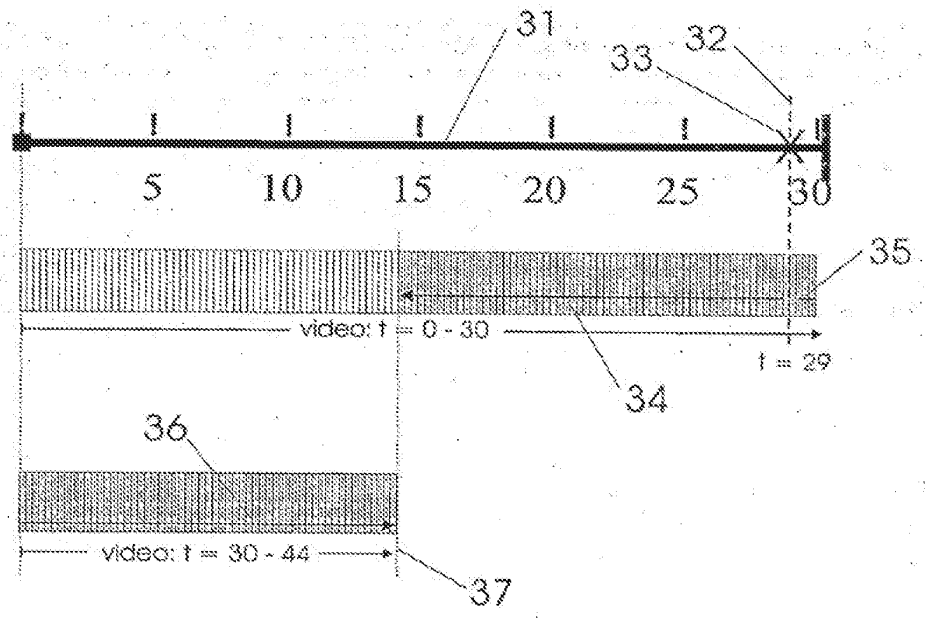


Fig 3
(prior art)

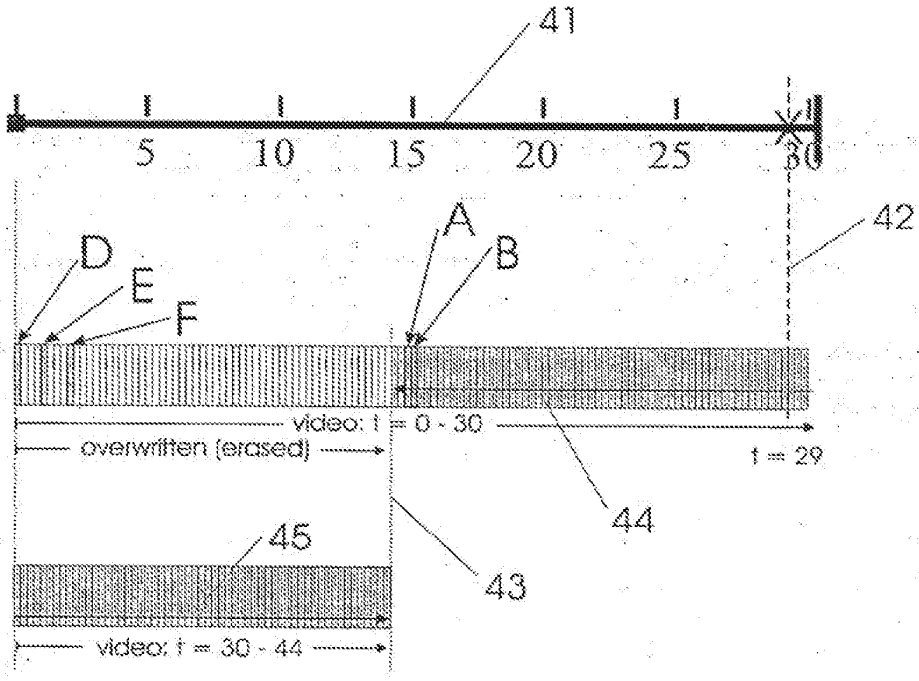

41
5
10
15
20
25
30
42
A
B
D
E
F
video: t = 0 - 30
overwritten (erased)
t = 29
44
45
43
video: t = 30 - 44

Fig 4

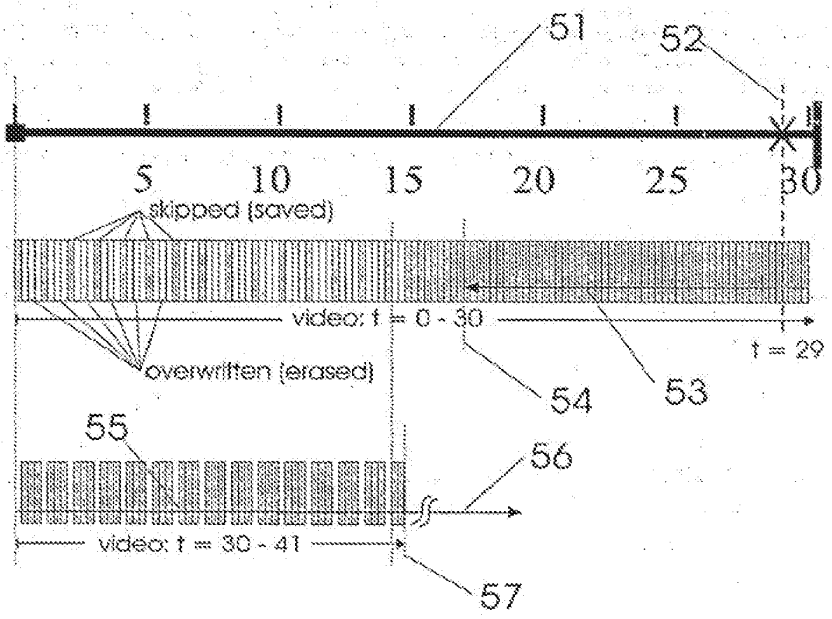

51
52
5
10
15
20
25
30
skipped (saved)
video: t = 0 - 30
t = 29
overwritten (erased)
54
53
55
56
video: t = 30 - 41
57

Fig 5

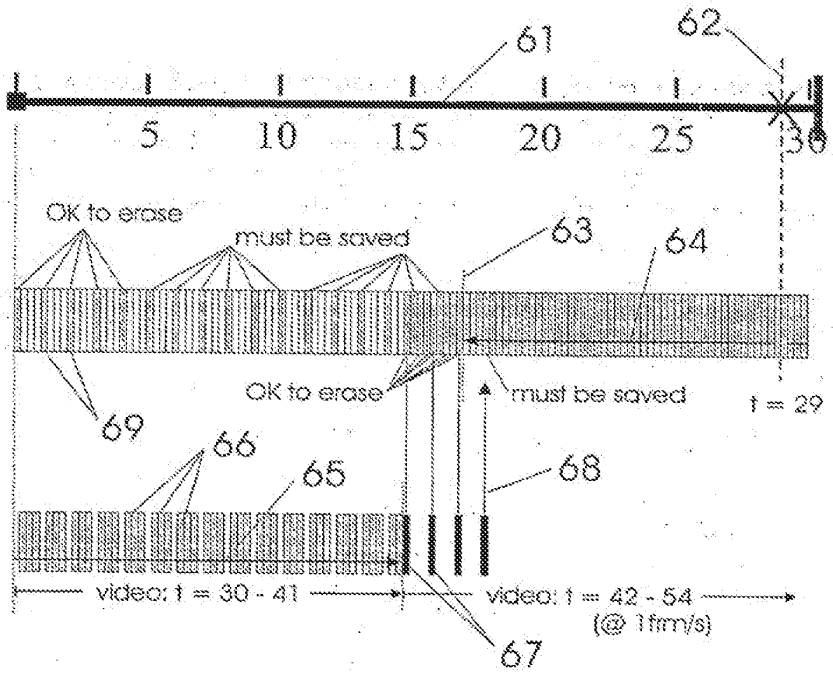

61
62
5
10
15
20
25
30
OK to erase
must be saved
63
64
OK to erase
must be saved
t = 29
69
66
65
68
video: t = 30 - 41
video: t = 42 - 54
(@ 1frm/s)
67

Fig 6

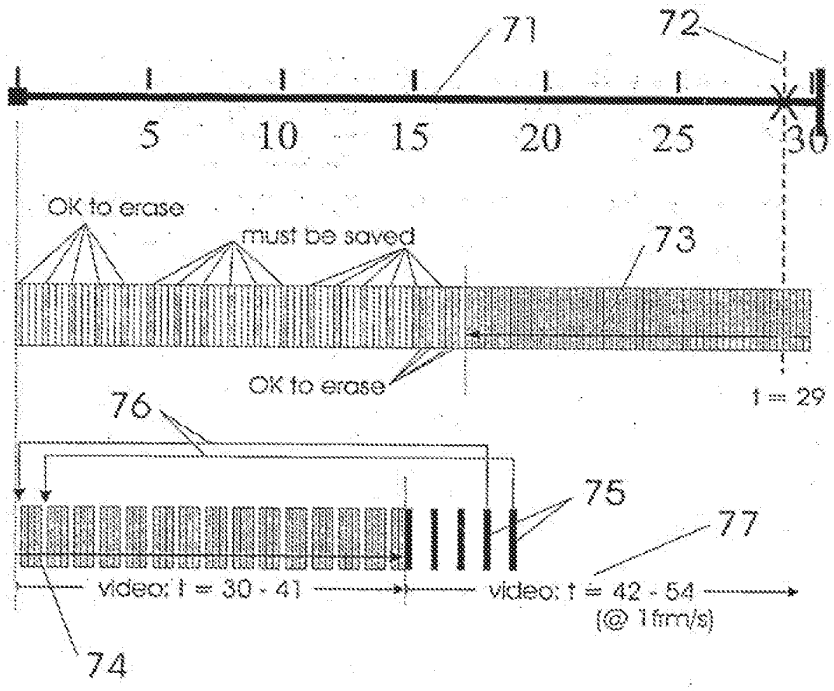

71
72
5
10
15
20
25
30
OK to erase
must be saved
73
OK to erase
t = 29
76
75
77
video: t = 30 - 41
video: t = 42 - 54
(@ 1 frm/s)
74

Fig 7

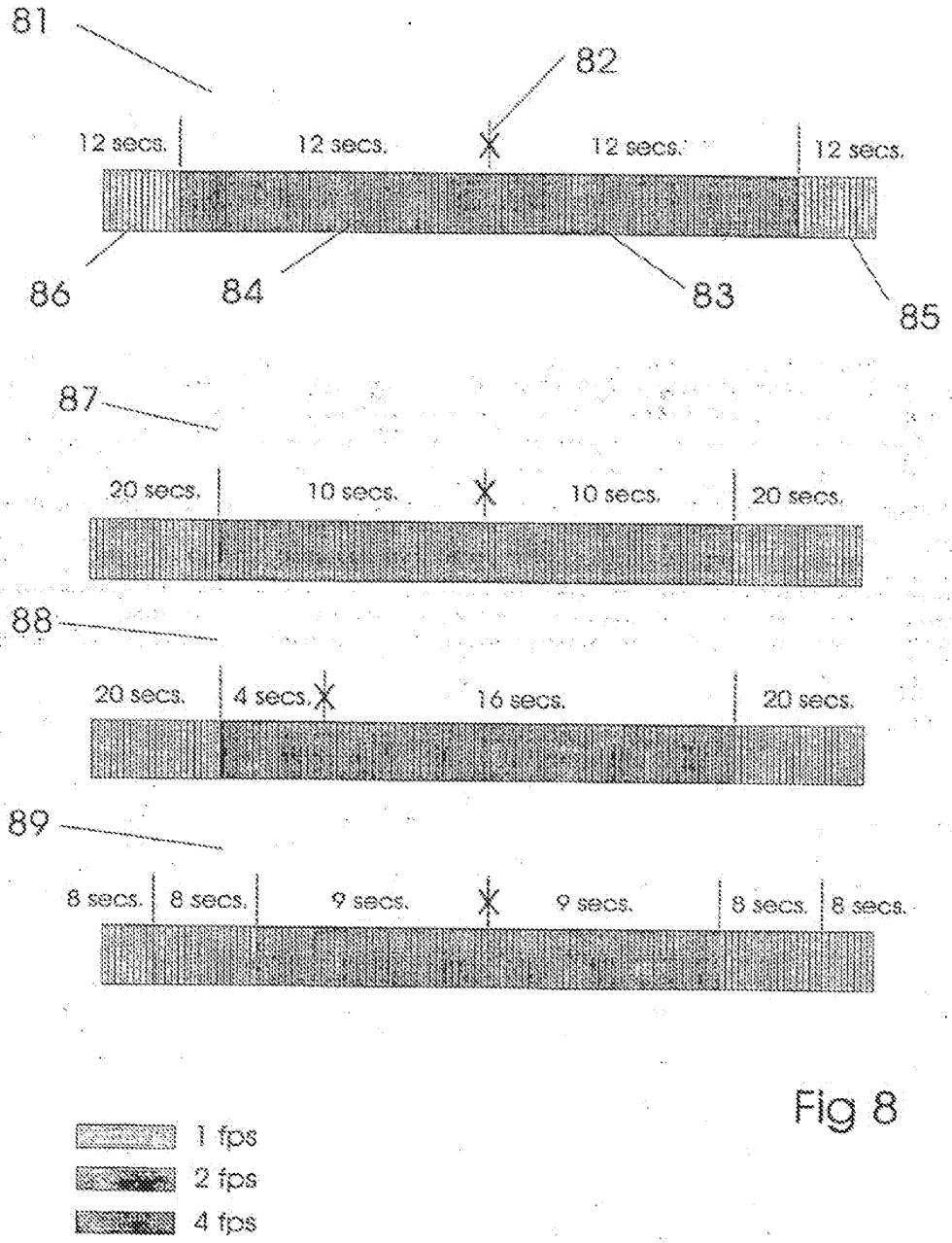

81
82
12 secs.
12 secs.
12 secs.
12 secs.
86
84
83
85
87
20 secs.
10 secs.
10 secs.
20 secs.
88
20 secs.
4 secs.
16 secs.
20 secs.
89
8 secs.
8 secs.
9 secs.
9 secs.
8 secs.
8 secs.
1 fps
2 fps
4 fps

Fig 8

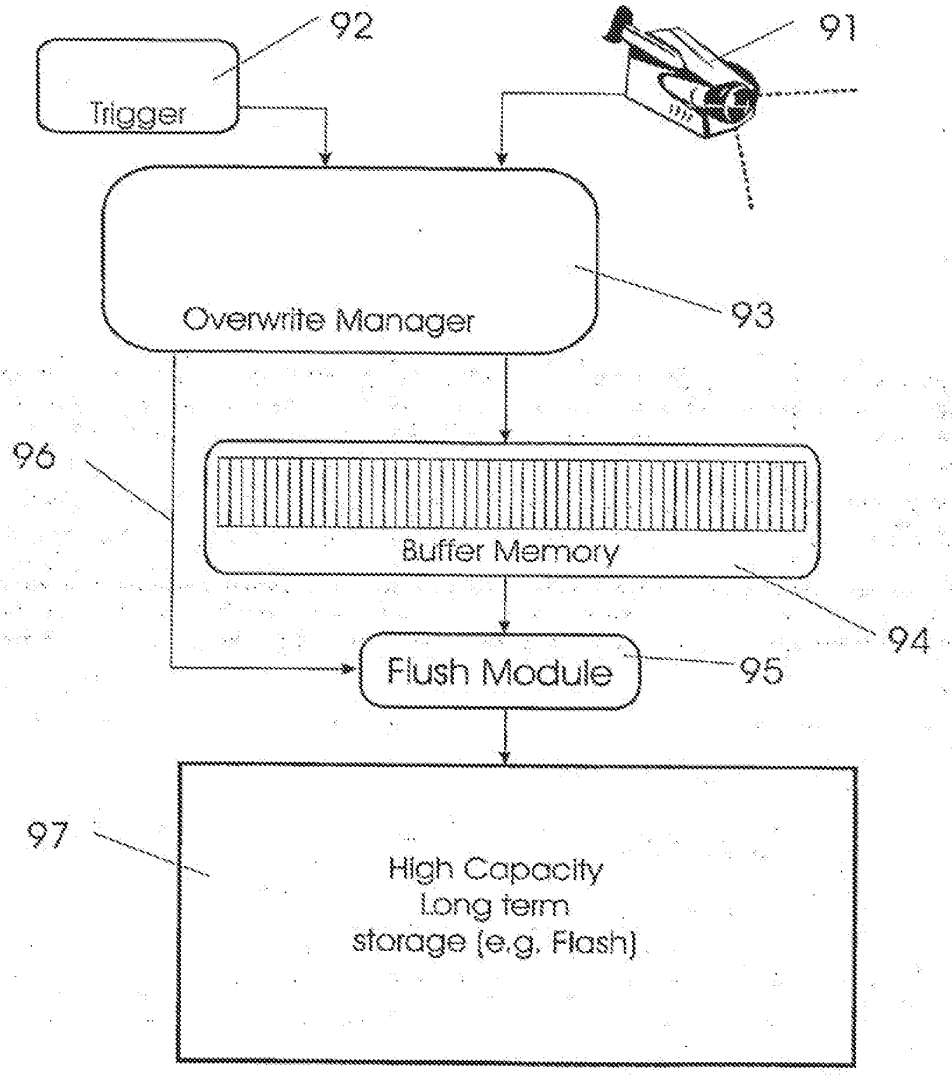

92
Trigger
91
Overwrite Manager
93
96
Buffer Memory
94
Flush Module
95
97
High Capacity
Long term
storage (e.g. Flash)

Fig. 9

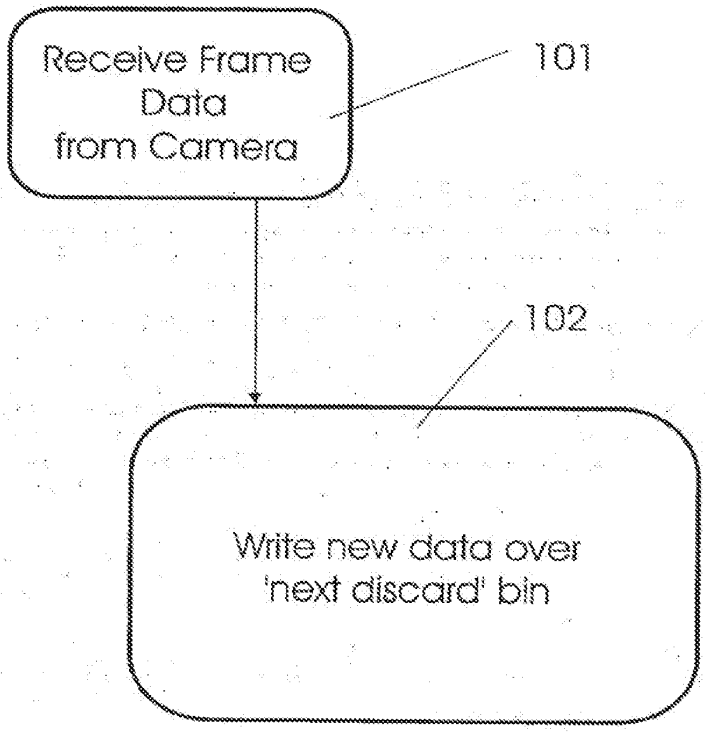

Receive Frame Data from Camera
101
102
Write new data over 'next discard' bin

Fig. 10

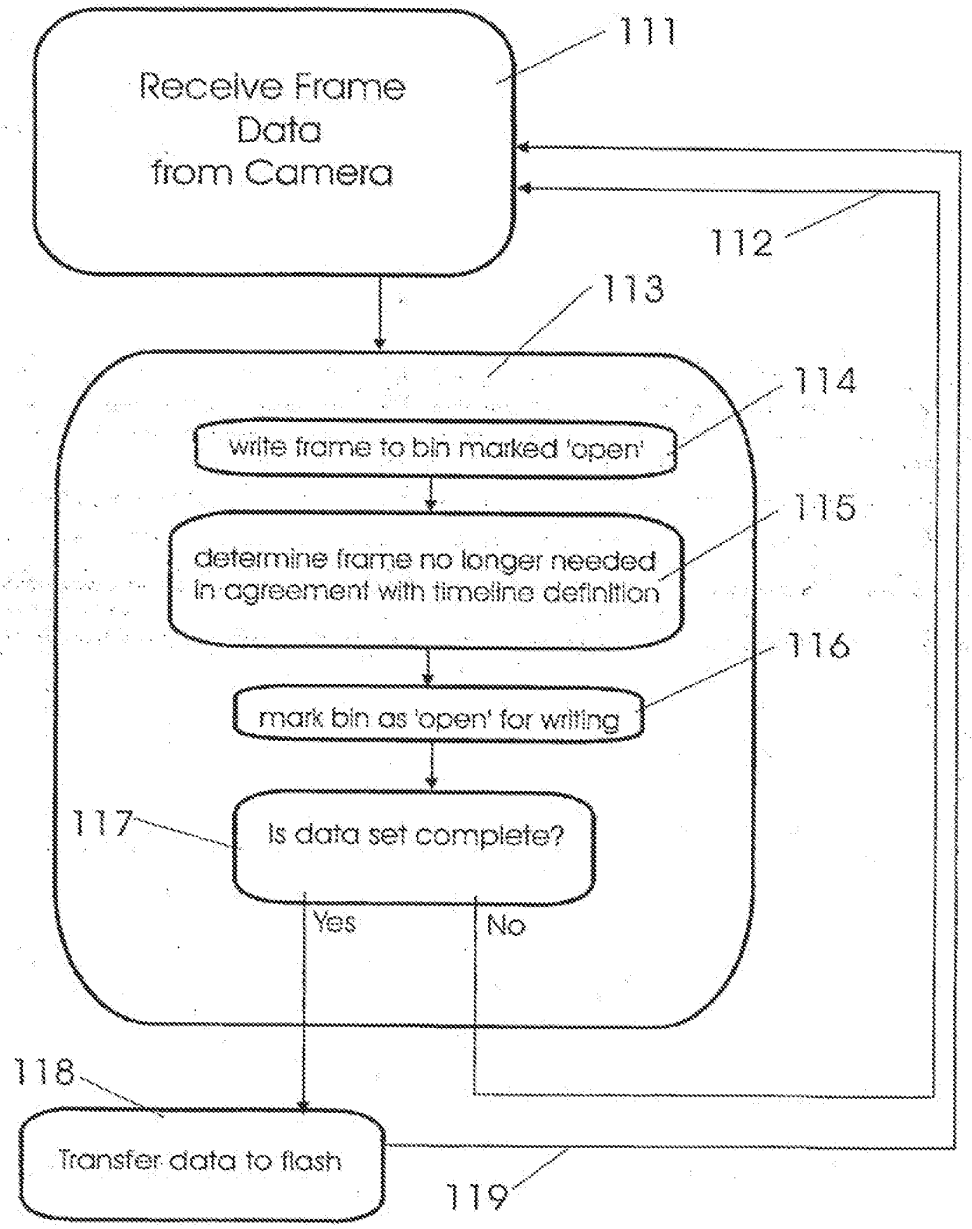

Receive Frame Data from Camera
111
112
113
114
write frame to bin marked 'open'
115
determine frame no longer needed in agreement with timeline definition
116
mark bin as 'open' for writing
117
Is data set complete?
Yes
No
118
Transfer data to flash
119

Fig. 11

Electronic Acknowledgement Receipt

EFS ID:	16049391
Application Number:	13994455
International Application Number:	
Confirmation Number:	1621
Title of Invention:	METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOR
First Named Inventor/Applicant Name:	Andrew William Wright
Customer Number:	30734
Filer:	Mark Krietzman H/Tonya Mertens
Filer Authorized By:	Mark Krietzman H
Attorney Docket Number:	044228.010200
Receipt Date:	14-JUN-2013
Filing Date:	
Time Stamp:	17:54:18
Application Type:	U.S. National Stage under 35 USC 371

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	Preliminary Amendment	Keltie_010200_Prel_Amendment.pdf	90135 3b78dae630a4b443006af17a9bc8ead8d9753d66	no	14
Warnings:					
Information:					

2	Specification	Keltie_010200_Repl_Spec.pdf	292117 9aa553c7895a9663f28e513b692e4bd4789c7f78	no	34
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	Keltie_010200_IDS.pdf	195680 1209d2a427f2799020e5b9302d41ea262b4ca753	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Foreign Reference	WO2006075419A1_Omotaya.pdf	12469217 4e39c7ab52c9fcc01b19f67e02d4905a0c582d51	no	15
Warnings:					
Information:					
5	Foreign Reference	EP1764749A2_Suzuki.pdf	669700 1dc6828d990c39bb18704f76cdaa30d79a6c6461	no	12
Warnings:					
Information:					
6	Foreign Reference	JP2008244674_Takahashi.pdf	173722 508481c90ec73f0c1ada4257858375630f16c2fd	no	2
Warnings:					
Information:					
7	Foreign Reference	WO2006127534A1_Siemens.pdf	14821203 66d58d4b27f3cefde44a3dbedbcff86afe35ac3a	no	16
Warnings:					
Information:					
8	Foreign Reference	EP1615178A2_Bellin_red.pdf	4336557 9ce6f6bd21b50266ac213683809c9ac24cafd843	no	19
Warnings:					
Information:					
9	Foreign Reference	WO2007067775A2_Plante_red.pdf	6215167 7ad36d90ecf6fff09b18714d20d54c7961b3ffcf	no	46
Warnings:					
Information:					
		Total Files Size (in bytes):	39263498		

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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.

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as stored electronically on the Patents Electronic Case file System in connection with patent application GB1109759.9 filed on 10th June 2011

The Patents Electronic Case-file System is compliant with British Standard BS10008 - *Evidential weight and legal admissibility of information stored electronically* and ISO15801 - Electronic imaging – information stored electronically, recommendations for trustworthiness and reliability.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Dated 17th January 2012

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Patents Form 1
Patents Act 1977 *(Rule 12)*

Request for grant of a patent

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Application number GB 1109759.9

1.	Your reference	**P27757GB/SSA/KE**
2.	Full name, address and postcode of the applicant or of each applicant	**Wright, Andrew William** **Cedar Springs** **Waverley Drive** **Virginia Water GU25 4PZ** **Surrey** **United Kingdom**
	Patents ADP number *(if you know it)*	
3.	Title of the invention	**Mobile Device for Recording Vehicle Events**
4.	Name of your agent *(if you have one)*	**Keltie LLP**
	"Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) *(including the postcode)*	**Keltie LLP** **Fleet Place House** **2 Fleet Place** **London EC4M 7ET** **United Kingdom**
	Patents ADP number *(if you know it)*	**09540048001**
5.	Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)	

Country	Application number	Date of filing	Date available on PDAS

6.	Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application	Number of earlier UK application	Date of filing *(day / month / year)*
7.	Inventorship: (Inventors must be individuals not companies)		
	Are all the applicants named above also inventors?	**Yes**	
	If yes, are there any other inventors?	**No**	
8.	Are you paying the application fee with this form?	**No**	

Patents Form 1

9. Accompanying documents: please enter the number of pages of each item accompanying this form.

Continuation sheets of this form

Description:	**17**
Claim(s):	**n/a**
Abstract:	**n/a**
Drawing(s):	**19**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	Date available on PDAS

10. If you are also filing any of the following, state how many against each item.

Priority documents:	**0**
Statement of inventorship and right to grant of a patent (Patents Form 7):	**0**
Request for search (Patents Form 9A):	**0**
Request for a substantive examination (Patents Form 10):	**0**
Any other documents (please specify):	

11. I/We request the grant of a patent on the basis of this application.

Signature: **Subject: GB, Keltie, K. Elkiner 18943; Issuer: , European Patent Office, European Patent Office CA**

Date: **10 Jun 2011**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

Elkiner, Mr. Kaya
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Although you may have an address for service in the Channel Islands, any agent instructed to act for you must reside or have a place of business in the European Economic Area or Isle of Man.

Mobile device for recording vehicle events

The present invention relates to a mobile device for recording the events associated with a vehicle such as a car. In particular, the present invention relates to a mobile device loaded with an application – a 'mobile app' – which is arranged to record and document the events surrounding an incident involving the vehicle such as a vehicle crash. The mobile application is hereinafter referred to as Witness.

A general overview of an embodiment of the present invention will now be described:

General overview

Witness interfaces with the hardware on a mobile device, such as a smart-phone, to provide an event recording device that can capture information in the lead up to, during and after a vehicle incident. In use, the mobile device is mounted adjacent the vehicle windscreen so that a camera on the mobile telephone can see the road ahead.

It will be appreciated that a more sophisticated telephone (e.g. a smart-phone) has a richer sensor set with which to record data and determine the occurrence of an incident. However, the general principles of the Witness application can be compatible with most mobile telephones provided that the sensor set is adequate.

Inputs

The Witness application can receive the following sensor/data inputs, as is typical for modern smart-phones:

- G-force / accelerometer
- Microphone (Audio)
- Camera (Picture/Video)
- GPS module (Speed, location, elevation, direction etc)
- 3D compass (Orientation: Pitch, Roll and Yaw)
- Time/date
- Touch-sensitive screen (receiving user data inputs)

Recording / Storage

- The Witness application is arranged to record a number of these sensor inputs continuously.
- The recording takes place at the highest update rate possible. However, to conserve storage space on the smart-phone, data is stored / overwritten according to a recording strategy, to attempt to preserve the most relevant data.
- The recording strategy could be set up as follows:
    - The Witness application is arranged to register the occurrence of 'an event of significance' – for example, a potential vehicle crash.
    - All data recorded close to, and immediately after the time of the event of significance is preserved. Data recorded further away in time can be overwritten.
    - In effect, the data preservation/overwriting is such that the closer in time that recorded data is to the 'event of significance', the higher the quality of data. This can also be thought of the recorded data having a higher update rate closer to the event of significance.
- Data can also be compressed.
- Data is also encrypted to preserve the authenticity of the data.

Data processing

As mentioned, the sensor data is used to determine the occurrence of 'an event of significance' such as a vehicle crash. Example ways this could be detected include one or a combination of the following inputs:

- A change in pitch + sharp deceleration (braking heavily / impact)
- A change in yaw at a given speed (swerve/skid)
- A roll (vehicle overturned)
- The sound of:
    - Tyre squeal
    - The crumple zone being crushed
    - Airbags deploying
    - Breaking glass
    - Impact (thud) with the vehicle chassis
    - Passengers shouting/screaming
- GPS – zero velocity for a predetermined period (vehicle not moving anymore)
- An input from a user to say that an event to be recorded has taken place

Approximate parameter values for detecting certain events of significance are as follows:

- Harsh braking – a deceleration of greater than 2.5 m/s^2 or forward G-force of greater than 0.7G for more than 400msec.
- Harsh acceleration – from stationary, an acceleration greater than 2.5 m/s^2 or backward G-force of greater than 0.7G for more than 800msec.
- Harsh swerving - lateral G-forces greater than 0.7G for more than 400msec.

Benchmarking

It will be appreciated that different sensor types, phones, mounting positions, vehicles, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

- During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.
    - Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of an event of significance.
- There is an option to notify the Witness application of a change in parameters (e.g. different driver, driving off-road etc). Thus a number of 'profiles' may be set up. Each profile may require an independent training mode period.
- If the Witness program incorrectly detects that an incident of significance has occurred, it can receive feedback from the user to modify its sensitivities. E.g. a more aggressive driver is actually driving.

Crash Management

- On detection of a crash (or other event of significance) the Witness application is arranged to take one or more of the following actions:
    - Announce that it has detected an accident (audio/screen prompt)
    - Call the emergency services (with option to cancel) – e.g: Audio/screen prompt: 'Witness has detected that you have been involved in a (serious) accident and will call the emergency services. If this is not the case, please cancel within 10 seconds.'
    - Provide reassurance

- Provide the user with a checklist of things to do:
  - Take photographs of vehicles involved in the incident (inc number plates)
  - Take down name, address, insurance details etc of 3rd parties involved in incident
- Communicate to the insurance company that an incident has been detected (e.g. low bandwidth data or text message)
- Protect the high quality recorded data so it is not overwritten
- If appropriate – or in response to a request from a communication to the phone from the insurance company – transmit all or selected portions of the recorded data associated with the incident.
  - N.B. Use of the communication channels is controlled by the Witness application to prioritise essential communications such as calls to the emergency services.
- Note that data transmission from the mobile telephone to the insurance company may be automatic (for example, triggered by a detected incident) or manual (for example, in response to a request from the insurance company). In the latter case, the Witness application may include functionality to allow the insurance company to browse through the files available on the mobile telephone so as to select one or more for transmission to the insurance company.

Data processing for other purposes

The recorded input from the sensors can be used for other purposes. In particular, for aiding the insurance company assess the risk profile of the driver (and potentially modify an insurance premium accordingly). Various parameters may be used to determine this:

- If the Witness application incorrectly detects an incident of significance, and receives feedback that the vehicle was not in accident (but was in a near miss) – this could alter the risk profile of the driver. For example – if this happens frequently, but no accident occurs over a given period, this could be an indicator that the driver is good at reacting to potential hazards.
- Erratic driving (e.g. jerky steering or braking detected by G-force sensor).
- Driving faster than the speed limit allocated to a given road (detected by GPS).

A more detailed description of an embodiment of the present invention will now be described with reference to the accompanying Figures. It will be understood that features of this specific embodiment and the previously described general embodiment may be combined where context allows.

5

Specific description of Witness application

Referring to Figure 1, a first page of the Witness application user manual is shown in which an image of the Main Menu (the top-level menu) is displayed. The Main Menu is displayed when a user first runs the application on a smart-phone, such as the iPhone 4. The main menu includes the following user-selectable buttons:

- **Recording Screen**
- **File Management**
- **Settings**
- **Accident Management**
- **Information** (displays up a manual, as shown in Figures 1 to 10).

Selecting the Recording Screen button opens the Recording Screen – the second image shown in Figure 1. The Recording Screen contains a video feed from the camera of the smart-phone, which occupies the majority of the visible screen area. Overlaid on to the video feed is the detected speed of the vehicle (e.g. 0 mph), heading (e.g. south by south-west) and the elapsed recorded time (e.g. 00:00). Displayed in a left column of the Recording Screen are additional user selectable buttons:

- **Keep current video** (pressing this button will automatically copy the current video - and the previous video segment - to the 'kept videos' section of the smart-phone and so prevents that information from being overwritten via a Recording Strategy - as will be described. The user is advised to press this button in the event of a traffic incident that needs to be recorded).
- **Take photo** (captures a still photograph).
- **Exit Recorder** (returns to main screen).
- **Start / Stop Recording** (starts recording video footage - and other data).

Referring to Figure 2, a second page of the Witness application user manual is shown in which an image of the Recording Screen is shown and described operating in a map-displaying mode rather than a video-feed mode.

During recording, (i.e. when the 'Start / Stop Recording' button is pressed) the Exit Recorder button in the Recording Screen is substituted with a Map Display button. Pressing it will toggle between the modes showing the video feed and a map of the current location.

Referring to Figure 3, a third page of the Witness application user manual is shown in which the File Management Screen is shown and described. The File Management Screen can be accessed by pressing the File Management Button in the Main Menu.

The File Management Screen displays video and associated data (e.g. telemetry data) that has been previously recorded. The stored data is contained in either a "Kept" area of storage or in a "Recording Stack". Data files in the Kept area are saved and so not overwritten as part of a Recording Strategy. In contrast, data files in the Recording Stack may be overwritten as part of the Recording Strategy.

As described in Figure 3, the bottom section of the list represents the "Kept" data files, whereas the top section of the list represents the "Recording Stack". "Kept" data files can be edited and deleted at this File Management Screen, whereas "Recording Stack" data files cannot. Editing "Kept" data files can involve renaming them.

The recorded data files are listed on screen along with the time and date of the recording and the electronic size of the data file. Accordingly, the user is provided with feedback about how big the data files are, and so if the smart-phone is low in storage, the user can elect to delete certain "Kept" data files. "Recording Stack" data files will be automatically overridden by the Recording Strategy.

The controls on the toolbar at the bottom of the recordings screen allow a user to change the selection mode of the video stack and includes:

- **Video** (when highlighted, if a data file is selected, a video recording playback screen will be displayed).
- **Map** (when highlighted, if a data file is selected, then a map will be displayed showing the area over which the recording was made).
- **Export** (when highlighted, a selected data file will be passed to an Export Screen where export options will be provided).
- **Keep** (when highlighted, if a "Recording Stack" data file is selected, then a user will be prompted to name it, and then it will be stored as a "Kept" data file).

The icons in the File Management Screen change in dependence on the selected mode. For example, Figure 16 shows the icons displayed when the Video selection mode is highlighted; Figure 17 shows the icons displayed when the Map selection mode is highlighted; Figure 18 shows the icons displayed when the Export selection mode is highlighted and Figure 19 shows the icons displayed when the Keep selection mode is highlighted. Advantageously, this provides improved feedback to a user about what selection mode is highlighted and so what action is likely from the selection of a data file.

Referring to Figure 4, a fourth page of the Witness application user manual is shown in which an image of a Recording Playback screen is shown and described. The Recording Playback screen is invoked by highlighting the Video Mode in the File Management Screen and selecting an appropriate data file.

In the Recording Playback screen it is possible to play back a pre-recorded video feed associated with a chosen data file. As well as playing back the recorded video feed, the Recording Playback screen also displays other associated data such as telemetry data. For example, date, time, speed, forward/backward G-forces, latitude, longitude and heading information is overlaid onto the video feed. As the video is played back, these values will typically change depending on the behaviour of the vehicle, as recorded by the mobile device.

Forward and backward G-forces are those that correspond to the forward and backward movement of the vehicle and are the primary metric for determining an event such as a crash. However, other G-forces (e.g. up/down and side-to-side) may also be measured by the device – even if they are not necessarily display on the mobile screen.

As recited in Figure 4, the Recording Playback screen provides further user controls in the form of:

- **Playback Position Scrub Bar** (horizontal bar at bottom of screen)
- **Playback Speed Bar** (vertical bar at left side of screen)
- **Pause** (pauses playback)
- **Eject** (return to previous screen)
- **Loop** (plays the data file continuously)

The Playback Position Scrub Bar allows a user to jump to different positions within the recording without necessarily needing to watch all of the recorded footage. Advantageously, this allows a user to more quickly locate a desired item of footage within a given data file. Also, the Playback Speed Bar can be used to speed up or slow down the playback of the data file. This allows a desired item of footage to be found more quickly through sped-up playback, and also allows an item of footage to be more carefully analysed through slowed-down playback. Furthermore, it is possible to zoom in and out of a region of the video file using a 'pinch and zoom' movement as is standard with most multi-touch touch-screen devices.

Referring to Figure 5, a fifth page of the Witness application user manual is shown in which a different type of Recording Playback screen is shown and described. Specifically, the image represents playback of a pre-recorded data file as can be invoked by highlighting the Map Mode in the File Management Screen and selecting an appropriate data file.

In contrast with the Video Mode playback, this Map Mode playback shows a map of the area where the recording took place. A blue breadcrumb trail is overlaid on to the map showing the extent of movement of the vehicle during the recorded period. A scrub slider is shown which is user-operable to adjust the time within the recorded period. As the slider is adjusted, a pin moves along the blue breadcrumb to show the position of the vehicle at the time as specified by the slider. Tapping the pin displays associated telemetry data at that position and time.

Referring to Figure 6, a sixth page of the Witness application user manual is shown in which an image of a Video Export Screen is described. The Video Export Screen may be invoked by highlighting the Export button in the File Management Screen and selecting an appropriate data file.

The Video Export Screen allows the quality of the video associated with the selected data file to be adjusted before that video is exported. Advantageously, this can allow the user to control the size of the data to be exported. Telemetry data is also exported, embedded within the video file. Video data can be exported with or without sound, depending on the permissions of the user. Export typically involves copying data files from the mobile device to a local computer (e.g. via a data cable) or a remote server (e.g. via a wireless connection).

Referring to Figure 7, a seventh page of the Witness application user manual is shown, in which an image of the Settings Screen is displayed and described. The Settings Screen allows the operation of the Recording Strategy to be controlled. Specifically, the Settings Screen allows a user to select the number of video segments that the application should store, and the size of those segments. Accordingly, the user is able to set a limit to the storage usage of the Recording Stack part of the program. The user can also control the storage usage of the Recording Stack through the use of the video quality buttons.

Note that the Witness application may be arranged to calculate the remaining memory available on the smart-phone and suggest the appropriate settings automatically.

The Recording Strategy involves maintaining a user-controlled number of video segments. When a new video recording is initialised – instantiating a new segment – this is written over the oldest video segment. Thus only the most recently recorded videos are maintained in the Recording Stack.

Another setting that can be controlled in the Settings Screen is the G-force threshold at which the Witness application will assume that a crash has taken place. It is expected that different vehicles and driving styles will need different G-force thresholds to be set to ensure a reasonable sensitivity to crash forces whilst also prevent crash detection false positives. It should be noted that although the manual recites "*Raise the sensitivity if you find that crash detection is triggered during normal driving...*" it is the sensitivity *threshold* that is to be raised, and not the sensitivity itself. A slider allows the sensitivity threshold to be set via the touch-sensitive screen.

The Settings Screen also has a button to allow a user to define more settings via a More Settings Screen.

Referring to Figure 8, an eighth page of the Witness application user manual is shown in which an image of the More Settings Screen is displayed and described. Here it is possible for the user to select speed units and also select whether the map should be displayed during recording, and at which speed it should be displayed in favour of the video feed. This is a safety feature of the Witness application that hides the video feed during recording when the vehicle is detected as travelling above a

predetermined speed. The video feed is replaced by a map of the location of the vehicle – as is typical with in-vehicle GPS devices. Note that although the on-screen video feed is replaced with a map, video recording continues in the background.

In alternatives, the application may be arranged to detect the vehicle speed, and at a particular speed, switch off the screen entirely. It should be understood that the device will continue to record video, telemetry and other information even when the screen is switched off. Entirely switching off the screen of the device is advantageous as it significantly reduces the drain on the battery of the mobile device.

Note that the Witness application is also arranged to interface with the phone to detect low-light conditions and in response change the brightness of the screen to prevent the user/driver being dazzled. This can also save battery life.

The More Settings Screen also includes a Personal Details button which, when pressed invokes a Personal Details Screen.

Referring to Figure 9, an ninth page of the Witness application user manual is shown in which an image of the Personal Details Screen is displayed and described.

Here, the name, vehicle registration number, mobile number and email address to be used in an emergency can be specified by the user. In the event of a detected incident, these details, along with information regarding the detected incident (e.g. time of incident, location and optionally telemetry data) will be emailed to the specified email address automatically. This can ensure that the chosen recipient of that email will be informed immediately about the occurrence and nature of the detected incident.

This Personal Details Screen also allows the user to set whether it is possible for the video stack to be deleted. A security PIN protects the changing of this option so that if a first user having the PIN (for example, a parent) can review the driving style and behaviour of a second user not having the PIN (for example, their son or daughter) by reviewing the Recording Stack – as the Recording Stack cannot be deleted by that second user. As shown in Figure 20, the PIN can be set for the first time by entering it twice into the appropriate PIN fields.

Referring to Figure 10, a tenth page of the Witness application user manual is shown in which images of an Accident Management Screen and Witness Details Screen is displayed and described.

The Accident Management Screen can be invoked by the user via the Main Menu, or can be automatically switched to after the Witness application has detected that there has been an incident (e.g. via G-forces exceeding a threshold level). Similarly, data can automatically permanently stored as "Kept" and/or sent if high G-forces are detected.

As can be seen on the Accident Management Screen, there are the following user selectable buttons:

- **Accident Advice / What to do**
  This option provides guidance as to what to do during an accident – see Figures 11 and 12 for the displayed Accident Advice Screens.
- **Witnesses**
  This option invokes functionality to allow collection of information from or about witnesses to an incident. An image of the Witnesses Detail information summary screen is shown in Figure 10. Figure 13 shows the Witness Detail information collection screen. Voice notes can also be taken via the microphone of the smart-phone.
- **Photos**
  This option enables the camera to allow a user to capture images associated with an incident.
- **Drivers**
  This option invokes functionality to allow collection about the other drivers involved in an incident, such as their vehicle and insurance details. The Drivers Detail information collection screen is shown in Figure 14.
- **Your Details**
  This option provides a readily available store of the details of the user - as to be provided to other drivers – and can contain name, address and insurance details. The 'Your Details' screen is shown in Figure 15.

Details recorded via the Accident Management Screen are electronically authenticated and feature a time-stamp. In alternatives, this data may be encrypted to ensure the integrity of the stored data.

Furthermore, in alternatives, the exchange of the details of the drivers and witnesses can be conducted, at least in part, via Bluetooth® (for example, between mobile devices) – and/or via email. The relevant information associated with the driver that is pre-stored on the Witness application in a format that can be sent readily via a communication channel such as Bluetooth® or email.

Finally, note that in each Screen or Menu, there is a button provided to go back to the previous menu. Also, when certain actions are performed or selected by a user, the Witness application is arranged to provide an audible feedback signal (for example, a beep). For example, this could be in response to starting a recording, keeping a video segment and/or a stopped recording.

Embodiment alternatives and extensions

So far, the Witness application has been described primarily in the context of a personalised smart-phone application for the sole use of a smart-phone user. However, the Witness application can be extended to interface with remote users to allow them to control the operation of the application as well as view information logged by the application.

In particular, the present application can be extended to a scenario where the Witness application is under the control of an insurance company. Such an insurance company may provide insurance to the user, and so may have an interest in the behaviour of that user, and moreover, a vehicle under the control of that user.

The Witness application can assist the insurance company in making informed decisions about a user's insurance policy by allowing access to logged driving behaviour. For example, if it is determined from video logs that a driver drives safely, then the insurance premium associated with that driver may be lowered.

In such a scenario, the insurance company will maintain a device monitoring system that can interface with a mobile device running the Witness application. In fact, the device monitoring system may interface with a large number of mobile devices, each running an individual copy of the Witness application logging respective user/vehicle behaviours.

With such a monitoring system, it is unpractical to actively monitor each and every mobile device and receiving and handling the sheer quantity of data from each and every device would also be very difficult.

Consequently, the device monitoring system and the mobile devices are advantageously arranged to automatically and intelligently interface with one another in a way that minimises the computational and bandwidth burden on the device monitoring system.

In particular, each mobile device running the Witness application is arranged to make a determination as to whether there is a need to transfer data to the device monitoring system. For example, the Witness application may be arranged to automatically send data to the device monitoring system that only has high G-force activity associated with it, as this may be indicative of a crash or another event of significance. Alternatively, the Witness application may be arranged to send detailed or high-bandwidth information if a user indicates that an accident has occurred.

In either case, the video segments and associated telemetry data associated with the relevant event will be send. However, no other data (for example, from another date) will be sent.

Alternatively, less computationally or bandwidth intensive information may be sent on a periodic basis – for example, every day, week or month. Such general information may be sent to establish a profile of a particular user. For example, many high G-force related activities may indicate that the driver is driving aggressively. A determination about the profile can be made automatically by requesting and automatically analysing further data. For example, the location and speed information can be used to determine whether a vehicle is found to frequently break the speed limit. If this is the case, then the profile of the user can be set accordingly.

Such general and periodically obtained information can also be used to remotely adjust the settings of the application. For example, many high G-force related activities may instead indicate that the set up of the car is such that the mobile device is subjected to high G forces (rather than the driver driving aggressively). If the driving is determined to be safe, but the mobile device is setting off many false positives, then the device monitoring system can automatically adjust the settings of

the application. For example, the G-force sensitivity threshold may be increased remotely.

Thus the initial data that is automatically transmitted from the mobile device to the vehicle monitoring system is limited in bandwidth so as not to overload the vehicle monitoring system as a whole. However, after processing or analysis is performed on the initial data, further information may be requested. For example, further information may be requested automatically by the system or manually by a controller acting for the insurance company. Such further information may include high resolution video logs and telemetry data such as G-force measurements.

It will be understood that the mobile device may also automatically keep certain data at random. Furthermore, the reason for keeping certain data may also be logged (e.g. logged as a result of a manual request by the user, or in response to a high G-force event).

The mobile device and device monitoring system may also be arranged to highlight detected transgressions. For example, driving during curfew hours, or driving at locations where insurance is not valid (e.g. other countries, off-road, race tracks etc).

As will be appreciated, the interaction of the mobile device and the device monitoring system has the advantage of actively improving user driving behaviour. That is, if the user knows that their logged driving behaviour may adversely effect their insurance policy, then it is likely that the user will be dissuaded from driving recklessly. In view of this, an insurance company may be able to incentivise users through lower insurance premiums.

However, so that users do not wrongfully benefit from such incentives, it is necessary to enforce the correct and consistent use of the Witness application.

It would not be beneficial from the perspective of the insurance company if the user could choose when to enable the application. For example, if a user could choose to disable the application when speeding then the effectiveness of the application would be reduced.

Accordingly, the application may include measures to guarantee that the application is enabled whenever a given insured vehicle is being driven.

Such measures may involve matching data recorded by the Witness application with that recorded independently by the vehicle. For example, the Witness application records the distance travelled during every journey. To ensure the summed distances of all journeys tracked by the Witness application tally with the total travelled distance of the vehicle, the user may be prompted to enter the odometer mileage periodically.

If the distance recorded by the Witness application does not correlate with the difference between odometer readings, then the discrepancy will be flagged to the user and/or the insurance company. A substantial discrepancy will typically indicate that the Witness application has not been monitoring all vehicle journeys and the appropriate action can be taken (e.g. the user can be warned, insurance premium may be raised etc).

It will be appreciated that such a tallying exercise depends on the Witness application being used every time one particular vehicle is driven. However, in alternatives, if the Witness application is used with different vehicles, the Witness application may be arranged to register the different vehicles so that their respective odometer readings can be tallied with distance recordings associated with each respective vehicle.

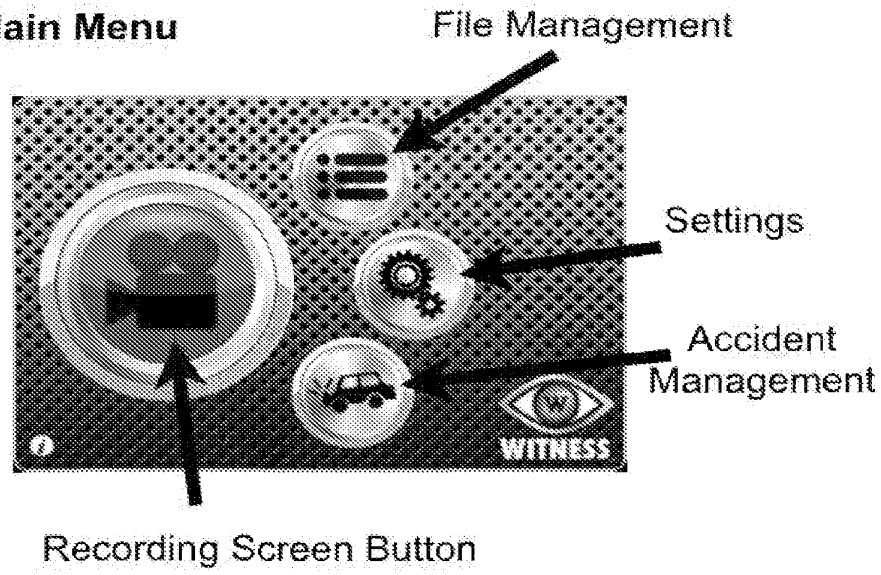
Other measures can be implemented in conjunction with the Witness application to guarantee that the application is enabled whenever a given vehicle is being driven. For example, the mobile device on which the Witness application is installed may comprise a near-field communication (NFC) device, such as an RFID tag. The NFC device may be compatible with a complementary device on a so-called 'smart-holster' into which the mobile device may be fitted during operation.

The smart-holster positions and holds the mobile device correctly so that the video camera on the mobile device can clearly view the road ahead via of the front windscreen of the vehicle. However, the smart-holster also interacts with the NFC device on the smart-phone to determine whether or not the smart-phone is inserted into the smart-holster. The smart-holster can then be interfaced with the engine management system of the vehicle so that the vehicle may be activated and driven only when the mobile device is in place within the smart-holster.

It will be appreciated that the mobile device has so far been described in the context of a smart-phone. However, it will be appreciated by a person skilled in the art that other devices may also be suitable for performing the functions described in relation to the Witness application. For example, the Witness application may be adapted to run on a general purpose tablet-style computing device, such as an iPad.

Witness User Manual

Main Menu



Recording Screen

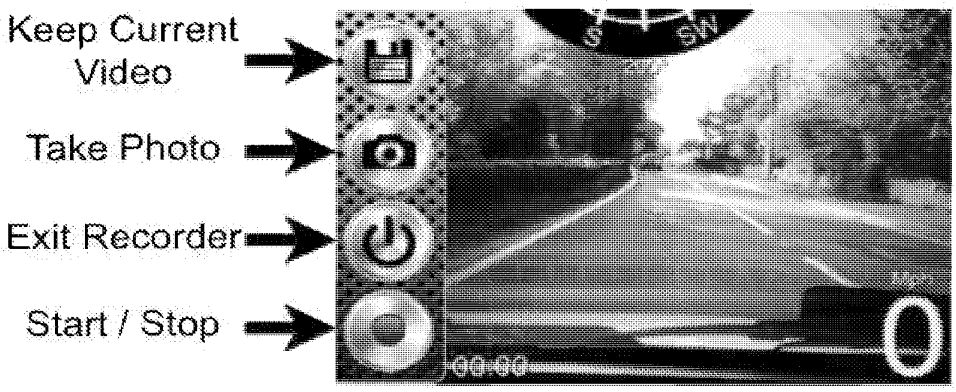


Figure 1

User Manual

The recording screen also displays your current heading, speed and recording time.

During recording, the exit button becomes the map display button. Pressing this toggles the display of a map overlay showing your current position.

Pressing the "Keep Current Video" button will automatically copy the current video and the previous video to the kept videos section in the library. Use this button if an incident occurs whilst you are driving and you wish to keep it.

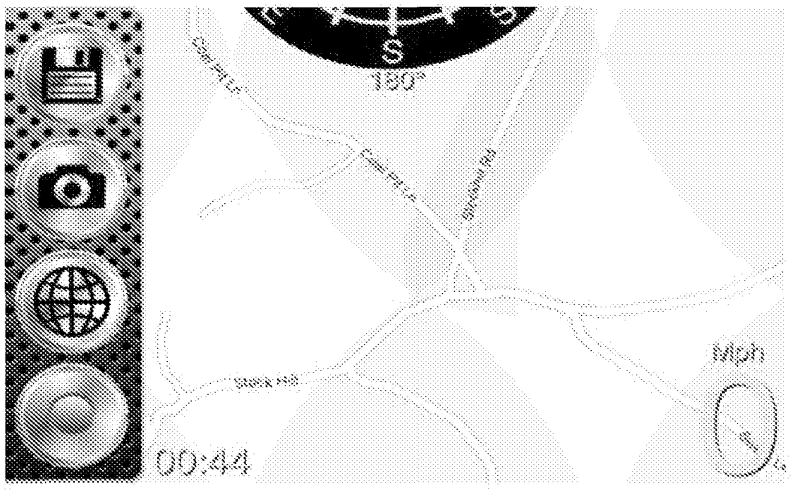


Figure 2

File management



The top section of the file management screen contains the recording stack. The recording stack contains your recent video segments, the number of which depends upon your personal settings.

The bottom section contains videos segments that you have chosen to keep.



Your kept recordings can be deleted individually, but the video stack can only be cleared from the settings screen.

Figure 3

Main Menu

User Manual

Recording Playback

5 of 11



The playback screen shows your recorded video along with the associated telemetry data. The data displayed shows the date and time of the recording, the current speed, the forward and reverse G force, the current GPS position and the current heading.

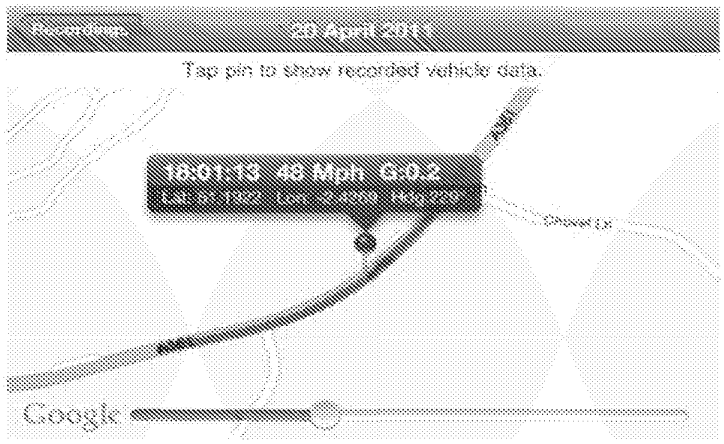
The G force measures the force of braking and acceleration with the phone mounted with the screen facing rearward, and the back of the phone facing forwards.

Video playback is controlled via the scrub bar at the bottom. The vertical slider on the left is the playback speed. Other controls are loop, pause and eject.

Figure 4

Please Note:
The playback video screen is a floating view and can be zoomed by pinching and moved with a single finger. A double tap will reset the view.

Map Playback

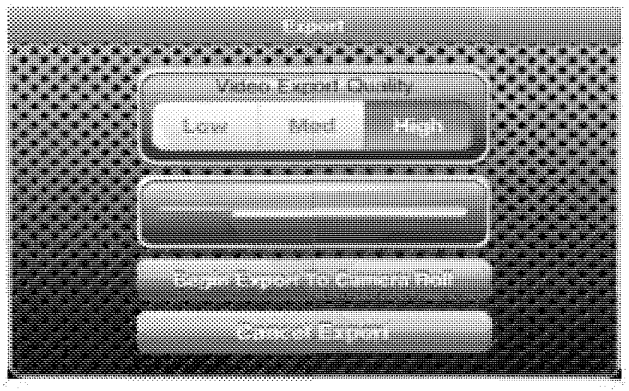


Map playback shows where a recording was made via a blue breadcrumb trail. A pin shows the vehicle position and can be tapped to reveal telemetry data.

The scrub slider will move the pin according to the recorded telemetry.

Figure 5

Video Export



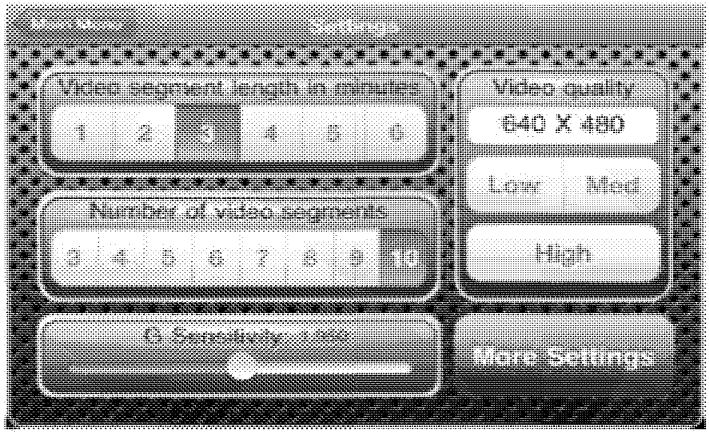
Choose the video quality according to your preference and the video will be exported to the camera roll with the telemetry data embedded within the video.

Medium and high quality reveal good results but with fairly large files usually too big to e-mail, although trimming within the camera roll can shorten the video to just the bit you need. Low quality produces small files but the quality suffers.

Please remember that the iPhone is not a desktop computer and therefore long video segments exported at high quality may take several minutes to complete.

Figure 6

Settings



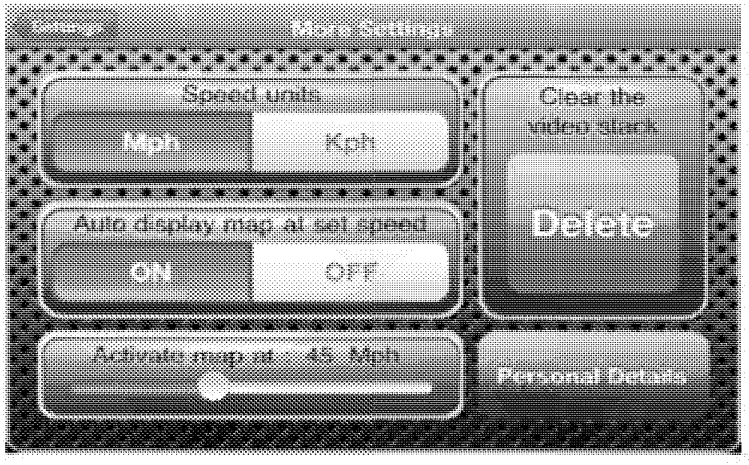
Video recording can be adjusted to allow up to an hour of recorded video in the video stack.

Choose the segment length in minutes and the number of segments you would like according to the available space on your device. Each minute of video at high quality will use 26Mb of space. 1 hour will use 1.5Gb.

G Sensitivity adjusts the automatic triggering of crash detection. Raise the sensitivity if you find that crash detection is triggered during normal driving due to differences in vehicle suspension.

Figure 7

More Settings



Choose your preferred speed units here which will be used throughout the app. Even if you change the speed units after a recording is made, then the correct speed units will be used in playback and export.

You are able to choose whether to have the map overlay display at a certain speed during recording on the main recording screen. Please select the option and set the speed if you would like this to happen.

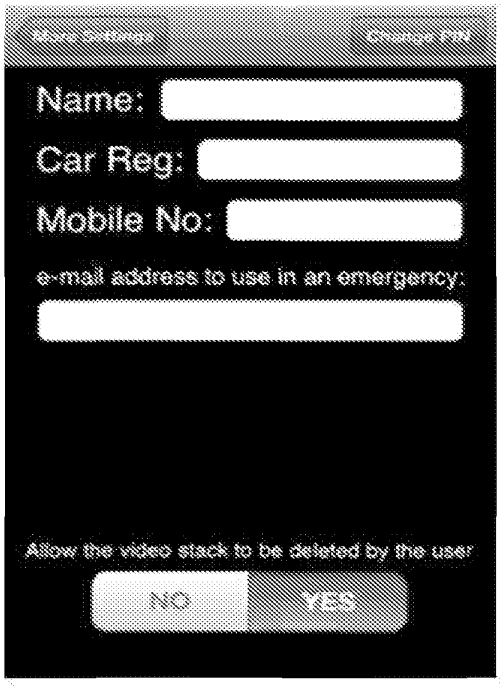
Please note: If you change the speed units, you will need to re-adjust the map trigger speed accordingly.

Figure 8

Main Menu

User Manual

Personal Details



These details will be used in the event of an accident to send an automated message.

Enter your name, the registration number of the car the device will be used in, the telephone number of this device and the e-mail address of the person you would like contacted.

You can also set here the option to prevent the video stack from being cleared.

This screen can be protected with a PIN number, but please make sure you remember it or make a note of it somewhere. Re-setting the PIN can only be accomplished be deleting and re-installing the app which will result in all video and data being lost.

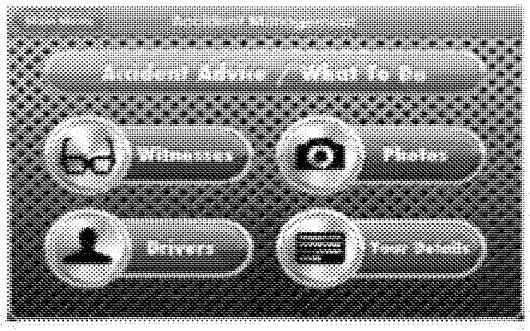
Figure 9

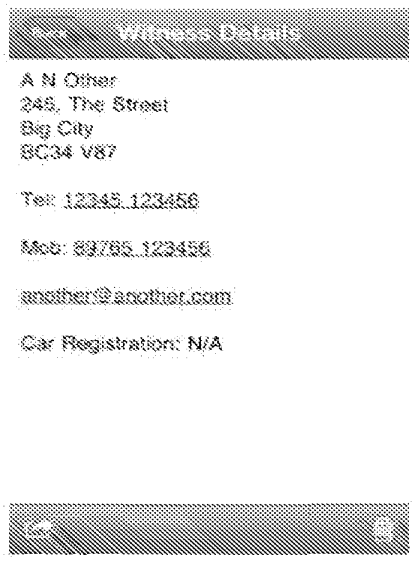
Main Menu

User Manual

Accident Management

In the event of an accident, Witness provides the necessary tools you need in order to gather and keep the correct information.





Witness and driver details can be stored and viewed from within the internal database.

There is also a place to store your insurance details should you need them. Please enter these now so they are in the phone for future use.

Figure 10

What should you do?

Make sure you and others are safe

* Is anyone injured?
* Is the accident causing a hazard?
* Has someone left the scene?

If yes to any of these, then call the emergency services.

1. Witnesses – Collect the names and addresses of any witnesses.

2. Photographs – Take pictures of the scene of the accident, damage to cars and other property, and the occupants of the other vehicle.

3. Drivers – Collect names, addresses, registration numbers and insurance details of all other drivers involved.

Figure 11

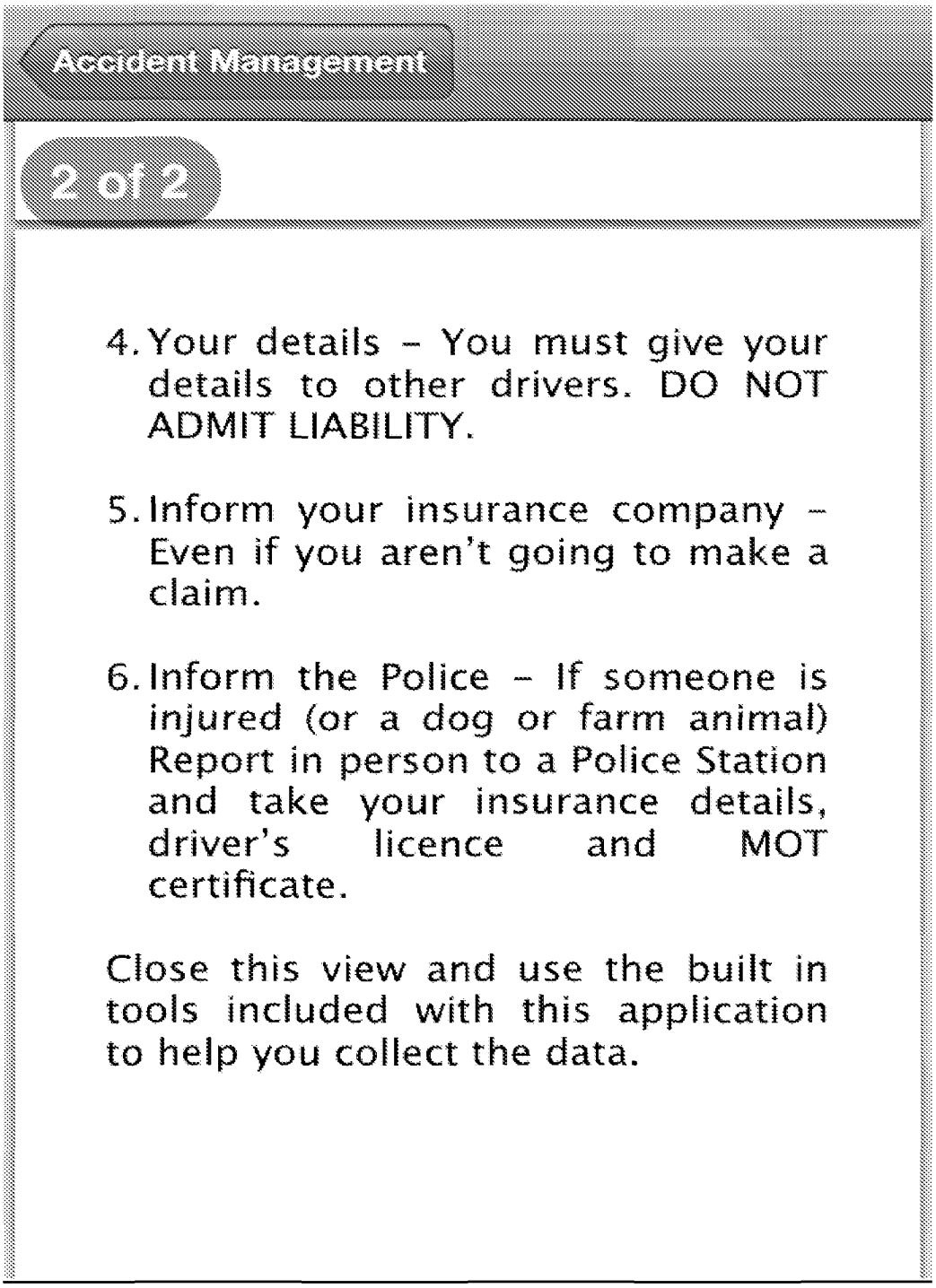

Accident Management
2 of 2
4. Your details - You must give your details to other drivers. DO NOT ADMIT LIABILITY.
5. Inform your insurance company - Even if you aren't going to make a claim.
6. Inform the Police - If someone is injured (or a dog or farm animal) Report in person to a Police Station and take your insurance details, driver's licence and MOT certificate.
Close this view and use the built in tools included with this application to help you collect the data.

Figure 12


Back
Witness Details
Full name of witness
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number
Mobile telephone number

Figure 13



Figure 14

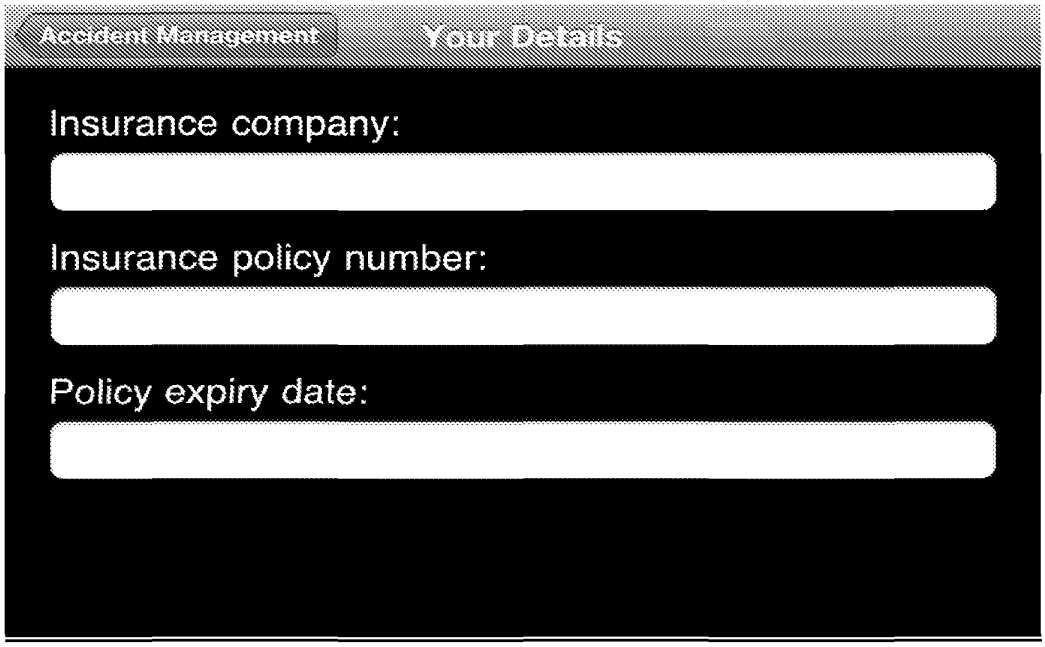


Figure 15


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 16


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 17


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 18


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 19

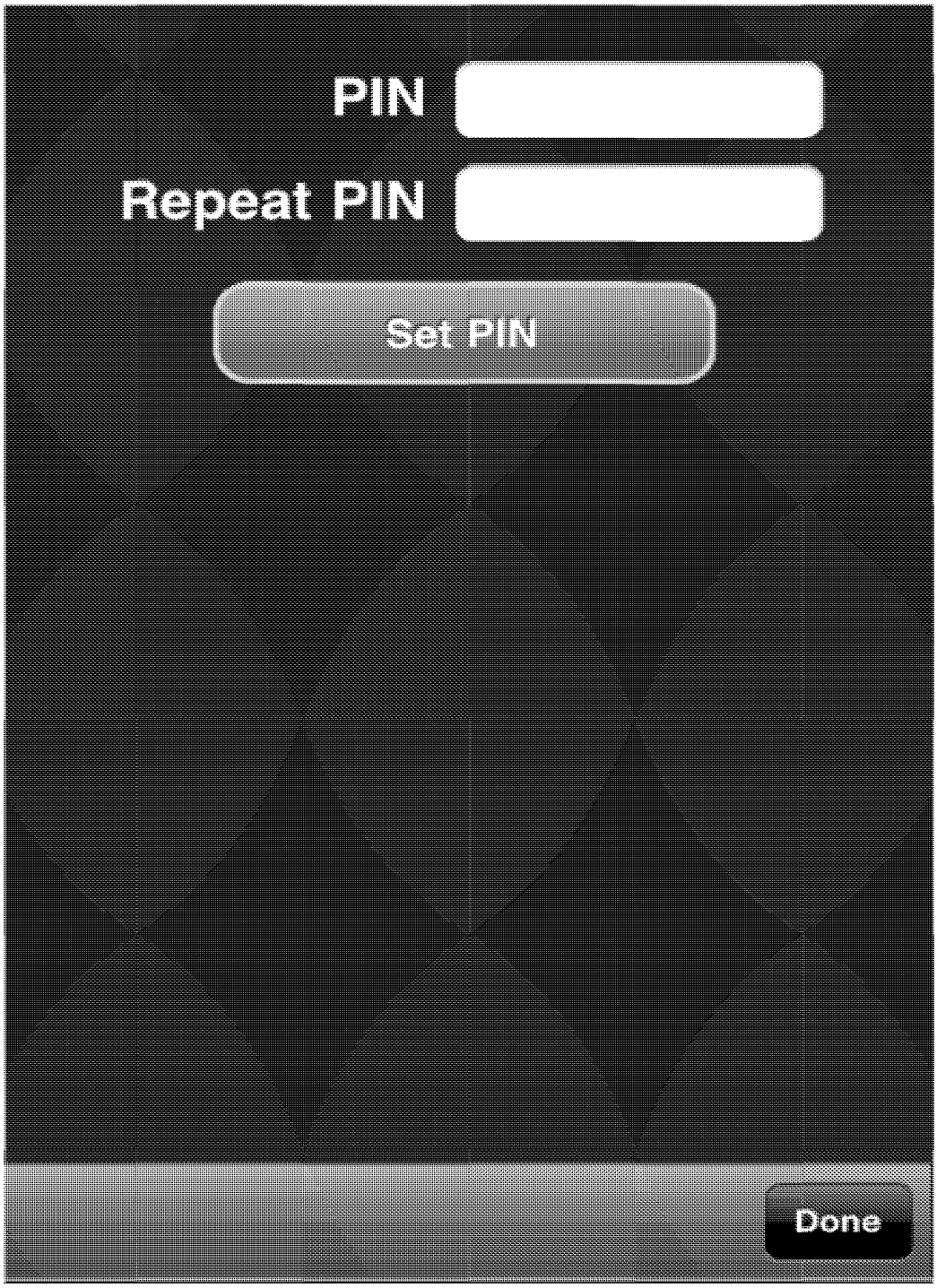


Figure 20

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ORGANIZATION

DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:		**PCT/GB2011/052491**
International filing date:		**15 December 2011 (15.12.2011)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**GB**
	Number:	**1109759.9**
	Filing date:	**10 June 2011 (10.06.2011)**
Date of receipt at the International Bureau:		**20 January 2012 (20.01.2012)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

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NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as stored electronically on the Patents Electronic Case file System in connection with patent application GB1118777.0 filed on 31st Oct 2011

The Patents Electronic Case-file System is compliant with British Standard BS10008 - *Evidential weight and legal admissibility of information stored electronically* and ISO15801 - Electronic imaging – information stored electronically, recommendations for trustworthiness and reliability.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed 

Dated 16th January 2012

INTELLECTUAL PROPERTY OFFICE

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K730312 D02718
31/10/2011 0.00 NONE

Patents Form 1
Patents Act 1977 *(Rule 12)*

Request for grant of a patent

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Application number GB 1118777.0

1.	Your reference	**P28832GB/SSA/KE**
2.	Full name, address and postcode of the applicant or of each applicant Patents ADP number *(if you know it)*	**Wright, Andrew William** **Cedar Springs** **Waverley Drive** **Virginia Water GU25 4PZ** **Surrey** **United Kingdom**
3.	Title of the invention	**Mobile Device for Recording Vehicle Events**
4.	Name of your agent *(if you have one)* "Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) *(including the postcode)* Patents ADP number *(if you know it)*	**Keltie LLP** **Keltie LLP** **Fleet Place House** **2 Fleet Place** **London EC4M 7ET** **United Kingdom** **09540048001**
5.	Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)	

Country	Application number	Date of filing	Date available on PDAS

6.	Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application	Number of earlier UK application	Date of filing *(day / month / year)*

7.	Inventorship: (Inventors must be individuals not companies) Are all the applicants named above also inventors? If yes, are there any other inventors?	 **Yes** **No**
8.	Are you paying the application fee with this form?	**No**

Patents Form 1

9. Accompanying documents: please enter the number of pages of each item accompanying this form.

Continuation sheets of this form

Description:	**18**
Claim(s):	**n/a**
Abstract:	**n/a**
Drawing(s):	**19**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	Date available on PDAS

10. If you are also filing any of the following, state how many against each item.

Priority documents:	**0**
Statement of inventorship and right to grant of a patent (Patents Form 7):	**0**
Request for search (Patents Form 9A):	**0**
Request for a substantive examination (Patents Form 10):	**0**
Any other documents (please specify):	

11. I/We request the grant of a patent on the basis of this application.

Signature: **Subject: GB, Keltie, K. Elkiner 18943; Issuer: European Patent Office, European Patent Office CA**

Date: **31 Oct 2011**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

Elkiner, Mr. Kaya
Telephone: +44 (0)20 7329 8888
Fax: +44 (0)20 7329 1111

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Although you may have an address for service in the Channel Islands, any agent instructed to act for you must reside or have a place of business in the European Economic Area or Isle of Man.

Mobile device for recording vehicle events

The present invention relates to a mobile device for recording the events associated with a vehicle such as a car. In particular, the present invention relates to a mobile device loaded with an application – a 'mobile app' – which is arranged to record and document the events surrounding an incident involving the vehicle such as a vehicle crash. The mobile application is hereinafter referred to as Witness.

A general overview of an embodiment of the present invention will now be described:

General overview

Witness interfaces with the hardware on a mobile device, such as a smart-phone, to provide an event recording device that can capture information in the lead up to, during and after a vehicle incident. In use, the mobile device is mounted adjacent the vehicle windscreen so that a camera on the mobile telephone can see the road ahead.

It will be appreciated that a more sophisticated telephone (e.g. a smart-phone) has a richer sensor set with which to record data and determine the occurrence of an incident. However, the general principles of the Witness application can be compatible with most mobile telephones provided that the sensor set is adequate.

Inputs

The Witness application can receive the following sensor/data inputs, as is typical for modern smart-phones:

- G-force / accelerometer
- Microphone (Audio capture and user voice command input)
- Camera (Picture/Video)
- GPS module (Speed, location, elevation, direction etc)
- 3D compass (Orientation: Pitch, Roll and Yaw)
- Time/date
- Touch-sensitive screen (receiving user data inputs)

Recording / Storage

- The Witness application is arranged to record a number of these sensor inputs continuously.
- The recording takes place at the highest update rate possible. However, to conserve storage space on the smart-phone, data is stored / overwritten according to a recording strategy, to attempt to preserve the most relevant data.
- The recording strategy could be set up as follows:
    - The Witness application is arranged to register the occurrence of 'an event of significance' – for example, a potential vehicle crash.
    - All data recorded close to, and immediately after the time of the event of significance is preserved. Data recorded further away in time can be overwritten.
    - In effect, the data preservation/overwriting is such that the closer in time that recorded data is to the 'event of significance', the higher the quality of data. This can also be thought of the recorded data having a higher update rate closer to the event of significance.
- Data can also be compressed.
- Data is also encrypted to preserve the authenticity of the data.

Data processing

As mentioned, the sensor data is used to determine the occurrence of 'an event of significance' such as a vehicle crash. Example ways this could be detected include one or a combination of the following inputs:

- A change in pitch + sharp deceleration (braking heavily / impact)
- A change in yaw at a given speed (swerve/skid)
- A roll (vehicle overturned)
- The sound of:
    - Tyre squeal
    - The crumple zone being crushed
    - Airbags deploying
    - Breaking glass
    - Impact (thud) with the vehicle chassis
    - Passengers shouting/screaming
- GPS – zero velocity for a predetermined period (vehicle not moving anymore) – especially after one of the above inputs.

Using such inputs, the Witness application can make an automatic determination that an 'event of significance' has taken place. Alternatively, the Witness application can receive an input from a user to say that an event to be recorded has taken place.

It will be appreciated that automatic detection may be selectively disabled by a user. This is useful if the Witness application is being used in an environment that would generate an unprecedented number of false positives. For example, if used on a bicycle or motorcycle, the Witness application may be subject to more noise and/or G-forces unexpected in a vehicle such as a car.

Approximate parameter values for detecting certain events of significance via G-forces are as follows:

- Harsh braking – a deceleration of greater than 2.5 m/s^2 or forward G-force of greater than 0.7G for more than 400msec.
- Harsh acceleration – from stationary, an acceleration greater than 2.5 m/s^2 or backward G-force of greater than 0.7G for more than 800msec.
- Harsh swerving - lateral G-forces greater than 0.7G for more than 400msec.

Benchmarking

It will be appreciated that different sensor types, phones, mounting positions, vehicles, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

- During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.
    - Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of an event of significance.
- There is an option to notify the Witness application of a change in parameters (e.g. different driver, driving off-road etc). Thus a number of 'profiles' may be set up. Each profile may require an independent training mode period.
- If the Witness program incorrectly detects that an incident of significance has occurred, it can receive feedback from the user to modify its sensitivities. E.g. a

more aggressive driver is actually driving.

Crash Management

- On detection of a crash (or other event of significance) the Witness application is arranged to take one or more of the following actions:
    - Announce that it has detected an accident (audio/screen prompt)
    - Call the emergency services (with option to cancel) – e.g: Audio/screen prompt: 'Witness has detected that you have been involved in a (serious) accident and will call the emergency services. If this is not the case, please cancel within 10 seconds.'
    - Provide reassurance
    - Provide the user with a checklist of things to do:
        - Take photographs of vehicles involved in the incident (inc number plates)
        - Take down name, address, insurance details etc of 3rd parties involved in incident
    - Communicate to the insurance company that an incident has been detected (e.g. low bandwidth data or text message)
    - Protect the high quality recorded data so it is not overwritten
    - If appropriate – or in response to a request from a communication to the phone from the insurance company – transmit all or selected portions of the recorded data associated with the incident.
        - N.B. Use of the communication channels is controlled by the Witness application to prioritise essential communications such as calls to the emergency services.
    - Note that data transmission from the mobile telephone to the insurance company may be automatic (for example, triggered by a detected incident) or manual (for example, in response to a request from the insurance company). In the latter case, the Witness application may include functionality to allow the insurance company to browse through the files available on the mobile telephone so as to select one or more for transmission to the insurance company.

Data processing for other purposes

The recorded input from the sensors can be used for other purposes. In particular, for aiding the insurance company assess the risk profile of the driver (and potentially

modify an insurance premium accordingly). Various parameters may be used to determine this:

- If the Witness application incorrectly detects an incident of significance, and receives feedback that the vehicle was not in accident (but was in a near miss) – this could alter the risk profile of the driver. For example – if this happens frequently, but no accident occurs over a given period, this could be an indicator that the driver is good at reacting to potential hazards.
- Erratic driving (e.g. jerky steering or braking detected by G-force sensor).
- Driving faster than the speed limit allocated to a given road (detected by GPS).

A more detailed description of an embodiment of the present invention will now be described with reference to the accompanying Figures. It will be understood that features of this specific embodiment and the previously described general embodiment may be combined where context allows.

Specific description of Witness application

Referring to Figure 1, a first page of the Witness application user manual is shown in which an image of the Main Menu (the top-level menu) is displayed. The Main Menu is displayed when a user first runs the application on a smart-phone, such as the iPhone 4. The main menu includes the following user-selectable buttons:

- **Recording Screen**
- **File Management**
- **Settings**
- **Accident Management**
- **Information** (displays up a manual, as shown in Figures 1 to 10).

Selecting the Recording Screen button opens the Recording Screen – the second image shown in Figure 1. The Recording Screen contains a video feed from the camera of the smart-phone, which occupies the majority of the visible screen area. Overlaid on to the video feed is the detected speed of the vehicle (e.g. 0 mph), heading (e.g. south by south-west) and the elapsed recorded time (e.g. 00:00). Displayed in a left column of the Recording Screen are additional user selectable buttons:

- **Keep current video** (pressing this button will automatically copy the current video - and the previous video segment - to the 'kept videos' section of the smart-phone and so prevents that information from being overwritten via a Recording Strategy - as will be described. The user is advised to press this button in the event of a traffic incident that needs to be recorded).
- **Take photo** (captures a still photograph).
- **Exit Recorder** (returns to main screen).
- **Start / Stop Recording** (starts recording video footage - and other data).

Referring to Figure 2, a second page of the Witness application user manual is shown in which an image of the Recording Screen is shown and described operating in a map-displaying mode rather than a video-feed mode.

During recording, (i.e. when the 'Start / Stop Recording' button is pressed) the Exit Recorder button in the Recording Screen is substituted with a Map Display button. Pressing it will toggle between the modes showing the video feed and a map of the current location.

In alternatives, the Witness application may be arranged to hide the additional user-selectable buttons, thereby enabling a greater proportion of the screen to be used to display the footage being recorded. The hiding of user-interactable artefacts may be automatic (for example, after a predetermined period after the commencement of recording). Alternatively, these artefacts may be hidden under control of the user. For example, when on Camera View, a "swipe left" on the touch sensitive display will hide the controls, and a "swipe right" will display them again. Alternatively, a small chevron button or bar (to call up the additional functions) may be used. This would be useful in the Map Mode due to the multi-touch preferred for interaction with the map (e.g. to zoom in and out).

Referring to Figure 3, a third page of the Witness application user manual is shown in which the File Management Screen is shown and described. The File Management Screen can be accessed by pressing the File Management Button in the Main Menu.

The File Management Screen displays video and associated data (e.g. telemetry data) that has been previously recorded. The stored data is contained in either a "Kept" area of storage or in a "Recording Stack". Data files in the Kept area are

saved and so not overwritten as part of a Recording Strategy. In contrast, data files in the Recording Stack may be overwritten as part of the Recording Strategy.

As described in Figure 3, the bottom section of the list represents the "Kept" data files, whereas the top section of the list represents the "Recording Stack". "Kept" data files can be edited and deleted at this File Management Screen, whereas "Recording Stack" data files cannot. Editing "Kept" data files can involve renaming them.

The recorded data files are listed on screen along with the time and date of the recording and the electronic size of the data file. Accordingly, the user is provided with feedback about how big the data files are, and so if the smart-phone is low in storage, the user can elect to delete certain "Kept" data files. "Recording Stack" data files will be automatically overridden by the Recording Strategy.

The controls on the toolbar at the bottom of the recordings screen allow a user to change the selection mode of the video stack and includes:

- **Video** (when highlighted, if a data file is selected, a video recording playback screen will be displayed).
- **Map** (when highlighted, if a data file is selected, then a map will be displayed showing the area over which the recording was made).
- **Export** (when highlighted, a selected data file will be passed to an Export Screen where export options will be provided).
- **Keep** (when highlighted, if a "Recording Stack" data file is selected, then a user will be prompted to name it, and then it will be stored as a "Kept" data file).

The icons in the File Management Screen change in dependence on the selected mode. For example, Figure 16 shows the icons displayed when the Video selection mode is highlighted; Figure 17 shows the icons displayed when the Map selection mode is highlighted; Figure 18 shows the icons displayed when the Export selection mode is highlighted and Figure 19 shows the icons displayed when the Keep selection mode is highlighted. Advantageously, this provides improved feedback to a user about what selection mode is highlighted and so what action is likely from the selection of a data file.

Referring to Figure 4, a fourth page of the Witness application user manual is shown in which an image of a Recording Playback screen is shown and described. The Recording Playback screen is invoked by highlighting the Video Mode in the File Management Screen and selecting an appropriate data file.

In the Recording Playback screen it is possible to play back a pre-recorded video feed associated with a chosen data file. As well as playing back the recorded video feed, the Recording Playback screen also displays other associated data such as telemetry data. For example, date, time, speed, forward/backward G-forces, latitude, longitude and heading information is overlaid onto the video feed. As the video is played back, these values will typically change depending on the behaviour of the vehicle, as recorded by the mobile device.

Forward and backward G-forces are those that correspond to the forward and backward movement of the vehicle and are the primary metric for determining an event such as a crash. However, other G-forces (e.g. up/down and side-to-side) may also be measured by the device – even if they are not necessarily display on the mobile screen.

As recited in Figure 4, the Recording Playback screen provides further user controls in the form of:

- **Playback Position Scrub Bar** (horizontal bar at bottom of screen)
- **Playback Speed Bar** (vertical bar at left side of screen)
- **Pause** (pauses playback)
- **Eject** (return to previous screen)
- **Loop** (plays the data file continuously)

The Playback Position Scrub Bar allows a user to jump to different positions within the recording without necessarily needing to watch all of the recorded footage. Advantageously, this allows a user to more quickly locate a desired item of footage within a given data file. Also, the Playback Speed Bar can be used to speed up or slow down the playback of the data file. This allows a desired item of footage to be found more quickly through sped-up playback, and also allows an item of footage to be more carefully analysed through slowed-down playback. Furthermore, it is possible to zoom in and out of a region of the video file using a 'pinch and zoom' movement as is standard with most multi-touch touch-screen devices.

Referring to Figure 5, a fifth page of the Witness application user manual is shown in which a different type of Recording Playback screen is shown and described. Specifically, the image represents playback of a pre-recorded data file as can be invoked by highlighting the Map Mode in the File Management Screen and selecting an appropriate data file.

In contrast with the Video Mode playback, this Map Mode playback shows a map of the area where the recording took place. A blue breadcrumb trail is overlaid on to the map showing the extent of movement of the vehicle during the recorded period. A scrub slider is shown which is user-operable to adjust the time within the recorded period. As the slider is adjusted, a pin moves along the blue breadcrumb to show the position of the vehicle at the time as specified by the slider. Tapping the pin displays associated telemetry data at that position and time.

Referring to Figure 6, a sixth page of the Witness application user manual is shown in which an image of a Video Export Screen is described. The Video Export Screen may be invoked by highlighting the Export button in the File Management Screen and selecting an appropriate data file.

The Video Export Screen allows the quality of the video associated with the selected data file to be adjusted before that video is exported. Advantageously, this can allow the user to control the size of the data to be exported. Telemetry data is also exported, embedded within the video file. Video data can be exported with or without sound, depending on the permissions of the user. Export typically involves copying data files from the mobile device to a local computer (e.g. via a data cable) or a remote server (e.g. via a wireless connection).

Referring to Figure 7, a seventh page of the Witness application user manual is shown, in which an image of the Settings Screen is displayed and described. The Settings Screen allows the operation of the Recording Strategy to be controlled. Specifically, the Settings Screen allows a user to select the number of video segments that the application should store, and the size of those segments. Accordingly, the user is able to set a limit to the storage usage of the Recording Stack part of the program. The user can also control the storage usage of the Recording Stack through the use of the video quality buttons.

Note that the Witness application may be arranged to calculate the remaining memory available on the smart-phone and suggest the appropriate settings automatically.

The Recording Strategy involves maintaining a user-controlled number of video segments. When a new video recording is initialised – instantiating a new segment – this is written over the oldest video segment. Thus only the most recently recorded videos are maintained in the Recording Stack.

Another setting that can be controlled in the Settings Screen is the G-force threshold at which the Witness application will assume that a crash has taken place. It is expected that different vehicles and driving styles will need different G-force thresholds to be set to ensure a reasonable sensitivity to crash forces whilst also prevent crash detection false positives. It should be noted that although the manual recites "*Raise the sensitivity if you find that crash detection is triggered during normal driving…*" it is the sensitivity *threshold* that is to be raised, and not the sensitivity itself. A slider allows the sensitivity threshold to be set via the touch-sensitive screen.

The Settings Screen also has a button to allow a user to define more settings via a More Settings Screen.

Another feature of the Settings Screen is the ability to turn off audio capture. This enables a user to play music in the background without it interfering with the video recording or functionality of the Witness application.

A further optional feature of the Settings Screen is allowing "auto record" as soon as the application is first initialised. Thus, instead of waiting for the mobile application to be loaded before being able to record driving footage (e.g. by then manually pressing the appropriate button), a user merely needs to open the application. This enables the user to start driving even though the Witness application may not have fully loaded on the mobile device.

Referring to Figure 8, an eighth page of the Witness application user manual is shown in which an image of the More Settings Screen is displayed and described. Here it is possible for the user to select speed units and also select whether the map should be displayed during recording, and at which speed it should be displayed in

favour of the video feed. This is a safety feature of the Witness application that hides the video feed during recording when the vehicle is detected as travelling above a predetermined speed. The video feed is replaced by a map of the location of the vehicle – as is typical with in-vehicle GPS devices. Note that although the on-screen video feed is replaced with a map, video recording continues in the background.

In alternatives, the application may be arranged to detect the vehicle speed, and at a particular speed, switch off the screen entirely. It should be understood that the device will continue to record video, telemetry and other information even when the screen is switched off. Entirely switching off the screen of the device is advantageous as it significantly reduces the drain on the battery of the mobile device.

Note that the Witness application is also arranged to interface with the phone to detect low-light conditions and in response change the brightness of the screen to prevent the user/driver being dazzled. This can also save battery life. Alternatively, the Witness application may allow user control of the screen brightness – for example, swipe up or down to respectively increase or decrease screen brightness.

The Witness application may also be arranged to alert the user when the battery level is too low, and in the event that the battery level reaches a predetermined level, the Witness application may be arranged to automatically stop recording and save data to permanent storage to prevent video footage being lost when power to the mobile device is lost. A battery level indicator may be provided on the main recording view so that a user is provided feedback about battery levels. Moreover, the battery indicator is displayed (and may only be displayed) when the device is recording footage. Accordingly, this provides a useful indication to the user that the mobile device is recording.

The More Settings Screen also includes a Personal Details button which, when pressed invokes a Personal Details Screen.

Referring to Figure 9, an ninth page of the Witness application user manual is shown in which an image of the Personal Details Screen is displayed and described.

Here, the name, vehicle registration number, mobile number and email address to be used in an emergency can be specified by the user. In the event of a detected incident, these details, along with information regarding the detected incident (e.g.

time of incident, location and optionally telemetry data) will be emailed to the specified email address automatically. This can ensure that the chosen recipient of that email will be informed immediately about the occurrence and nature of the detected incident. In particular, a hyperlink may be provided in an email to a mapping application or website (such as Google® Maps) to enable a chosen recipient to be conveniently informed about the location of the occurrence.

In alternatives, in the event of an automatically detected incident, a countdown may be displayed. The countdown is presented to the user with an "option to cancel". If the option to cancel is selected by the user, then this will prevent transmission of information regarding the detected incident to the chosen recipient. If the option to cancel is not selected by a user within the countdown period, only then will the data regarding the incident be transmitted.

In another alternative, the user may be provided with an option to manually initiate the transmission of selected data to a chosen recipient. This option may be presented in the form of a "Panic Button". A user in distress would simply select the "Panic Button" and this would transmit a dearth of information, including the whereabouts of the user, and the fact that the "Panic Button" had been activated to a chosen recipient. This would be useful if a user were being harassed, or threatened and may not have time to contact a chosen recipient to rely the details of the problem.

This Personal Details Screen also allows the user to set whether it is possible for the video stack to be deleted. A security PIN protects the changing of this option so that if a first user having the PIN (for example, a parent) can review the driving style and behaviour of a second user not having the PIN (for example, their son or daughter) by reviewing the Recording Stack – as the Recording Stack cannot be deleted by that second user. As shown in Figure 20, the PIN can be set for the first time by entering it twice into the appropriate PIN fields.

Referring to Figure 10, a tenth page of the Witness application user manual is shown in which images of an Accident Management Screen and Witness Details Screen is displayed and described.

The Accident Management Screen can be invoked by the user via the Main Menu, or can be automatically switched to after the Witness application has detected that there

has been an incident (e.g. via G-forces exceeding a threshold level). Similarly, data can automatically permanently stored as "Kept" and/or sent if high G-forces are detected.

As can be seen on the Accident Management Screen, there are the following user selectable buttons:

- **Accident Advice / What to do**
  This option provides guidance as to what to do during an accident – see Figures 11 and 12 for the displayed Accident Advice Screens.
- **Witnesses**
  This option invokes functionality to allow collection of information from or about witnesses to an incident. An image of the Witnesses Detail information summary screen is shown in Figure 10. Figure 13 shows the Witness Detail information collection screen. Voice notes can also be taken via the microphone of the smart-phone.
- **Photos**
  This option enables the camera to allow a user to capture images associated with an incident.
- **Drivers**
  This option invokes functionality to allow collection about the other drivers involved in an incident, such as their vehicle and insurance details. The Drivers Detail information collection screen is shown in Figure 14.
- **Your Details**
  This option provides a readily available store of the details of the user - as to be provided to other drivers – and can contain name, address and insurance details. The 'Your Details' screen is shown in Figure 15.

Details recorded via the Accident Management Screen are electronically authenticated and feature a time-stamp. In alternatives, this data may be encrypted to ensure the integrity of the stored data.

Furthermore, in alternatives, the exchange of the details of the drivers and witnesses can be conducted, at least in part, via Bluetooth® (for example, between mobile devices) – and/or via email. The relevant information associated with the driver that is pre-stored on the Witness application in a format that can be sent readily via a communication channel such as Bluetooth® or email.

Finally, note that in each Screen or Menu, there is a button provided to go back to the previous menu. Also, when certain actions are performed or selected by a user, the Witness application is arranged to provide an audible feedback signal (for example, a beep). For example, this could be in response to starting a recording, keeping a video segment and/or a stopped recording.

User control of the Witness application has been described above to be primarily via selection of virtual buttons provided on a touch-sensitive display. However, it will be appreciated that "hands-free" operation of the Witness application is also possible via a voice-activation and recognition system onboard the mobile device. Accordingly, if a user wants a command to be carried out (for example, to record a video clip or select a menu item), it is possible to do this by speaking the appropriate command to a suitably configured mobile device. This is particularly convenient if the user is driving.

Embodiment alternatives and extensions

So far, the Witness application has been described primarily in the context of a personalised smart-phone application for the sole use of a smart-phone user. However, the Witness application can be extended to interface with remote users to allow them to control the operation of the application as well as view information logged by the application. A remote user may be an employee of an insurance company, or a fleet manager wanting an insight into how vehicles of the fleet are being driven.

In particular, the present application can be extended to a scenario where the Witness application is interfaced with or is under the control of an insurance company. Such an insurance company may provide insurance to the user, and so may have an interest in the behaviour of that user, and moreover, a vehicle under the control of that user.

The Witness application can assist the insurance company in making informed decisions about a user's insurance policy by allowing access to logged driving behaviour. For example, if it is determined from video logs that a driver drives safely, then the insurance premium associated with that driver may be lowered.

In such a scenario, the insurance company will maintain a device monitoring system that can interface with a mobile device running the Witness application. In fact, the device monitoring system may interface with a large number of mobile devices, each running an individual copy of the Witness application logging respective user/vehicle behaviours. Such a device monitoring system may be arranged to generate a "driving score" on the basis of the data received from each device.

With such a monitoring system, it is unpractical to actively monitor each and every mobile device and receiving and handling the sheer quantity of data from each and every device would also be very difficult.

Consequently, the device monitoring system and the mobile devices are advantageously arranged to automatically and intelligently interface with one another in a way that minimises the computational and bandwidth burden on the device monitoring system.

For example, the Witness application may simply generate a score such as a "driving score" to be passed to the remote user to log against a respective user and/or vehicle. Thus in this case, the computation of the score would take place solely on the mobile device, minimising the amount of data to be transmitted to a remote system (and thereby the associated computational burden of processing that data).

Alternatively, a determination about which data is kept on the mobile device and which is transmitted from it to a device monitoring system may be made dynamically or on a case-by-case basis.

In particular, each mobile device running the Witness application is arranged to make a determination as to whether there is a need to transfer data to the device monitoring system. For example, the Witness application may be arranged to automatically send data to the device monitoring system that only has high G-force activity associated with it, as this may be indicative of a crash or another event of significance. Alternatively, the Witness application may be arranged to send detailed or high-bandwidth information if a user indicates that an accident has occurred.

In either case, the video segments and associated telemetry data associated with the relevant event will be send. However, no other data (for example, from another date) will be sent.

Alternatively, less computationally or bandwidth intensive information may be sent on a periodic basis – for example, every day, week or month. Such general information may be sent to establish a profile of a particular user. For example, many high G-force related activities may indicate that the driver is driving aggressively. A determination about the profile can be made automatically by requesting and automatically analysing further data. For example, the location and speed information can be used to determine whether a vehicle is found to frequently break the speed limit. If this is the case, then the profile of the user can be set accordingly.

Such general and periodically obtained information can also be used to remotely adjust the settings of the application. For example, many high G-force related activities may instead indicate that the set up of the car is such that the mobile device is subjected to high G forces (rather than the driver driving aggressively). If the driving is determined to be safe, but the mobile device is setting off many false positives, then the device monitoring system can automatically adjust the settings of the application. For example, the G-force sensitivity threshold may be increased remotely.

Thus the initial data that is automatically transmitted from the mobile device to the vehicle monitoring system is limited in bandwidth so as not to overload the vehicle monitoring system as a whole. However, after processing or analysis is performed on the initial data, further information may be requested. For example, further information may be requested automatically by the system or manually by a controller acting for the insurance company. Such further information may include high resolution video logs and telemetry data such as G-force measurements.

It will be understood that the mobile device may also automatically keep certain data at random. Furthermore, the reason for keeping certain data may also be logged (e.g. logged as a result of a manual request by the user, or in response to a high G-force event).

The mobile device and device monitoring system may also be arranged to highlight detected transgressions. For example, driving during curfew hours, or driving at locations where insurance is not valid (e.g. other countries, off-road, race tracks etc).

As will be appreciated, the interaction of the mobile device and the device monitoring system has the advantage of actively improving user driving behaviour. That is, if the user knows that their logged driving behaviour may adversely effect their insurance policy, then it is likely that the user will be dissuaded from driving recklessly. In view of this, an insurance company may be able to incentivise users through lower insurance premiums.

However, so that users do not wrongfully benefit from such incentives, it is necessary to enforce the correct and consistent use of the Witness application.

It would not be beneficial from the perspective of the insurance company if the user could choose when to enable the application. For example, if a user could choose to disable the application when speeding then the effectiveness of the application would be reduced.

Accordingly, the application may include measures to guarantee that the application is enabled whenever a given insured vehicle is being driven.

Such measures may involve matching data recorded by the Witness application with that recorded independently by the vehicle. For example, the Witness application records the distance travelled during every journey. To ensure the summed distances of all journeys tracked by the Witness application tally with the total travelled distance of the vehicle, the user may be prompted to enter the odometer mileage periodically.

If the distance recorded by the Witness application does not correlate with the difference between odometer readings, then the discrepancy will be flagged to the user and/or the insurance company. A substantial discrepancy will typically indicate that the Witness application has not been monitoring all vehicle journeys and the appropriate action can be taken (e.g. the user can be warned, insurance premium may be raised etc).

It will be appreciated that such a tallying exercise depends on the Witness application being used every time one particular vehicle is driven. However, in alternatives, if the Witness application is used with different vehicles, the Witness application may be arranged to register the different vehicles so that their respective odometer readings can be tallied with distance recordings associated with each respective vehicle.

Other measures can be implemented in conjunction with the Witness application to guarantee that the application is enabled whenever a given vehicle is being driven. For example, the mobile device on which the Witness application is installed may comprise a near-field communication (NFC) device, such as an RFID tag. The NFC device may be compatible with a complementary device on a so-called 'smart-holster' into which the mobile device may be fitted during operation.

The smart-holster positions and holds the mobile device correctly so that the video camera on the mobile device can clearly view the road ahead via of the front windscreen of the vehicle. However, the smart-holster also interacts with the NFC device on the smart-phone to determine whether or not the smart-phone is inserted into the smart-holster. The smart-holster can then be interfaced with the engine management system of the vehicle so that the vehicle may be activated and driven only when the mobile device is in place within the smart-holster and/or the Witness application has been enabled.

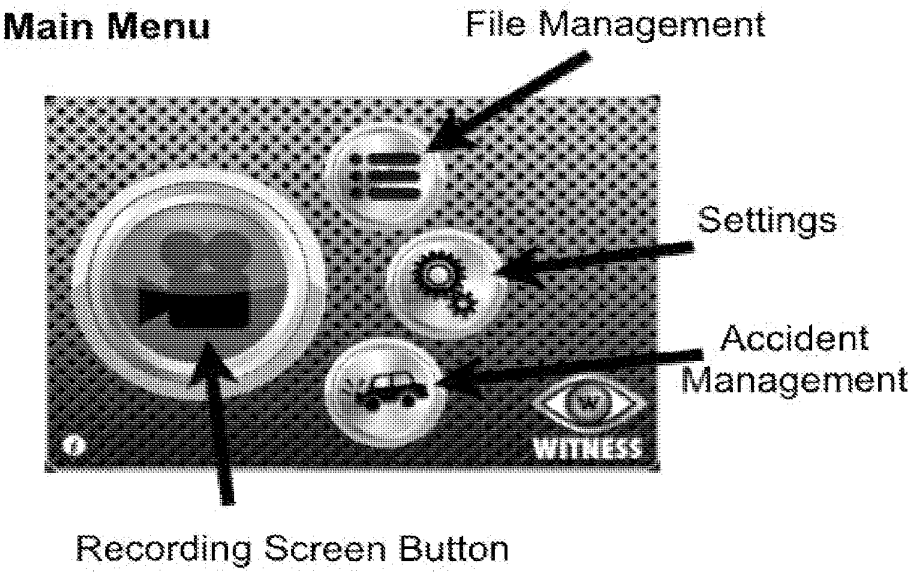
Alternatively, the vehicle may be fitted with an immobilisation device arranged to interface with an onboard vehicle computer or the like (e.g. the vehicle engine management system), so as to selectively control whether the vehicle can be started and driven away by a user. The immobilisation device may be arranged to permit a user to activate the vehicle on detection that the mobile device is within the vicinity of the vehicle. Moreover, the immobilisation device may prevent activation of the vehicle if the mobile device is not within the vicinity of the vehicle and/or the Witness application has not been suitable activated. To this end the mobile device running the Witness application is in communication with the immobilisation device, for example via a wireless communication protocol such as Bluetooth®.

A further extension is that the mobile device, through wireless communication with the onboard vehicle computer, may be used as a remote-control 'key' to gain access to the vehicle.

It will be appreciated that the mobile device has so far been described in the context of a smart-phone. However, it will be appreciated by a person skilled in the art that other devices may also be suitable for performing the functions described in relation to the Witness application. For example, the Witness application may be adapted to run on a general purpose tablet-style computing device, such as an iPad.

Witness User Manual

Main Menu



Recording Screen

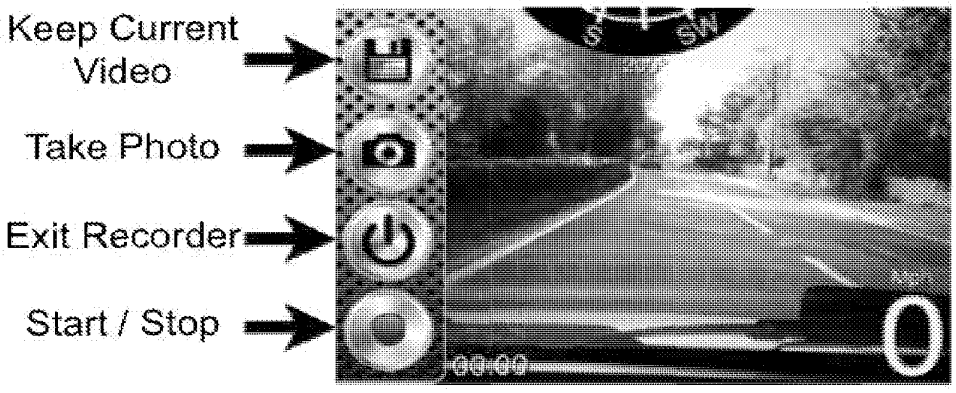


Figure 1

User Manual

The recording screen also displays your current heading, speed and recording time.

During recording, the exit button becomes the map display button. Pressing this toggles the display of a map overlay showing your current position.

Pressing the "Keep Current Video" button will automatically copy the current video and the previous video to the kept videos section in the library. Use this button if an incident occurs whilst you are driving and you wish to keep it.

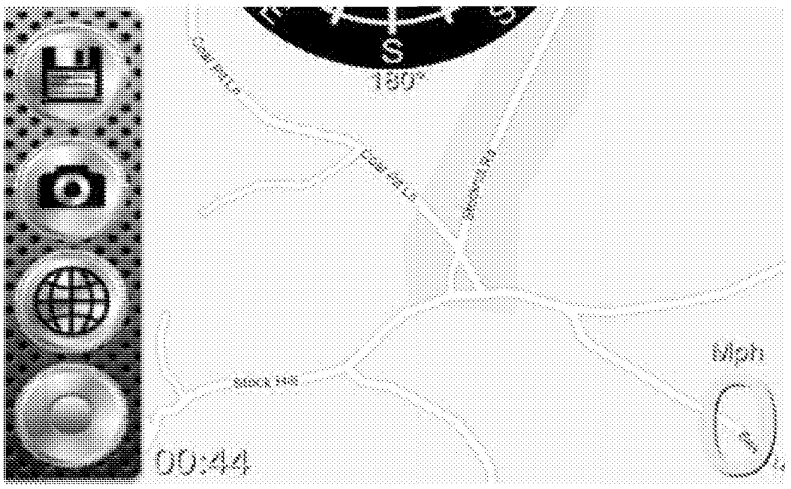


Figure 2

File management



The top section of the file management screen contains the recording stack. The recording stack contains your recent video segments, the number of which depends upon your personal settings.

The bottom section contains videos segments that you have chosen to keep.



Your kept recordings can be deleted individually, but the video stack can only be cleared from the settings screen.

Figure 3

Main Menu

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Recording Playback

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The playback screen shows your recorded video along with the associated telemetry data. The data displayed shows the date and time of the recording, the current speed, the forward and reverse G force, the current GPS position and the current heading.

The G force measures the force of braking and acceleration with the phone mounted with the screen facing rearward, and the back of the phone facing forwards.

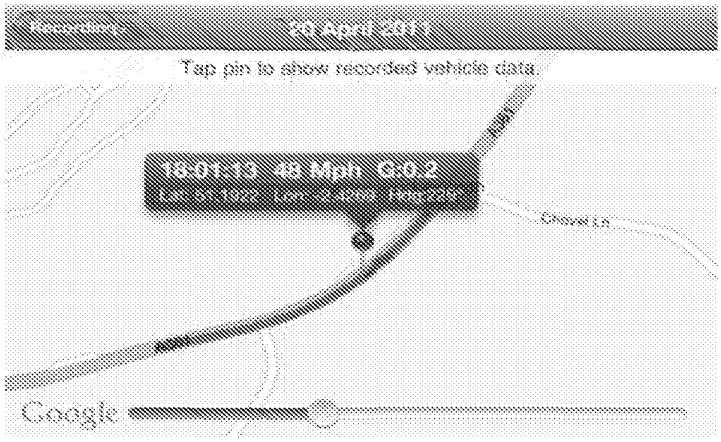
Video playback is controlled via the scrub bar at the bottom. The vertical slider on the left is the playback speed. Other controls are loop, pause and eject.

Figure 4

User Manual

Please Note:
The playback video screen is a floating view and can be zoomed by pinching and moved with a single finger. A double tap will reset the view.

Map Playback

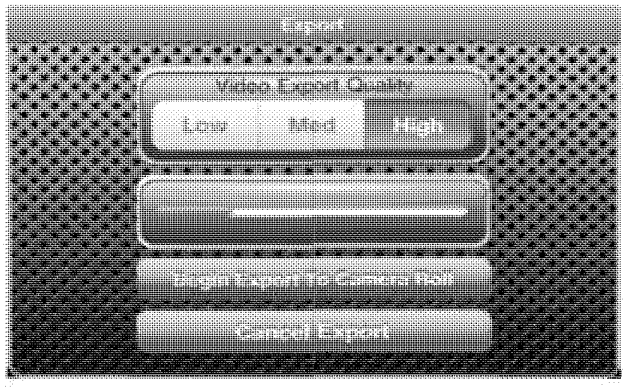


Map playback shows where a recording was made via a blue breadcrumb trail. A pin shows the vehicle position and can be tapped to reveal telemetry data.

The scrub slider will move the pin according to the recorded telemetry.

Figure 5

Video Export



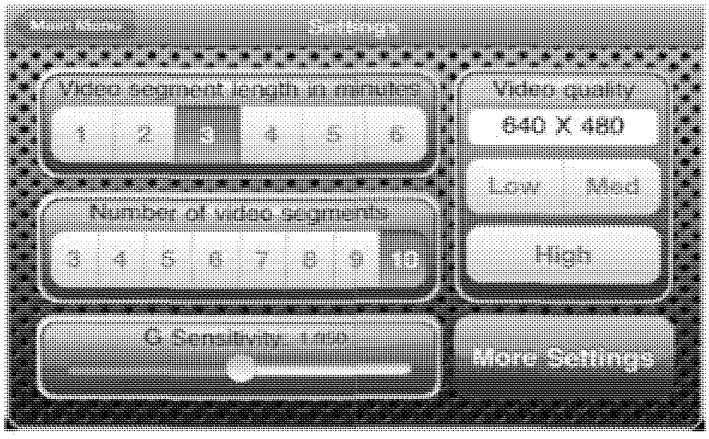
Choose the video quality according to your preference and the video will be exported to the camera roll with the telemetry data embedded within the video.

Medium and high quality reveal good results but with fairly large files usually too big to e-mail, although trimming within the camera roll can shorten the video to just the bit you need. Low quality produces small files but the quality suffers.

Please remember that the iPhone is not a desktop computer and therefore long video segments exported at high quality may take several minutes to complete.

Figure 6

Settings



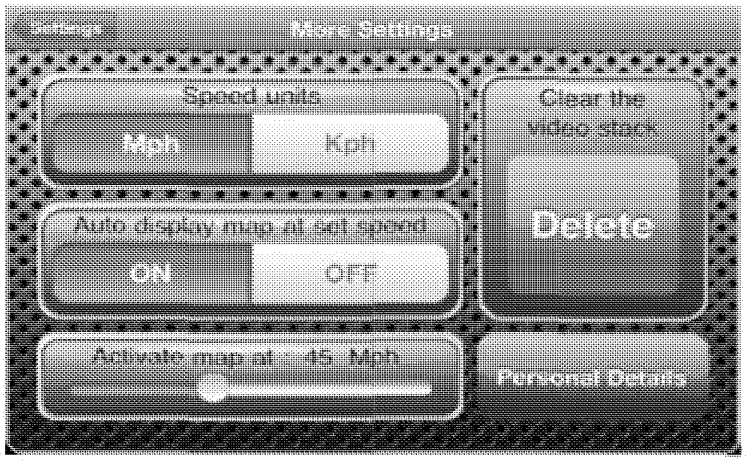
Video recording can be adjusted to allow up to an hour of recorded video in the video stack.

Choose the segment length in minutes and the number of segments you would like according to the available space on your device. Each minute of video at high quality will use 26Mb of space. 1 hour will use 1.5Gb.

G Sensitivity adjusts the automatic triggering of crash detection. Raise the sensitivity if you find that crash detection is triggered during normal driving due to differences in vehicle suspension.

Figure 7

More Settings



Choose your preferred speed units here which will be used throughout the app. Even if you change the speed units after a recording is made, then the correct speed units will be used in playback and export.

You are able to choose whether to have the map overlay display at a certain speed during recording on the main recording screen. Please select the option and set the speed if you would like this to happen.

Please note: If you change the speed units, you will need to re-adjust the map trigger speed accordingly.

Figure 8

Main Menu **User Manual**

Personal Details



These details will be used in the event of an accident to send an automated message.

Enter your name, the registration number of the car the device will be used in, the telephone number of this device and the e-mail address of the person you would like contacted.

You can also set here the option to prevent the video stack from being cleared.

This screen can be protected with a PIN number, but please make sure you remember it or make a note of it somewhere. Re-setting the PIN can only be accomplished be deleting and re-installing the app which will result in all video and data being lost.

Figure 9

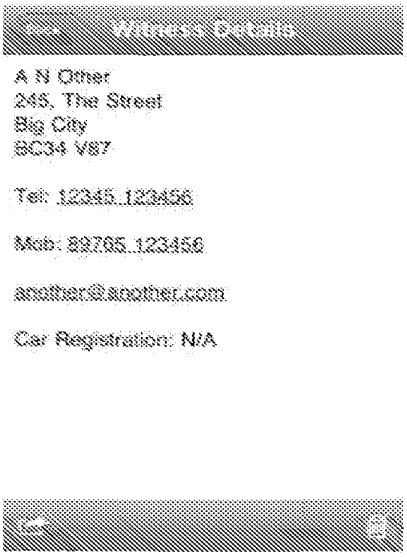
Main Menu

User Manual

Accident Management

In the event of an accident, Witness provides the necessary tools you need in order to gather and keep the correct information.





Witness and driver details can be stored and viewed from within the internal database.

There is also a place to store your insurance details should you need them. Please enter these now so they are in the phone for future use.

Figure 10

What should you do?

Make sure you and others are safe

- Is anyone injured?
- Is the accident causing a hazard?
- Has someone left the scene?

If yes to any of these, then call the emergency services.

1. Witnesses – Collect the names and addresses of any witnesses.

2. Photographs – Take pictures of the scene of the accident, damage to cars and other property, and the occupants of the other vehicle.

3. Drivers – Collect names, addresses, registration numbers and insurance details of all other drivers involved.

Figure 11

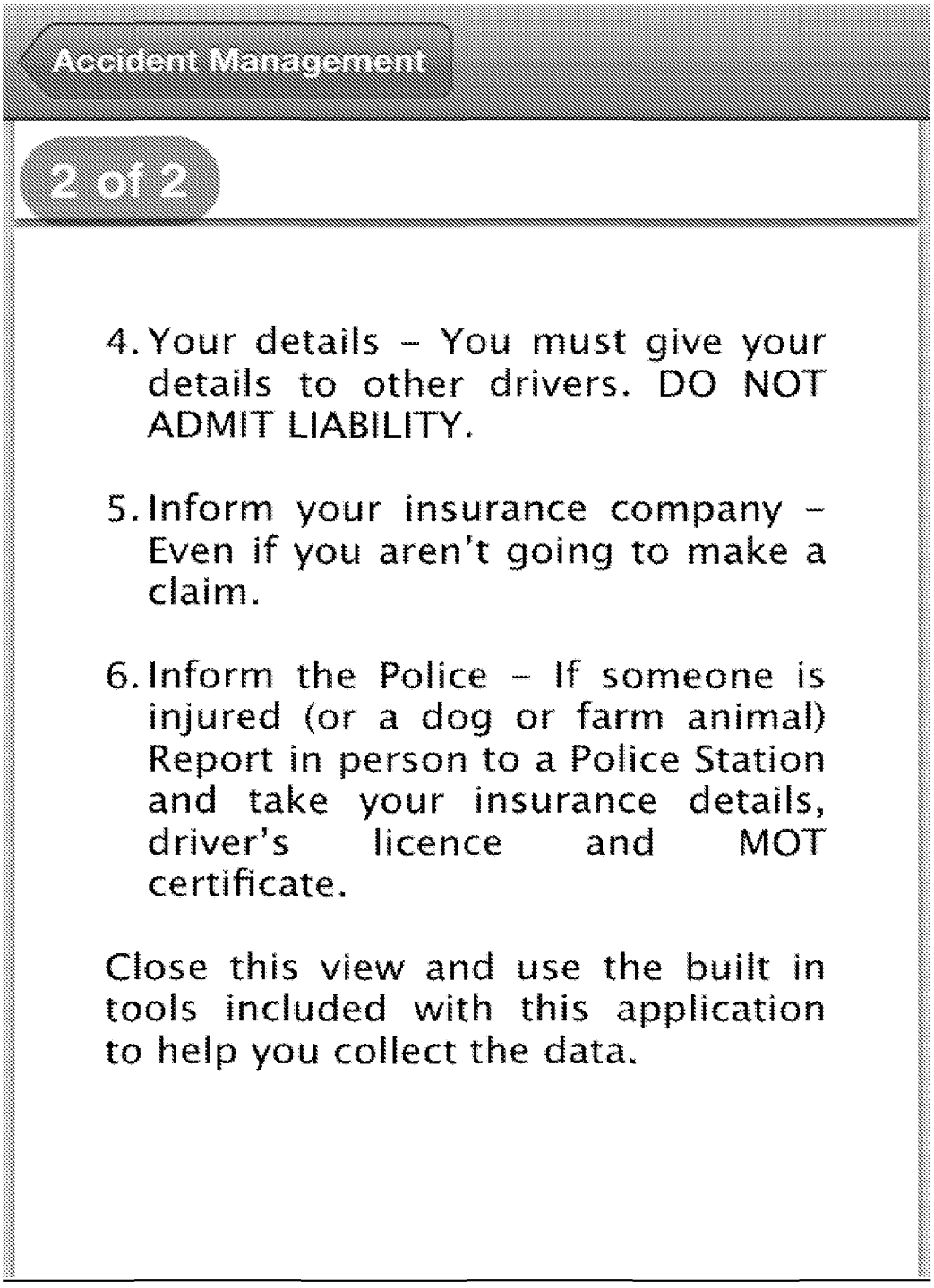

Accident Management
2 of 2
4. Your details - You must give your details to other drivers. DO NOT ADMIT LIABILITY.
5. Inform your insurance company - Even if you aren't going to make a claim.
6. Inform the Police - If someone is injured (or a dog or farm animal) Report in person to a Police Station and take your insurance details, driver's licence and MOT certificate.
Close this view and use the built in tools included with this application to help you collect the data.

Figure 12


Back
Witness Details
Full name of witness
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number
Mobile telephone number

Figure 13



Figure 14

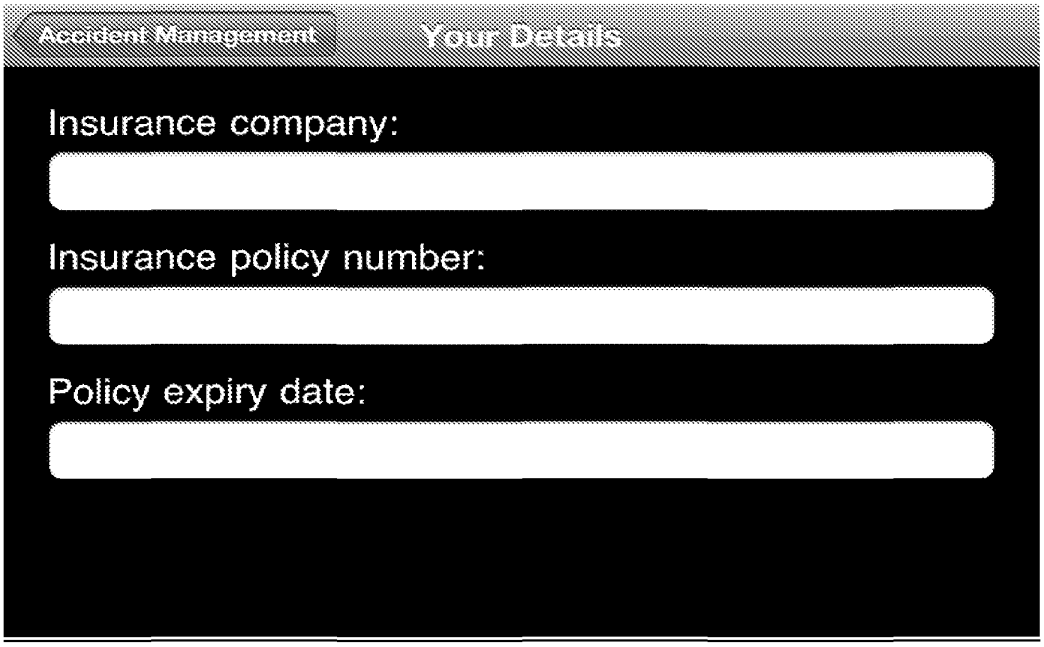


Figure 15


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 16


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 17


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 18


Main Menu
Recordings
Edit
Recording 1
25 May 2011 14:45, 128.6 Mb
Recording 2
25 May 2011 14:50, 128.6 Mb
Recording 3
25 May 2011 14:55, 127.5 Mb
Recording 4
25 May 2011 15:00, 131.5 Mb
Recording 5
25 May 2011 15:05, 5.0 Mb
Recording 6
26 May 2011 11:01, 12.6 Mb
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Figure 19

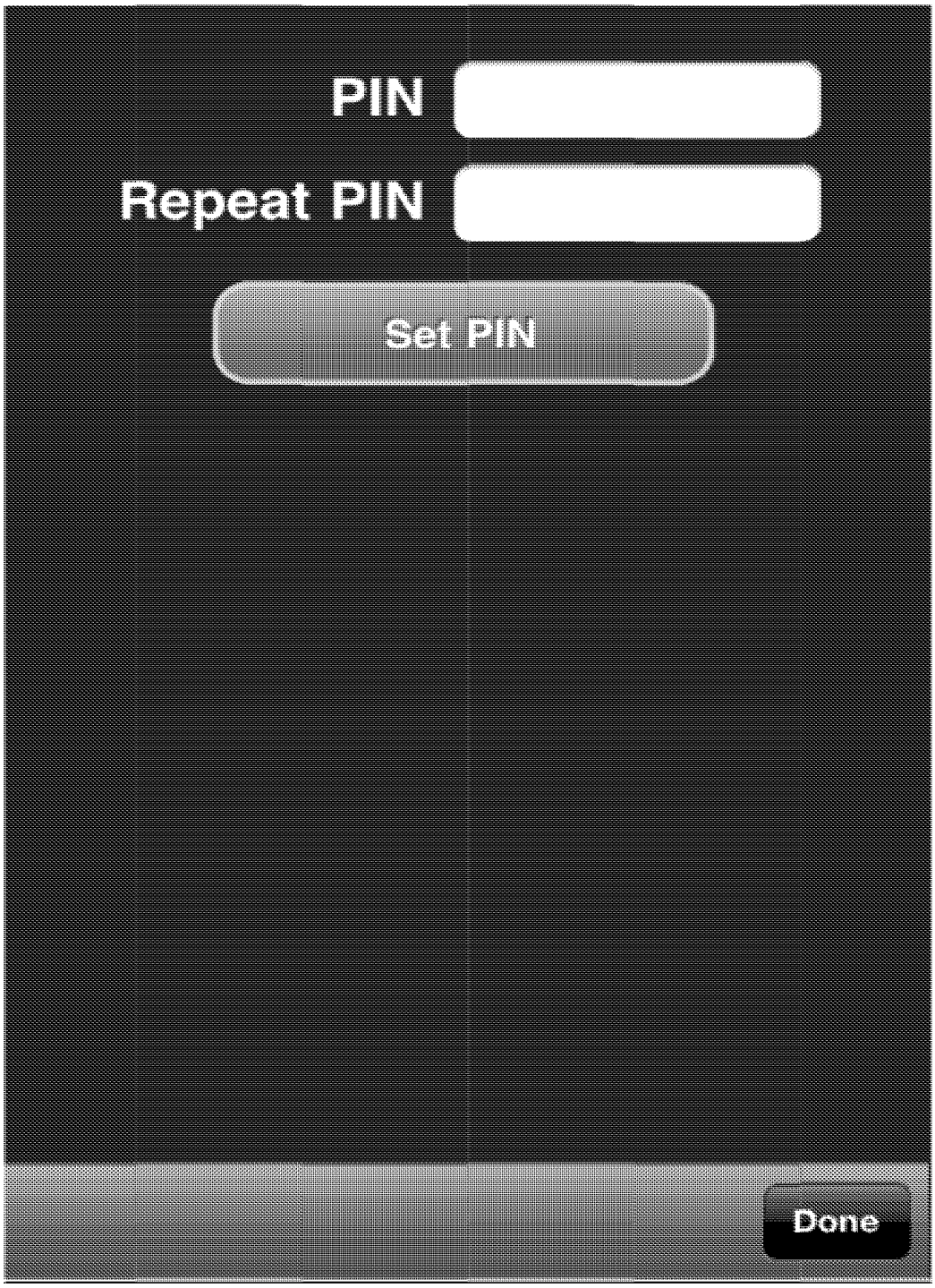


Figure 20

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DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:		**PCT/GB2011/052491**
International filing date:		**15 December 2011 (15.12.2011)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**GB**
	Number:	**1118777.0**
	Filing date:	**31 October 2011 (31.10.2011)**
Date of receipt at the International Bureau:		**20 January 2012 (20.01.2012)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

34, chemin des Colombettes
1211 Geneva 20, Switzerland
www.wipo.int

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as stored electronically on the Patents Electronic Case file System in connection with patent application GB1021292.6 filed on 15th Dec 2010

The Patents Electronic Case-file System is compliant with British Standard BS10008 - *Evidential weight and legal admissibility of information stored electronically* and ISO15801 - Electronic imaging – information stored electronically, recommendations for trustworthiness and reliability.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed 

Dated 17th January 2012

INTELLECTUAL PROPERTY OFFICE

1200005685
K722649 D02718
16/12/2010 0.00 NONE

Patents Form 1
Patents Act 1977 *(Rule 12)*

Request for grant of a patent

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Application number GB 1021292.6

1.	Your reference	**P26415GB/SSA**
2.	Full name, address and postcode of the applicant or of each applicant	**Wright, Andrew William** **Cedar Springs** **Waverley Drive** **Virginia Water GU25 4PZ** **Surrey** **United Kingdom**
	Patents ADP number *(if you know it)*	
3.	Title of the invention	**Improvements Relating to Vehicle Recording Systems**
4.	Name of your agent *(if you have one)*	**Keltie**
	"Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) *(including the postcode)*	**Keltie** **Fleet Place House** **2 Fleet Place** **London EC4M 7ET** **United Kingdom**
	Patents ADP number *(if you know it)*	**09540048001**
5.	Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)	

Country	Application number	Date of filing	Date available on PDAS

6.	Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application	Number of earlier UK application	Date of filing *(day / month / year)*
7.	Inventorship: (Inventors must be individuals not companies)		
	Are all the applicants named above also inventors?	**Yes**	
	If yes, are there any other inventors?	**No**	
8.	Are you paying the application fee with this form?	**No**	

Patents Form 1

9. Accompanying documents: please enter the number of pages of each item accompanying this form.

Continuation sheets of this form

Description:	**2**
Claim(s):	**n/a**
Abstract:	**n/a**
Drawing(s):	**n/a**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	Date available on PDAS

10. If you are also filing any of the following, state how many against each item.

Priority documents:	**0**
Statement of inventorship and right to grant of a patent (Patents Form 7):	**0**
Request for search (Patents Form 9A):	**0**
Request for a substantive examination (Patents Form 10):	**0**
Any other documents (please specify):	

11. I/We request the grant of a patent on the basis of this application.

Signature: **Subject: GB, Keltie, S. Ahmad 19226; Issuer: , European Patent Office, European Patent Office CA**

Date: **15 Dec 2010**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

Ahmad, Dr. Sheikh Shakeel
Telephone: +44 (0)20 7329 8888
Fax: +44 (0)20 7329 1111

Warning
After an application for a patent has been filed, the Comptroller will consider whether publication or communication of the invention should be prohibited or restricted under section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you are resident in the United Kingdom and your application contains information which relates to military technology, or would be prejudicial to national security or the safety of the public, section 23 of the Patents Act 1977 prohibits you from applying for a patent abroad without first getting written permission from the Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked. Until such time or until the revocation of any direction, for any such application the address for service referred to at part 4 above must be in the United Kingdom.

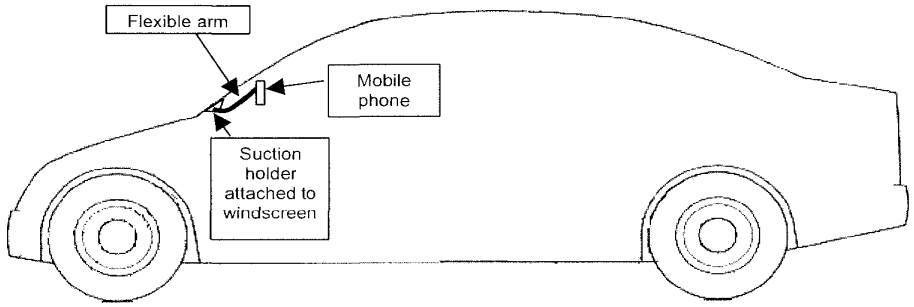
Although you may have an address for service in the Channel Islands, any agent instructed to act for you must reside or have a place of business in the European Economic Area or Isle of Man.

"Witness":
loop recording of video using a mobile phone to promote car safety and establish the cause of road accidents

Accidents recorded in the UK 'On the spot' investigation showed 34% of accidents involved only one car. In the USA, in 2007, fifty-eight percent of fatal crashes involved only one vehicle. There are many accidents where there is little reliable evidence of what caused the accident.

In-car systems do exist which can record video of events leading up to car accidents but they are expensive and require time & skill to install. This means that usage rates are low & generally limited to fleets of commercial vehicles. "Witness" utilises a mobile phone making it simple to install and use and making it available to the majority of people at very low cost because it simply requires a program to be downloaded.

When driving, the driver places their mobile phone into a standard suction holder so that the camera faces forward through the windscreen. The phone is attached to a car's power source via the cigarette lighter. The phone senses the change of power source from the phone battery to the car battery/alternator and automatically switches on the "Witness" phone application. Otherwise, the driver simply starts the programme before driving away.



The 'app' begins recording video in a loop of a variable amount of time (between one minutes and ten depending on available memory) so that video older than the required time is deleted as new video is recorded over it. The time and date of the recording is embedded at various points within the video file which is recorded.

The phone will automatically adjust the camera settings for daytime or night-time recording by reducing the number of frames recorded per second depending on external light levels.

At the same time the GPS facility on the phone records speed and location of the vehicle. This information is also embedded within the video.

Where a rear camera is present on the mobile phone this also records so that some indication of events inside the car is recorded.

These recordings carry on in the 'background' so that the user is still able to use the hands-free and/or satellite navigation functions on the phone.

In the event of a sudden deceleration or acceleration (set to be triggered by a collision at the front or from the rear), the phone will continue to record for a short period and then stop and save the data. Alternatively, if this mechanism is not triggered, the driver can touch the phone screen and stop the camera.

The data is compressed to minimise the size of the file and make it easier to store and send via e-mail. The inclusion of date, time, speed and GPS location embedded within the digital video make it suitable for use by insurance companies and law enforcement agencies in establishing the cause of the accident and the veracity of the data file.

An audio/visual prompt will then occur which asks the driver if an accident has happened. If the driver pushes the "Yes" button the phone then makes a series of suggestions to keep the driver safe and to help record important details. The prompts would include taking pictures of the scene of the accident, other cars, the other drivers and passengers. The phone would also prompt the recording of the names and addresses of drivers, passengers and other witnesses. The prompts could also remind the person of their responsibilities at the scene of the accident.

Such an application might be provided by insurance companies to drivers who promise to use it in return for a reduction in their insurance premium or excess – this on the understanding that there will be a recording of any accident otherwise the excess is at the normal level.

The video recording of the accident may reduce the cost of establishing who caused an accident. It will reduce the risk of insurance fraud and the knowledge that the driver's own driving is being recorded will reduce risky driving behaviour.

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DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:		**PCT/GB2011/052491**
International filing date:		**15 December 2011 (15.12.2011)**
Document type:		**Certified copy of priority document**
Document details:	Country/Office:	**GB**
	Number:	**1021292.6**
	Filing date:	**15 December 2010 (15.12.2010)**
Date of receipt at the International Bureau:		**20 January 2012 (20.01.2012)**

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-*bis*)

34, chemin des Colombettes
1211 Geneva 20, Switzerland
www.wipo.int

PCT REQUEST

Print Out (Original in Electronic Form)

0	**For receiving Office use only**	
0-1	International Application No.	**PCT/GB2011/052491**
0-2	International Filing Date	**15 December 2011 (15.12.2011)**
0-3	Name of receiving Office and "PCT International Application"	**RO/GB**

0-4	**Form PCT/RO/101 PCT Request**	
0-4-1	Prepared Using	**PCT Online Filing Version 3.5.000.225 MT/FOP 20020701/0.20.5.20**
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	**UK Intellectual Property Office (RO/GB)**
0-7	**Applicant's or agent's file reference**	**P26415WO/SSA**
I	**Title of Invention**	**METHOD AND SYSTEM FOR LOGGING VEHICLE BEHAVIOUR**
II	**Applicant**	
II-1	This person is	**Applicant and inventor**
II-2	Applicant for	**All designated States**
II-4	Name (LAST, First)	**WRIGHT, Andrew William**
II-5	Address	**Cedar Springs Waverley Drive Virginia Water Surrey GU25 4PZ United Kingdom**
II-6	State of nationality	**GB**
II-7	State of residence	**GB**

PCT REQUEST

Print Out (Original in Electronic Form)

IV-1	**Agent or common representative; or address for correspondence**	
	The person identified below is hereby/ has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	Agent
IV-1-1	Name (LAST, First)	ELKINER, Kaya
IV-1-2	Address	Keltie LLP Fleet Place House 2 Fleet Place London EC4M 7ET United Kingdom
IV-1-3	Telephone No.	+44 (0)20 7329 8888
IV-1-4	Facsimile No.	+44 (0)20 7329 1111
IV-2	**Additional agent(s)**	additional agent(s) with same address as first named agent
IV-2-1	Name(s)	CUMMINGS, Sean; CALDWELL, Judith; AHMAD, Sheikh; HOPLEY, Joanne; CREASE, Devanand; LAWRENCE, Richard; MOORE, Michael; RICHARDSON, Mark; HAWKINS, Richard; BUMKE, Jakob; KELTIE, David; KENT, Peter; HOLMES, Derek; KEHOE, Laura; BRANNEN, Joseph; BAKER, Philip
V	**DESIGNATIONS**	
V-1	**The filing of this request constitutes under Rule 4.9(a), the designation of all Contracting States bound by the PCT on the international filing date, for the grant of every kind of protection available and, where applicable, for the grant of both regional and national patents.**	
VI-1	**Priority claim of earlier national application**	
VI-1-1	Filing date	15 December 2010 (15.12.2010)
VI-1-2	Number	1021292.6
VI-1-3	Country	GB
VI-2	**Priority claim of earlier national application**	
VI-2-1	Filing date	25 January 2011 (25.01.2011)
VI-2-2	Number	1101259.8
VI-2-3	Country	GB
VI-3	**Priority claim of earlier national application**	
VI-3-1	Filing date	10 June 2011 (10.06.2011)
VI-3-2	Number	1109759.9
VI-3-3	Country	GB

PCT REQUEST

Print Out (Original in Electronic Form)

VI-4	**Priority claim of earlier national application**		
VI-4-1	Filing date	31 October 2011 (31.10.2011)	
VI-4-2	Number	1118777.0	
VI-4-3	Country	GB	
VI-5	**Priority document request** The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1, VI-2, VI-3, VI-4	
VI-6	**Incorporation by reference :** where an element of the international application referred to in Article 11(1)(iii)(d) or (e) or a part of the description, claims or drawings referred to in Rule 20.5(a) is not otherwise contained in this international application but is completely contained in an earlier application whose priority is claimed on the date on which one or more elements referred to in Article 11(1)(iii) were first received by the receiving Office, that element or part is, subject to confirmation under Rule 20.6, incorporated by reference in this international application for the purposes of Rule 20.6.		
VII-1	**International Searching Authority Chosen**	European Patent Office (EPO) (ISA/EP)	
VIII	**Declarations**	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	-	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	
IX	**Check list**	Number of sheets	Electronic file(s) attached
IX-1	Request (including declaration sheets)	4	✓
IX-2	Description	33	✓
IX-3	Claims	6	✓
IX-4	Abstract	1	✓
IX-5	Drawings	24	✓
IX-7	TOTAL	68	

PCT REQUEST

Print Out (Original in Electronic Form)

	Accompanying Items	Paper document(s) attached	Electronic file(s) attached
IX-8	Fee calculation sheet	-	✓
IX-18	PCT-SAFE physical media	-	-
IX-20	**Figure of the drawings which should accompany the abstract**	1	
IX-21	**Language of filing of the international application**	English	
X-1	**Signature of applicant, agent or common representative**	(PKCS7 Digital Signature)	
X-1-1	Name (LAST, First)	AHMAD, Sheikh	
X-1-2	Name of signatory	GB, Keltie, S. Ahmad 19226	
X-1-3	Capacity (if such capacity is not obvious from reading the request)	(Representative)	

FOR RECEIVING OFFICE USE ONLY

10-1	**Date of actual receipt of the purported international application**	15 December 2011 (15.12.2011)
10-2	**Drawings:**	
10-2-1	Received	
10-2-2	Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/EP
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as stored electronically on the Patents Electronic Case file System in connection with patent application GB1101259.8 filed on 25th Jan 2011

The Patents Electronic Case-file System is compliant with British Standard BS10008 - *Evidential weight and legal admissibility of information stored electronically* and ISO15801 - Electronic imaging – information stored electronically, recommendations for trustworthiness and reliability.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed 

Dated 17th January 2012

INTELLECTUAL PROPERTY OFFICE

1200007911
K723429 D02718
25/01/2011 0.00 NONE

Patents Form 1
Patents Act 1977 *(Rule 12)*

Request for grant of a patent

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

Application number GB 1101259.8

1.	Your reference	**P26650GB/SSA/KE**
2.	Full name, address and postcode of the applicant or of each applicant Patents ADP number *(if you know it)*	**Wright, Andrew William** **Cedar Springs** **Waverley Drive** **Virginia Water GU25 4PZ** **Surrey** **United Kingdom**
3.	Title of the invention	**Improvements Relating to Vehicle Recording Systems**
4.	Name of your agent *(if you have one)* "Address for service" to which all correspondence should be sent. This may be in the European Economic area or Channel Islands (see warning note below) *(including the postcode)* Patents ADP number *(if you know it)*	**Keltie** **Keltie** **Fleet Place House** **2 Fleet Place** **London EC4M 7ET** **United Kingdom** **09540048001**
5.	Priority declaration: Are you claiming priority from one or more earlier-filed patent applications? If so, please give details of the application(s)	

Country	Application number	Date of filing	Date available on PDAS

6.	Divisionals etc: Is this application a divisional application, or being made following resolution of an entitlement dispute about an earlier application. If so, please give the application number and filing date of the earlier application	Number of earlier UK application	Date of filing *(day / month / year)*

7.	Inventorship: (Inventors must be individuals not companies)	
	Are all the applicants named above also inventors?	**Yes**
	If yes, are there any other inventors?	**No**
8.	Are you paying the application fee with this form?	**No**

Patents Form 1

9. Accompanying documents: please enter the number of pages of each item accompanying this form.

Continuation sheets of this form

Description:	**10**
Claim(s):	**n/a**
Abstract:	**n/a**
Drawing(s):	**n/a**

If you are not filing a description, please give details of the previous application you are going to rely upon

Country	Application number	Date of filing	Date available on PDAS

10. If you are also filing any of the following, state how many against each item.

Priority documents:	**0**
Statement of inventorship and right to grant of a patent (Patents Form 7):	**0**
Request for search (Patents Form 9A):	**0**
Request for a substantive examination (Patents Form 10):	**0**
Any other documents (please specify):	

11. I/We request the grant of a patent on the basis of this application.

Signature: **Subject: GB, Keltie, K. Elkiner 18943; Issuer: , European Patent Office, European Patent Office CA**

Date: **25 Jan 2011**

12. Name, e-mail address, telephone, fax and/or mobile number, if any, of a contact point for the applicant

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Witness Application

Notes of technical features from meeting of 20 January 2011 (Shakeel Ahmad, Kaya Elkiner, Gill Switalski and Andy Wright).

'Witness' is an application running on the mobile telephone of a driver. In use, the mobile device is mounted adjacent the vehicle windscreen so that a camera on the mobile telephone can see the road ahead.

The application interfaces with the hardware on the telephone to provide a device that documents the events surrounding an incident involving the vehicle such as a crash.

It will be appreciated that a more sophisticated telephone (e.g. a smart-phone) has a richer sensor set with which to record data and determine the occurrence of an incident. However, the Witness application is compatible with most mobile telephones provided that the sensor set is adequate.

Inputs

The Witness application can receive the following sensor/data inputs, as is typical for modern smart-phones:

- G-force / accelerometer
- Microphone (Audio)
- Camera (Picture/Video)
- GPS module (Speed, location, elevation etc)
- 3D compass (Orientation: Pitch, Roll and Yaw)
- Time/date

Recording / Storage

- The Witness application is arranged to record these sensor inputs continuously.
- The recording takes place at the highest update rate possible. However, to conserve storage space on the smart-phone, data is stored / overwritten according to a recording strategy, to attempt to preserve the most relevant data.
- The recording strategy could be set up as follows:

- The Witness application is arranged to register the occurrence of 'an event of significance' – for example, a potential vehicle crash.
- All data recorded close to, and immediately after the time of the event of significance is preserved. Data recorded further away in time can be overwritten.
- In effect, the data preservation/overwriting is such that the closer in time that recorded data is to the 'event of significance', the higher the quality of data. This can also be thought of the recorded data having a higher update rate closer to the event of significance.

- Data can also be compressed.
- Data is also encrypted to preserve the authenticity of the data.

Data processing

As mentioned, the sensor data is used to determine the occurrence of 'an event of significance' such as a vehicle crash. Example ways this could be detected include one or a combination of the following inputs:

- A change in pitch + sharp deceleration (braking heavily / impact)
- A change in yaw at a given speed (swerve/skid)
- A roll (vehicle overturned)
- The sound of:
  - Tyre squeal
  - The crumple zone being crushed
  - Airbags deploying
  - Breaking glass
  - Impact (thud) with the vehicle chassis
  - Passengers shouting/screaming
- GPS – zero velocity for a predetermined period (vehicle not moving anymore)

Benchmarking

It will be appreciated that different sensor types, phones, mounting positions, cars, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

- During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.
    - Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of an event of significance.
- There is an option to notify the Witness application of a change in parameters (e.g. different driver, driving off-road etc). Thus a number of 'profiles' may be set up. Each profile may require an independent training mode period.
- If the Witness program incorrectly detects that an incident of significance has occurred, it can receive feedback from the user to modify its sensitivities. E.g. a more aggressive driver is actually driving.

Crash Management

- On detection of a crash (or other event of significance) the Witness application is arranged to take one or more of the following actions:
    - Announce that it has detected an accident (audio/screen prompt)
    - Call the emergency services (with option to cancel) – e.g: Audio/screen prompt: 'Witness has detected that you have been involved in a (serious) accident and will call the emergency services. If this is not the case, please cancel within 10 seconds.'
    - Provide reassurance
    - Provide the user with a checklist of things to do:
        - Take photographs of vehicles involved in the incident (inc number plates)
        - Take down name, address, insurance details etc of 3rd parties involved in incident
    - Communicate to the insurance company that an incident has been detected (e.g. low bandwidth data or text message)
    - Protect the high quality recorded data so it is not overwritten
    - If appropriate – or in response to a request from a communication to the phone from the insurance company – transmit all or selected portions of the recorded data associated with the incident.
        - N.B. Use of the communication channels is controlled by the Witness application to prioritise essential communications such as calls to the emergency services.

- Note that data transmission from the mobile telephone to the insurance company may be automatic (for example, triggered by a detected incident) or manual (for example, in response to a request from the insurance company). In the latter case, the Witness application may include functionality to allow the insurance company to browse through the files available on the mobile telephone so as to select one or more for transmission to the insurance company.

Data processing for other purposes

The recorded input from the sensors can be used for other purposes. In particular, for aiding the insurance company assess the risk profile of the driver (and potentially modify an insurance premium accordingly). Various parameters may be used to determine this:

- If the Witness application incorrectly detects an incident of significance, and receives feedback that the vehicle was not in accident (but was in a near miss) – this could alter the risk profile of the driver. For example – if this happens frequently, but no accident occurs over a given period, this could be an indicator that the driver is good at reacting to potential hazards.
- Erratic driving (e.g. jerky steering or braking detected by G-force sensor).
- Driving faster than the speed limit allocated to a given road (detected by GPS).

Project Spike

Development of

Witness™

a driving app


S: 0.00mph
G: 96mph
d: 0.000m, t: 0.00s

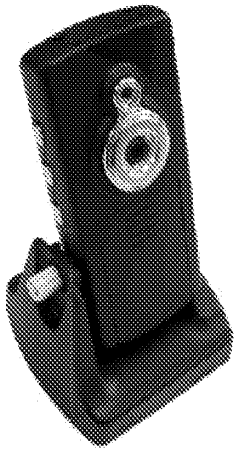
Map
Search
Hotel
New York
Date - Time
Source



$299

GreenRoad
Be safe to drive

$1,000 for 3 years

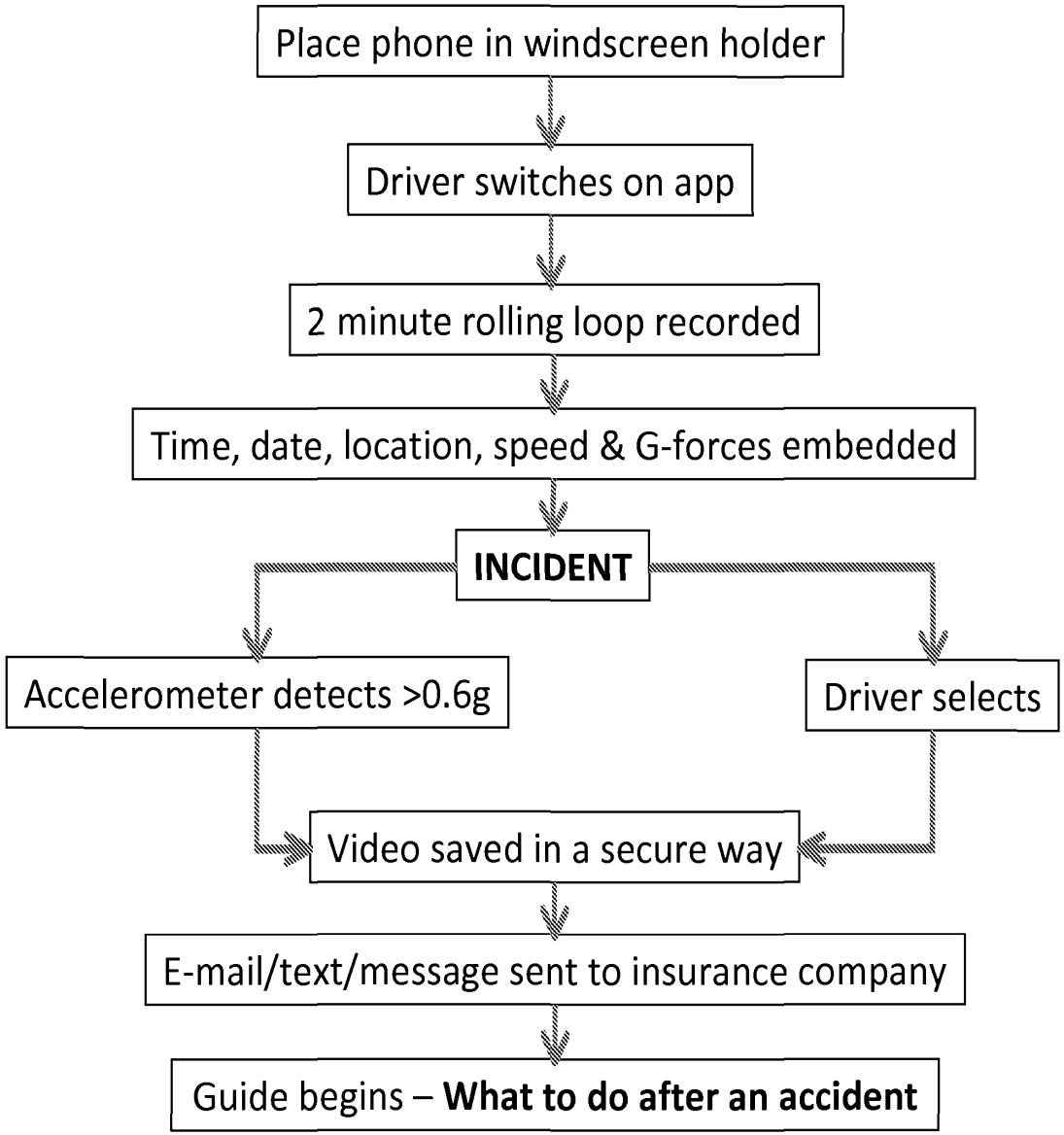


$59.95



$379

475


Place phone in windscreen holder
Driver switches on app
2 minute rolling loop recorded
Time, date, location, speed & G-forces embedded
INCIDENT
Accelerometer detects >0.6g
Driver selects
Video saved in a secure way
E-mail/text/message sent to insurance company
Guide begins – What to do after an accident

Key features

- System is simple to set up and use
- Settings made automatically to video, etc
- Hands-free and sat nav can still be used
- Video is tamper-proof for a period of time
- Driver can e-mail copy of video
- Simple video format for ease of use

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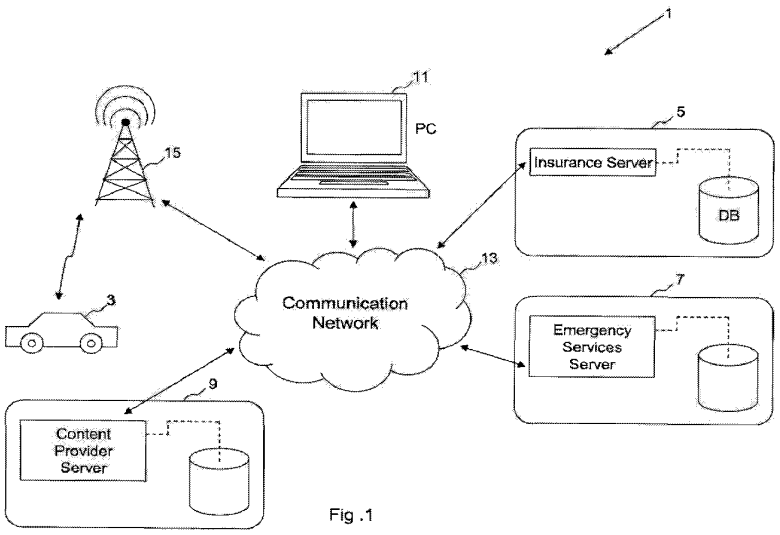


Fig .1

(57) Abstract: Methods and systems for logging driving information associated with a vehicle when driven are disclosed. In one aspect, a mobile telecommunications device is provided that is adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven. The mobile device is arranged to register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. The mobile device is also arranged to process sensor data during the driving period to derive driving information associated with how the vehicle is driven. The mobile device is also arranged to store a selection of the driving information to a memory.

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Method and system for logging vehicle behaviour

Field of the invention

The present invention relates to methods and systems for logging driving information associated with vehicle behaviour. Moreover, the present invention relates to a mobile device adapted for installation to a vehicle and configured to log such driving information, for example, video footage associated with how the vehicle is driven. Such driving information may subsequently be utilised to determine the cause of an event such as an accident, to modify driver behaviour and/or to determine insurance premiums.

Background

Data logging devices are commonly installed on aircraft that log data about events associated with the behaviour of the aircraft and also the crew controlling the aircraft. Such data logging devices are commonly termed "black boxes" and are very useful for determining the cause of problems that have effected the aircraft, especially when no other record of a significant event such as a crash exists.

Similar data logging devices exist for road vehicles, and can be used to realise similar advantages. Vehicle users as well as authorities can use such devices to determine the cause of traffic accidents or other vehicle-related events, whether these stem from a vehicle malfunction or driver negligence. For example, the data logged by these devices can be used as evidence for insurance claims and so potentially to determine insurance premiums.

Some of these data logging devices can be integrated with the car data network, and so may take inputs from sensors integrated with the vehicle, such as those measuring the speed of the vehicle. However, these can be difficult and costly to install. Others having their own internal sensor set are more readily retrofitted to a vehicle. Nonetheless, such data logging devices for road vehicles are less prevalent perhaps due to their unjustifiable expense. Accordingly the uptake of data logging devices that can be retrofitted to road vehicles, as are known in the art, has been minimal.

It is the object of the present invention to alleviate the above-mentioned problems, at least in part.

Summary of the invention

According to a first aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from the sensor set to derive said driving information; a memory for storing said derived driving information; and a wireless telecommunications module operable to download an application; the mobile device being arranged to execute the downloaded application to control the mobile device to: register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; process sensor data from the sensor set during the driving period to

derive driving information associated with how the vehicle is driven; and store a selection of the driving information to the memory.

Advantageously, the use of a mobile telecommunication device enables a data logging device to be conveniently and inexpensively retrofitted to a vehicle. Mobile telecommunication devices such as "smart-phones" are becoming increasingly widespread, and these devices tend to have the requisite sensor sets to capture data concerning vehicle behaviour. Thus, a generic mobile telecommunication device already owned by a driver of the vehicle can be loaded with the application to provide such data logging functionality that would otherwise necessitate a dedicated black-box. Thus, the functionality of a black-box can be realised without additional expense.

Following on from this, it will be appreciated that the mobile device is ideally a portable mobile telecommunication device. Ideally, the mobile device is a hand-portable mobile device. Advantageously, the portability permits the mobile device to be conveniently fitted to and removed from the vehicle.

Furthermore, such a mobile telecommunication device presents additional advantages over known dedicated black-box systems as the data logging functionality of the mobile telecommunication device can be continually refined. This can be achieved without physically upgrading the hardware of the device, and also without significant user intervention. Specifically, the application may be arranged to determine whether a software update exists and if so, control the mobile device to download at least portions of an improved version of the application. Conveniently, downloading may be via the wireless telecommunication module. Said downloading may be automatic, or may be user-confirmed. For the avoidance of doubt, the application will typically be stored on a portion of the memory of the mobile device and executed therefrom, as is known in the art. Also, it will be appreciated that the application, or portion thereof may be downloaded via the wireless telecommunication module and/or via an intermediary device. For example the application may be side-loaded to the mobile device from an intermediary computing device.

The application may be sourced from an application store and/or content provider. For example, the content provider may comprise the Apple® Appstore®. The content provider may comprise a cloud computing provider.

It will be appreciated that the use of such a generic mobile device in this context may be counter-intuitive to a person skilled in the art - such generic devices are not designed to withstand events such as catastrophic crashes. Furthermore, such generic devices are usually not necessarily configured to appropriately detect conditions that may need to be recorded. Such devices are usually kept in a user's pocket or bag, and so are not best placed to generate sensor data associated with the behaviour of a vehicle. However, the inventor of the present invention has realised that such a mobile device that is adapted for installation to the vehicle can overcome such drawbacks and fulfil a role similar to a black box. To this end, the mobile telecommunication device may comprise an adapter arranged to hold the device securely to the vehicle.

Advantageously, as well as protecting the device from damage, the adapter improves the suitability and reliability of the sensor data and so the driving information associated with when and/or how the vehicle is being driven. For example, if the sensor set comprises an

accelerometer, the acceleration of the vehicle can be more accurately measured due to the mobile device being firmly attached to the vehicle. Similarly, if the sensor set comprises an image sensor, for example, for capturing video footage of the road ahead, better footage can be obtained as the mobile device can be held in the correct position and orientation relative to the vehicle. In particular, the mobile device may be positioned by the adapter so that its image sensor views the road ahead through a windshield of the vehicle.

As mentioned, the device is arranged to log driving information associated with the vehicle, when that vehicle is being driven. This is realised by registering the start of the driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by the driver. Advantageously, this prevents driving information from being needlessly recorded. As will be appreciated the mobile device has only a finite storage capacity and so registering the start of the driving period is useful for minimising the unnecessary usage of memory. In particular, where the mobile device comprises an image sensor, and the sensor data comprises a sequence of images (e.g. a video) the storage space can be very quickly filled by the memory.

To this end, it is preferred that when the application is executed, it controls the mobile device to register the start of a driving period in response to an initialisation input. The initialisation input may comprise a user input - for example, the user manually executing the application on the mobile device. The initialisation input may also or instead be generated automatically in response to the mobile device being installed to the vehicle and/or the vehicle being driven. The initialisation input may be generated automatically in response to the sensor data having predetermined values. For example, if the sensor data reflects a detected speed above a predetermined threshold – for example, 20 kilometres per hour – then this can be used to trigger the start of the driving period. Similarly, if the sensor data reflects that the mobile device is held securely to the vehicle in a predetermined position (for example, via the adapter) this can also be used to trigger the start of the driving period. To this end, the adapter and/or the mobile device may comprise a registration module configured to register the installation of the mobile device to the vehicle and/or the adapter. The registration module may comprise a proximity sensor to detect the proximity of the mobile device to the vehicle. The registration module may comprise a NFC (near field communication) device. The registration module may be arranged to determine a match between the location of the mobile device and the location of the vehicle. The match may be performed by receiving and comparing a first positioning input associated with the position of the vehicle and a second positioning input associated with the position of the mobile device. The registration module and/or adapter may be a smart holster.

Preferably, the executed application controls the mobile device to manage voice-calls incoming to the mobile device during a driving period. For example, said voice-call management may comprise temporarily disabling and/or diverting voice-calls incoming to the mobile device during a driving period. Advantageously, this safety feature discourages users from making or receiving phone calls whilst driving. It will be appreciated that a driver is less able to control a vehicle effectively whilst also manipulating a mobile device, and in many countries doing so is illegal. However, the provision of a 'hands-free' mode or accessory – as are well known in the art - may obviate the need for a user to manipulate the mobile device. Accordingly, the executed

application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the detection of a hands-free accessory or hands-free mode enabled on the mobile device.

Furthermore, the executed application may be arranged to control the mobile device to enable a hands-free mode of operation on detection of a driving period. For example, the enabled hands-free mode of operation may comprise enabling voice-activated commands. In light of this, it is preferred that the adapter is configured to hold the mobile device in a way that facilitates reception of voice commands from the user. In particular, the mobile device may be held in a position relative to the user to permit clear reception of the users voice. Typically, this position is about the dashboard in a vehicle such as car or van. Furthermore, the adapter is configured with an opening through which an audio sensor of the mobile device is able to receive the user's voice.

Also, even though a drivers control of a vehicle may be affected by manipulating the mobile device, under certain circumstances, this may not be objectionable – for example, when the vehicle is stationary. Accordingly, the executed application may be arranged to control the mobile device to selectively disable and/or divert voice-calls incoming to the mobile device during a driving period, in dependence on the driving information – for example, the speed and location of the vehicle.

Furthermore, it will be appreciated that the driver may not be the only user within the vehicle, and so disabling functions of the mobile device may not be appropriate under all circumstances, as a passenger of the vehicle may want to use the mobile device whilst the driver is driving. Under these circumstances, the executed application is arranged to control the mobile device to register the presence of a non-driver (for example, via image recognition, or entry of an unlock code) and unlock, or retain the original functionality of the mobile device. Furthermore, the executed application may be arranged to run in the background. Accordingly, the mobile device may be used for other purposes, such as making or receiving a telephone call.

It is advantageous to store only selected driving information for the purpose of logging how a vehicle is being driven during the driving period. Whilst it may be possible to sample and process sensor data at a relatively high rate (i.e. many times a second), continually storing driving information derived from that sensor data at such a high rate can use up a lot of storage space on the mobile device, the majority of which is likely to be redundant. Therefore, by being selective about the driving information that is stored, storage utilisation can be made more efficient.

In particular, the executed application may control the mobile device to store a summary of the driving period. The summary may comprise compressed and/or summarised driving information. For example, the sensor data can be processed at a first sampling rate and then down-sampled to a fraction of the first sampling rate for storage as driving information. Put another way, the mobile device can be controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate. Advantageously, this retains a snapshot of when and/or how the vehicle is being driven, but with fewer data points, and so requiring less storage space.

Nonetheless, under certain circumstances, it is more useful to retain information at higher or the highest possible sampling rates. In particular, it is more important to have detailed

information associated with the behaviour of a vehicle during a crash than when the vehicle is being driven normally.

Accordingly, the executed application may be arranged to control the mobile device to detect the occurrence of a predetermined event of significance (such as a crash) and in response store driving information associated with that event to the memory. Preferably, said driving information associated with that event comprises driving information in the lead up to and immediately following the event. In particular, detailed driving information in the lead up to, and immediately following a predetermined event of significance is preferably stored. It will be understood that the driving information associated with the detected event may be transmitted via the wireless telecommunication module in addition to, or instead of storing said data. Said transmitted driving information may be transmitted to a remote data logging system.

To this end the mobile device may comprise an event detector for detecting the occurrence of an event.

Preferably, the event detector is arranged to detect the occurrence of a predetermined event by correlating data, such as sensor data, against an event indication model. The application may comprise the event indication model.

Preferably, the event indication model comprises a set of predetermined data values corresponding to a predetermined event. Accordingly, the event detector is arranged to compare the set of predetermined data values against corresponding sensor data to determine whether the predetermined event has occurred.

For example, the event indication model may indicate that a serious crash has occurred if values returned by an accelerometer sensor exceed predetermined data values of the event indication model, thereby representing a sustained vehicle deceleration beyond a threshold level. Following on from this, it will be appreciated that detection of an event may be dependent on matching a sequence of data values that have occurred over time. Moreover, the event indication model may comprise a sequence of predetermined data values, the sequence being associated by a function of time. Thus, the event detector may be arranged to compare the sequence of predetermined data values against corresponding sensor data that have been generated over a given time period. Put another way, the event detector and event indication model are arranged to indicate the occurrence of an event in dependence on the correlation between a set of predetermined data values occurring over time. Thus, a set of values returned from sensor data over a period of time are compared against a corresponding sequence of predetermined data values of the event indication model. Typically, this is to determine a rate of change of variables associated with a sensor set.

It will be understood that an event indication model may comprise a plurality of sets of predetermined data values, each set corresponding to different sensor data. For example, an event indication model associated with a serious accident event may contain data values corresponding to both the deceleration of the vehicle, and the orientation of the vehicle. Thus, if a vehicle is involved in a serious impact, and overturns, this is represented by the model, and so can be detected by the event detector.

Preferably, the event indication model comprises a pattern of predetermined data values. Preferably, the event detector is arranged to detect the occurrence of an event by carrying out pattern recognition by matching sensor data values to the pattern of predetermined data values of the event indication model. Preferably, there are a plurality of event indication models. Each event indication model may be associated with a separate predetermined event.

Preferably, the executed application may be arranged to control the mobile device to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with when and/or how the vehicle is driven for each of the driving periods. Preferably, sensor data processed during a first set of driving periods define a benchmark against which sensor data is compared during subsequent sets of driving periods. In particular, the executed application may be arranged to control the mobile to modify one or more event indication models in response to the benchmark. Advantageously, such a benchmark ensures that the event indication models may be tailored to the standard behaviour of a particular vehicle. As will be appreciated, different sensor types, mobile devices, mounting positions, vehicles, drivers and road conditions may generate different sets of sensor data for driving behaviour that is considered standard or safe. Accordingly, the benchmark allows the mobile device to account for variable driving conditions.

Preferably, a plurality of benchmarks may be defined. A benchmark may be defined for each driver. A benchmark may be defined for each vehicle to which the mobile device is to be installed. Ideally, a benchmark is defined for each driver-vehicle pair. To this end, the mobile device may be arranged to receive an input to specify a driver, a vehicle or a driver-vehicle pair. Advantageously, this ensures that different drivers and vehicles do not disrupt the accurate event detecting capabilities of the event detector.

Once a predetermined event has been detected by the event detector, it is desirable to take an appropriate action in response to that detected event. Accordingly, the executed application may be arranged to control the mobile device to take at least one predetermined action in response to a detected event. The action taken may comprise transmitting driving information and/or sensor data, via the wireless telecommunication module of the mobile device, to a remote system. Advantageously, this enables a remote system to be notified of the occurrence of a particular event, and the details associated with that event. For example, the remote system may be arranged to deploy emergency services based on a transmitted notification concerning the occurrence of a crash, and also the location of the mobile device (and so the vehicle) are also included in the transmitted information. A further advantage of transmitting driving information and/or sensor data to a remote system is that such data then does not need to be stored on or processed by the mobile device. Thus, this can free the storage space on the mobile device, and also allow the processor of the mobile device to carry out other tasks. A remote system may comprise or be interfaced with an insurance company database.

A further advantage associated with sending driving information to a remote system is that the driving information can be assessed remotely. This assessment can be performed automatically or manually - either way it advantageously removes the processing burden from the mobile device. Alternatively, if transmission bandwidths are small, the processing can be

executed automatically on the processing device. In this case, the use of virtual neural networks can be used to determine whether the driving information represents acceptable or unacceptable driving patterns.

The action taken may comprise storing data captured at a higher (or the highest possible) sampling rate than when an event is not detected. Thus, as described above, this may involve preventing the down-sampling of sensor data. Furthermore, the action taken may comprise protecting said driving information from being overwritten.

The action taken may comprise providing feedback to a user to indicate that an event has been detected. Preferably, the mobile device is configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback. Advantageously, such user feedback can be used to modify event indication models thereby to refine the effectiveness of the event detector. The mobile device may comprise a speaker. Accordingly, such feedback may be provided via an audio prompt. The mobile device may comprise a display screen. Accordingly, such feedback may be provided via a visual prompt. The feedback may comprise notifying a user that a further action has been scheduled, and will be taken within a predetermined period. For example, the feedback may indicate to a user that an event such as a serious crash has been detected, and so the next action to be taken will be to contact emergency services within 10 seconds. Preferably, the feedback includes a prompt to receive a user input. For example, the prompt may be arranged to receive a user input to cancel a subsequently scheduled action. Advantageously, this prevents actions being taken needlessly as a result of an incorrect determination of an event.

The feedback may provide reassurance and/or guidance to a user. For example, a user may be provided with an important checklist of things to do following an accident or incident. For example, the user may be guided to use a camera (image sensor) on the mobile device to take photographs of the vehicles involved in the incident, including the number plates of those vehicles. The user may be guided to use a text input device on the mobile device to note the name, address, insurance details etc of third parties involved in incident.

The action taken may comprise communicating to a remote system associated with an insurance company that an incident has been detected (e.g. via a low bandwidth data connection or via text message). If appropriate – or in response to a request from a communication to the mobile device from the remote system – the action taken may comprise transmitting all or selected portions of the driving information associated with the detected event.

Preferably, the executed application is arranged to control the mobile device to prioritise essential communications, such as calls to the emergency services.

Preferably, the memory comprises a long term memory for persistently storing driving information and/or sensor data. Preferably the memory comprises a buffer. The buffer may comprise a short term memory for transiently storing driving information and/or sensor data. Preferably, the short term memory is arranged to receive driving information and/or sensor data at a higher update rate than the long term memory. Preferably, the long term memory has a larger capacity than the short term memory.

Preferably, the executed application controls the mobile device to write driving information and/or sensor data to the short term memory at a predetermined update rate during the driving period. Ideally, the driving information and/or sensor data is written to the short term memory in a predetermined sequence, ideally a chronological sequence. Preferably, the executed application controls the mobile device to overwrite driving information and/or sensor data previously written to the short term memory. Advantageously, this ensures that recording of sensor data and/or driving information, especially data that is recorded at a relatively high update rate, is not prevented during the driving period due to the short term memory becoming full.

Preferably, the driving information and/or sensor data is overwritten in accordance with the predetermined sequence. Advantageously, this can ensure that the most relevant, up-to-date data is retained in the short term memory.

Preferably, the action taken in response to a detected event comprises transferring data from the short term memory to the long term memory. Advantageously, this can ensure that the most recent information associated with an event is persistently stored in the long term memory, and is not overwritten.

Preferably, the sensor set comprises an accelerometer for detecting the acceleration of the mobile device. Accordingly, the corresponding sensor data may comprise acceleration data generated by the accelerometer. The accelerometer may be a single axis or dual axis accelerometer. However, it is preferable that the accelerometer is a three-axis accelerometer so that movement of the vehicle may be determined in three-dimensional space. Furthermore, as the mobile device may be mounted by a user in one of a number of different orientations relative to the vehicle, a three-axis accelerometer ensures that acceleration along the axis aligned with the general forward movement of the vehicle may be effectively detected. This is particularly important to determine an event such as heavy braking of the vehicle and/or a crash.

Preferably, the sensor set comprises an image sensor such as a camera. Accordingly, the corresponding sensor data may comprise images and/or a sequence of images generated from the image sensor. Said sequence of images may be processed and/or stored in the form of a video. Advantageously, this can improve the space utilisation of the sequence of images. Preferably, the mobile device is arranged to receive a user input to store a user-selected image or sequence of images to the memory. The image sensor data may be processed to determine safety information and feedback said safety information to the driver. For example, the mobile device may be controlled to determine the proximity of the mobile device to other vehicles. Said determination may be via comparing the apparent size of the number plate of other vehicles in an image with a known size of a standard number-plate, and from that the distance to those other vehicles. Thus, the mobile device can make a determination that another vehicle is too close, and issue a warning to the driver to slow down to avoid a collision. Similarly, images of the road ahead may be processed to determine whether a vehicle is drifting out of lane (e.g. because the driver is falling asleep). In response to such a determination, an alert can be issued. Similarly, images of road signs may be processed to assess driver behaviour.

It will be appreciated that the mobile device may comprise a plurality of image sensors. For example, the mobile device may have a forward-facing camera and a rear-facing camera.

Accordingly, it may be possible to view images of the road ahead, external to the vehicle, and also from inside the vehicle. In particular, the mobile device may be arranged to capture images or a sequence of images of the driver. Images of the driver may be processed to make a safety determination. For example, the images may be processed to detect whether the driver is falling asleep. In particular, a blink rate of the driver may be detected by processing the image data. Similarly, a determination may be made whether the driver has their eyes closed. In response to such a determination that a driver is falling asleep, the mobile device may be arranged to issue an alert so as to wake the driver.

Preferably, the sensor set comprises an audio sensor such as a microphone. Accordingly, the corresponding sensor data may comprise audio data.

Advantageously, an image sensor and/or an audio sensor can provide an important record of an event such as a crash.

Preferably, the sensor set comprises a positioning module arranged to determine the position of the mobile device. The positioning module may comprise a GPS module. The positioning module may be arranged to utilise the wireless telecommunication module to self-localise, for example by determining a position relative to one or more mobile telecommunication cell towers. Advantageously, the positioning module can allow the mobile device to determine its position (and so the position of the vehicle) over time. Accordingly, the positioning module can thus determine the speed of the mobile device and vehicle. Thus, the corresponding sensor data may comprise latitude, longitude, elevation, speed and other data obtainable from positioning modules such as GPS modules as is known in the art.

Preferably, the sensor set comprises an orientation sensor for determining the orientation of the mobile device. Said orientation sensor may comprise an electronic compass for determining a bearing, and so the direction in which the mobile device is facing. Accordingly, the corresponding sensor data may comprise orientation and bearing data. Advantageously, such data can be used to augment the data of the positioning module. Furthermore, the executed application may be arranged to use the data from the orientation sensor to determine whether the mobile device has been fitted to vehicle, and whether the mobile device has been fitted in the correct orientation. Advantageously, the data from the orientation sensor may also be used to determine whether a significant event has occurred, such as the vehicle overturning.

Preferably, the sensor set comprises a user-input device arranged to receive an input from a user. The user input device may comprise at least one of buttons and a touch-sensitive display screen. Advantageously, this allows a user to input data to the mobile device.

Preferably, the mobile device comprises a timer. Preferably, the executed application is arranged to control the mobile device to record sensor data and/or driving information against time as determined by the timer. Accordingly, the timer can be used to time-synchronise sensor data and/or driving information.

Preferably, the executed application is arranged to encrypt the driving information stored on the memory. Advantageously, this reduces the possibility of said driving information being modified without authorisation. This is an important consideration when such driving data may be used as evidence, for example, when determining the cause of an accident.

Preferably, the mobile device is arranged to interface with an external device to receive external driving information from said external device. It will be appreciated that the sensor set onboard the mobile device may be supplemented by a sensor set external to the mobile device. For example, the external device may be an engine management system of the vehicle and/or the external device may be arranged to connect to the on-car data network of the vehicle. Thus, the external device may have access to information associated with the behaviour of the vehicle (for example, the speed of the vehicle, how much the brake pedal is being pressed, etc). Such driving information can be processed and/or stored by the mobile device under control of the executed application in a manner similar to driving information derived from sensor data internal to the mobile device.

Preferably, the mobile device is arranged to interface with an external device wirelessly, for example via a Bluetooth® connection. Advantageously, this removes the need for the mobile device to be physically connected to the external device. As will be appreciated, following a driving period, a user may want to leave the vehicle and so take a personal mobile telecommunication device with them, and so a wireless interface with such an external device obviates the inconvenience of physically detaching and then subsequently re-attaching the mobile device.

Preferably, the mobile device is further controlled by the application to determine a unique identifier associated with the mobile device and retrieve from the memory and transmit via the wireless telecommunication module to a remote system said driving information paired with said unique identifier.

Advantageously, by pairing an identifier uniquely associated with the mobile device enables the remote system to unambiguously determine the source of the driving information. Accordingly, said driving information can be matched to a particular driver and/or vehicle. This is particularly useful when assessing a risk profile of said driver.

Preferably, the mobile device is controlled by the executed application to process the driving information to generate a driving score. The driving information may comprise the driving score.

Preferably, the mobile device comprises a display screen. Preferably, the display screen is touch-sensitive. Advantageously, the display screen may thereby be user-interactable. Preferably, the mobile device comprises a graphical user interface (GUI). The graphical user interface comprise user-interactable artefacts such as buttons. Preferably, the user-interactable artefacts may be displayed on the screen and receive a user input for selection or control of those artefacts. The mobile device may be controlled to selectively hide those artefacts in dependence on the state of the mobile device.

Preferably, the mobile device is controlled by the application to provide feedback about the driving information and/or values of the sensor data. Ideally, such feedback is via the display screen. For example, a detected speed may be displayed, a time elapsed may be displayed, a bearing/heading may be displayed, a detected position may be displayed and/or a detected image or sequence of images may be displayed (e.g. via a video feed).

According to a second aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module; a processor for processing sensor data from at least the sensor set to derive said driving information; a memory for storing said derived driving information; a wireless telecommunications module operable to download a controlling application; and a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; wherein, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven and store a selection of the driving information to the memory.

According to a third aspect of the present invention there is provided a mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising: a sensor interface arranged to receive sensor data from a sensor set; a processor for processing the sensor data to derive said driving information; a memory for storing said derived driving information; a wireless telecommunications module operable to download a controlling application; and a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; wherein, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven and store a selection of the driving information to the memory.

Preferably, the sensor interface is arranged to receive sensor data from a sensor set external to the mobile device. Preferably, the sensor interface is arranged to interface with an external device as described in relation to the first aspect of the present invention. Advantageously, this enables a mobile device to utilise a richer or better equipped sensor set than that local to the mobile device.

According to a fourth aspect of the present invention there is provided a mobile device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven. Preferably, the mobile device comprises a sensor interface arranged to receive sensor data from an external sensor set. The mobile device may comprise an internal sensor set. Preferably, the mobile device comprises a processor for processing the sensor data to derive said driving information. Preferably, the mobile device comprises a memory for storing said derived driving information. Preferably, the mobile device is a mobile telecommunication device, comprising a wireless telecommunications module. Preferably, the wireless telecommunications module is operable to download an application. Preferably, the mobile device comprises a registration means for registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver. Preferably, the processor is arranged to process sensor data from the sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven. Preferably, the mobile device is arranged to store a selection of the driving information to the memory. Preferably, the mobile

device is arranged to transmit a selection of the driving information via the wireless telecommunication module. The mobile device may be arranged to transmit a selection of the driving information via the wireless telecommunication module to a remote system such as a remote data-logging system. Advantageously, transmitting (rather than storing) selected driving information prevents storage space local to the mobile device being used up.

According to a fifth aspect of the present invention there is provided a method of logging driving information associated with a vehicle when driven, the method comprising: adapting and installing a mobile device to the vehicle, the mobile device comprising a memory; registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver; processing sensor data from a sensor set during the driving period to derive driving information associated with when and/or how the vehicle is driven; and storing a selection of the driving information to the memory of the mobile device.

According to a sixth aspect of the present invention there is provided a data-logging system for logging driving information comprising: a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver; a communications interface arranged to communicate with a remote mobile device, and receive therefrom: a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and driving information to be logged to that corresponding account.

The remote mobile device may be a mobile device in accordance with one of the first to fourth aspects of the present invention.

Preferably, the driving information comprises a driving score. Preferably, the driving information comprises sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver.

Preferably, the system is arranged to process the driving information logged to the corresponding account to generate a driving score. The driving score may be used to determine a risk profile for at least one of the vehicle and driver. The driving score may be used to define an insurance premium associated with the account.

Preferably, the system is further arranged to communicate to a mobile device an insurance offer generated in response to the driving information received from the mobile device. The data logging system may be further arranged to receive from the mobile device a user-acceptance of the insurance offer.

The mobile device may be arranged to generate an insurance offer in response to a predetermined set of conditions being met. For example, driving information over a plurality of driving period adhering to predetermined models. Such models may comprise safe driving parameters and/or thresholds.

For brevity, it will be understood that features, functions and advantages of different aspects of the present invention may be combined or substituted where context allows. For example, features, functions or advantages of the mobile device described in relation to the first to fourth aspects of the present invention may be provided as method steps in the method of logging driving information according to the fifth aspect of the present invention.

Brief Description of the Drawings

In order that the invention may be more readily understood, reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 is a schematic illustration of a system within which the mobile device of various embodiments of the present invention may be used;

Figure 2 is an illustration of the automobile of Figure 1 configured with a mobile device in accordance various embodiments of the present invention;

Figure 3 is a schematic illustration of the functional components of the mobile device of Figure 2;

Figure 4a is a process flow chart, illustrating method steps executable by the mobile device of Figures 2 and 3;

Figure 4b is a more detailed process flow chart, providing an example of how a driving incident or event may be detected in accordance with embodiments of the present invention; and

Figures 5 to 24 illustrate a graphical user interface of the mobile device according to Figures 1 to 4b.

Detailed Description of the Embodiments

Specific embodiments are now described with reference to the appended figures.

A preferred embodiment of the present invention relates to a mobile telecommunications device for recording events associated with a vehicle, such as a car. In particular, the mobile telecommunications device is loaded with an application – a 'mobile app' – which is arranged to record and document the events surrounding an incident involving the vehicle (a 'driving incident'), such as a vehicle collision. The mobile application may be referred to as the 'Witness' application in the ensuing description.

Figure 1 illustrates a system 1 within which a vehicle, such as an automobile 3 configured with a mobile telecommunications device executing the Witness application, may communicate with one or more remotely located devices or systems. Such devices may relate to one or more servers, such as an insurance server 5, an emergency services server 7, a content provider server 9, and a personal computer 11. Communication between the automobile 3 and the one or more remotely located devices 5, 7, 9, 11 may be effected via a shared communication network 13. The shared communication network may relate to a wide area network (WAN) such as the Internet, and may also comprise telecommunications networks. For example, the mobile telecommunications device of the present embodiments may be arranged to communicate with any one of the remotely located devices 5, 7, 9, 11 via a mobile telecommunications base station 15, which is coupled to the shared mobile telecommunications network 13.

A main purpose of the mobile telecommunications device, when arranged within a vehicle in motion, such as the illustrated automobile 3, is to monitor and process sensor data captured by the mobile device, to derive driving information associated with the moving automobile 3. As mentioned previously, this driving information is subsequently used by the mobile device to determine if a driving incident or event has occurred. The term "driving incident" as used within

the present context may relate to an event such as a collision, a near-miss, dangerous driving, erratic driving or similar. Similarly, the driving information may be used as a means for monitoring a driver's driving performance, and determining a driving characteristic, or user profile for the subject driver. In other words, the sensor data and/or the driving information may be used to determine for example, if the driver is a cautious driver, or a reckless driver. This information may be used, for example by an insurance provider, to conduct a risk assessment and to tailor an insurance premium to the subject driver on the basis of a determined driving characteristic. Further details of this alternative embodiment are described below.

The mobile telecommunication device's functionality is provided by the Witness application, which is installed in the device's local non-volatile storage, and which is executed by the device's native processor. The application may be downloaded to the mobile device via the shared communications network 13 and telephone base station 15, from the content provider server 9.

In use (once the application has been configured for execution on the mobile telecommunications device), when a driving incident has been detected by the mobile telecommunications device, data, comprising one or more of mobile device sensor data, derived driving information, and captured image data may be automatically forwarded to one or more of the remotely located devices 5, 7, 9, 11. For example, the mobile device may be configured such that when a driving incident is detected, such as a collision involving an automobile 3, driving information (including image data captured by the mobile device) derived from the sensor data is automatically forwarded to the insurance server 5, via the base station 15 and shared communications network 13. In this way, data relating to the driving incident (a collision in this example), is automatically forwarded to the automobile user's insurance provider, for use in claim settlement, and/or to determine culpability.

Similarly, once a driving incident has been detected, data may also be automatically forwarded to the emergency services server 7. For example, such data may comprise the position information of the automobile 3, along with an automated S.O.S. message requesting assistance from the emergency services. Forwarded data may also comprise sensor data, and any relevant derived driving information, such as speed of impact, the g-forces the vehicle was subjected to during the collision, or any other information wherefrom the severity of the collision may be determined, and which may be used to assist the emergency services in coordinating the appropriate level of response.

Optionally, an electronic message may be sent to a personal contact preselected by the user. For example, an automated message, such as an e-mail, may be forwarded to the PC 11 of the user nominated personal contact, informing the personal contact that the user of the vehicle 3 has been involved in a driving incident. Similarly, and due to the mobile device's telecommunications functionality, an electronic text message, such as an SMS (Short Message Service) may be forwarded to the telephone of the user selected personal contact, informing the contact of the driving incident. The mobile device may be equally be arranged to communicate with a personal contact via any known electronic messaging service and/or instant messaging service too. For example, via Apple's® iMessage, or RIM's® BlackBerry Messenger (BBM) service.

This functionality of forwarding a message to a nominated contact, may also be of particular benefit for managing large fleets of vehicles. For example, a car hire service. In this way, if any of the vehicles comprised in the fleet are involved in a driving incident, the car hire service may be automatically notified of the identity of the specific vehicle involved in the driving incident. In such embodiments, the nominated personal contact would be preselected by the vehicle fleet manager. The option of providing a second user selected personal contact is also envisaged. In this way, a message may be forwarded to both the car hire service for example, and to the driver's selected personal contact.

In preferred embodiments the mobile telecommunications device relates to a mobile telephone having native processing functionality, and preferably relates to a smartphone. Preferably, the mobile telephone comprises a camera arranged to enable image capture, and preferably arranged to enable a sequence of images to be captured taken in temporal succession. In other words, in preferred embodiments the mobile telephone comprises a camera configured to enable video footage of a sequence of events to be captured.

Alternatively, the mobile telecommunications device may relate to a PDA, a notepad such as an iPad®, or any other mobile device comprising local processing means and means for communicating with a telecommunications network.

Figure 2 provides a more detailed view of the automobile 3 of Figure 1, and illustrates a preferred arrangement of the mobile telecommunications device 17 within the automobile 3. In the illustrated embodiment, the mobile telecommunications device 17 relates to a smartphone configured with an image capture device, such as a camera. Preferably, the device 17 is arranged within the vehicle, such that the camera has a clear line of sight of the road in the principle direction of travel of the automobile 3. For example, the device 17 may be attached to the windshield 19 of the automobile 3 in an adapter 21. The adapter 21 may comprise a flexible telescopic arm, configured with a suction cup at one end for affixing the adapter to the windshield 19, and a dock arranged at the opposite end for securely holding the telecommunications device 17 in place. The telescopic arm enables the position of the device 17 to be varied, such that a clear line of sight in the direction of travel may be obtained.

The details of the adapter 21 are irrelevant for present purposes, with the exception that it must enable a clear line of sight in the principle direction of travel of the vehicle to be obtained, and it must firmly affix the mobile to the vehicle. Affixing the mobile telecommunications device 17 to the automobile 3, ensures that the mobile device 17 is able to accurately capture the automobile's state of motion. By principle direction of travel is intended the main direction of travel of the vehicle when operated in a conventional way, indicated by the arrow **A** in Figure 2. In other words, the forward direction of travel. The skilled reader will appreciate that whilst most vehicles, such as an automobile, may have more than one direction of travel (e.g. travelling backwards when in reverse gear), the majority of vehicles have a primary direction of travel, which is the intended direction of travel for any transit of substantial length and/or distance. Arranging the telecommunications device 17 relative to the direction of principal travel, ensures that the camera (not shown) of the telecommunications device 17 is well placed to capture any image data which may be pertinent to a subsequently detected driving incident, such as a collision.

Figure 3 is a schematic of the modular components of the mobile telecommunications device 17 of Figure 2. Preferably the mobile telecommunications device 17 comprises: an image capture module 21, an accelerometer 23, a GPS receiver 25, an audio capture module 27, a communications module 29, a processor module 31 and a storage module 33. The image capture module 21, accelerometer 23, GPS receiver 25, and audio capture module 27 form a sensor set and are generically referred to as data capture modules in the ensuing description, and are differentiated from the communications module 29, processor module 31 and storage module 33, in that they comprise sensors for sampling physical data.

This sampled physical data, which is also referred to as sensor data, is subsequently processed by the processor module 31 and stored in the storage module 33.

The image capture module 21 may relate to any image capture device, such as an integrated camera commonly found in smartphones or similar mobile devices. As mentioned previously, the image capture module 21 is preferably configured to capture a plurality of images taken in temporal succession, such as provided by a video camera.

The accelerometer 23 is arranged to provide information regarding the motion of the automobile 3 along all three dimensional axes. For example, the accelerometer 23 provides information regarding the pitch, yaw and roll of the automobile 3. Sensor data captured from the accelerometer 23 may be used to determine the g-forces the automobile has been subjected to. This is particularly useful in determining the severity of a collision. In general, the greater the g-forces experienced in a collision, the greater the risk of serious injury to the passengers of the vehicle. This information may assist the emergency services in forming an initial assessment of the severity of a collision. Furthermore, this type of data may also assist the emergency services and/or insurance provider to obtain a better understanding of the driving incident. For example, in the event of a collision, this data may assist the emergency services and/or insurance provider to obtain a better understanding of how the collision occurred. This information may subsequently be used for dispute resolution, and/or for determining culpability.

The GPS receiver 25 is arranged to provide location information, such as positional coordinates, and can also provide velocity information. When combined with the accelerometer sensor data, the GPS receiver data can be used to provide a very accurate model of a driving incident, such as a collision. In particular, the GPS sensor data provides velocity data, such as the velocity of impact. The velocity data enables one to determine if a vehicle was being driven at speeds greater than the legally permitted maximum speeds.

The audio capture module 27 provides means, such as a microphone, for recording audio data, which might be generated by a driving incident. This includes any sounds generated externally to the vehicle, for example the sound of an impact, or the sound of the crumple zone being crushed. Additionally, sounds generated internally to the vehicle are also recorded. Such audio data may also help to recreate a driving incident, and understanding the causes of the incident.

The communication module 29 provides the mobile telecommunications device 17 with functionality for communicating with the remotely located devices 5, 7, 9, 11 of Figure 1. The communication module 29 comprises a wireless telecommunications sub-module 31 enabling

communication over a telecommunications network. An optional wi-fi communication sub-module is also envisaged. Similarly, the presence of wired communication modules are also envisaged, such as a USB port and/or an IEEE 1394 interface (more commonly known as FireWire™) to support wired communication with a remote device, such as a personal computer or similar. Such a connection may be useful for the purposes of side-loading the application to the mobile device.

As mentioned previously, sensor data captured from any one of the aforementioned data capture modules 21, 23, 25, 27 is processed by the processor module 33, to generate driving information. By driving information is intended any data which may be derived from raw sensor data captured by any one of the aforementioned modules 21, 23, 25, 27. For example, g-force data is driving information which is derived from the sensor data sampled by the accelerometer 23. The skilled reader will be familiar with the plurality of types of driving information that may be derived from sensor data sampled by the aforementioned modules, and accordingly a complete list of the different types of driving information that may be derived from sampled sensor data is omitted for brevity.

The processor module 33 is also configured to analyse sampled sensor data and generated driving information to determine if a driving incident has occurred (described in more detail below).

Sampled sensor data is stored in storage 34, which is operatively coupled to the processor module 33, along with any generated driving information. The storage 34 is preferably configured with a FIFO (First In First Out) storage buffer 34a, and a permanent storage component 34b. In preferred embodiments, the data capture modules are configured to sample data at periodic intervals. Preferably, these intervals are sufficiently small, of the order of milliseconds, such that for practical purposes the data capture modules may be considered to sample data continuously. The sampled data, along with any derived driving information is preferably stored in the storage buffer 34a, unless a driving incident has been identified, in which case the associated sensor data and driving information is stored in the permanent storage component 34b to avoid undesirable overwriting.

In preferred embodiments, the FIFO storage buffer 34a is provided with a finite amount of storage space. Nonetheless, said storage space may be predefined by the user as will be described below. In any case, once this storage space has been exhausted, the oldest recorded data is overwritten by newly sampled data, and this cycle of overwriting older data with newly sampled data is continuously carried out during operation of the telecommunications device 17, unless a driving incident has been detected, in which case, and as mentioned previously, all data related to the driving incident is stored in a long term protected storage 34b to safeguard it from being overwritten by newer data.

In preferred embodiments, the mobile telecommunications device 17 may be configured with a data recording strategy by the user. This might define the frequency with which sensor data is sampled. In other words, how many measurements are made per unit of time. Furthermore, the recording strategy also defines how data is recorded. In preferred embodiments, sampled sensor data is stored in data files in the buffer 34a. Each data file represents a plurality of sequentially sampled sensor data, captured over a defined period of time, which will be referred to as a ‘data

file period'. This is best illustrated by considering captured image data, such as video footage. A video period may be defined, which period defines the unit of physical time covered by captured video footage comprised in a single video data file – this is the data file period for image data. The video data file is subsequently stored in the buffer 34a. For example, a five minute video period setting, instructs the processor 33 to store all sequentially captured image data captured by the image capture module 21 over a period of five minutes, in a separate video data file. It is to be understood that whilst the image capture module 21 is continuously sampling image data (in other words, it is continuously capturing image data), this plurality of captured image data is grouped together for storage in video data files, each data file representing a five minute data file period.

Sampled sensor data and derived driving information is also continuously analysed by the processor module 33 for the purposes of detecting a driving incident. As soon as a driving incident is identified, the associated sensor data and derived driving information is stored in a data file in accordance with the data recording strategy. Returning to the example described in the preceding paragraph, this entails combining the video footage captured within a temporal window of five minutes leading up to the detected driving incident, in a single video file, and storing this data file in protected storage 34b. Whilst each different type of sensor data may be recorded in separate data files, in preferred embodiments all the different types of sensor data sampled by the mobile telecommunications device 17 are stored together in a single data file in accordance with the user selected data recording strategy. This means that the five minute data file referred to above, preferably also comprises GPS data, accelerometer data, and audio data sampled over the five minute time period.

Data files are stored in the buffer 34a, unless they are associated with a driving incident, in which case they are then stored in protected storage 34b, which cannot be overwritten. Once the storage space comprised in the buffer 34a has been exhausted, the oldest data file is overwritten by a newer data file.

Data compression methods may also be used in conjunction with the present invention to improve the use of storage. For example, data comprised in data files which have not been associated with a driving incident may be compressed using compression techniques, which techniques will be known to the skilled reader. Similarly, within a data file associated with a driving incident, sensor data captured at time coordinates which are distant from the determined driving incident may be compressed. In this way, the resolution of sensor data which is directly pertinent to a driving incident is maintained, whilst sensor data which may be less relevant to the driving incident is maintained at a lower resolution.

Since the sensors of the mobile telecommunications device 17 are continuously recording sensor data, even when a driving incident is detected, the device 17 may be configured to comprise sensor data and/or driving information recorded/derived shortly after the driving incident in the same data file, since this data may also be relevant for understanding a driving incident. Furthermore, this also enables the mobile telecommunications device to record multiple driving incidents. For example, a multiple collision.

The processor module 33 may be configured with encryption means, enabling stored data files to be encrypted to prevent data tampering. Envisaged encryption means may comprise both

software solutions and hardware solutions. For example the processor module may comprise a cryptoprocessor, or the processor may be configured with code to carry out a cryptographic process.

Figure 4a is a flow chart outlining the method carried out by the mobile telecommunications device 17, to determine if a driving incident has occurred, in accordance with a preferred embodiment. An application is downloaded from the content provider server 9 of Figure 1, onto the mobile telecommunications device 17, at step 36, as previously described. This may be done over a telecommunications network. The application provides the mobile telecommunications device 17 with the previously described functionality, when executed on the device. The mobile telecommunications device is configured within the vehicle, at step 38. This may comprise affixing the mobile telecommunications device 17 to the vehicle via an adapter, as described previously.

The recording strategy is specified at step 40. As mentioned previously, this comprises setting the period of time that each recorded data file represents. Furthermore, it may also comprise defining the size of the buffer 34a and/or the number of data files that are to be stored within the buffer. Preferably, the recording strategy is specified only once, upon first use of the mobile telecommunications device 17. Where the recording strategy has already been defined, method step 40 is skipped, and the method continues with step 42.

The start of a driving period is registered, at step 42. The start of the driving period determines when the recording of sampled sensor data begins. The start of a driving period may be manually entered by the user via the application's graphical user interface (GUI). Alternatively, the start of the driving period may be automated. For example, the mobile device 17 may be configured to initiate the driving period once sensor data above a minimum threshold value is recorded, indicative of the vehicle being in motion. For example, once a velocity greater than 20 kilometres per hour is detected.

Alternatively, the start of the driving period may be initiated once the application determines that the mobile telecommunications device 17 has been affixed to the vehicle. For example, the adapter 21 may comprise a registration module (not shown) arranged to register the installation and fixation of the mobile device to the vehicle and/or adapter. The registration module may comprise an NFC device. When the mobile device is brought into close proximity with the registration module, a driving period is initiated.

Once the driving period has been initiated, sensor data is sampled and recorded in storage 34, at step 44. Additionally, the sampled sensor data is used to generate driving information by the processor module 33. The sampled sensor data and the driving information is continuously analysed by the processor module 33, at step 46.

The processor module 33 determines if a driving incident has been detected, at step 48. This is determined on the basis of the analysis carried out at step 46. If a driving incident has been detected, all the sensor data and driving information associated with the data file period, is stored in a data file in protected storage 34b, at step 50.

There are several ways in which a driving incident may be detected. Preferably, this is an automated process, wherein the processor module 33 determines a driving incident has occurred

on the basis of an observed marked variation in sensor data and/or driving information. The term 'marked variation' is to be understood to relate to a significant change in sensor data and/or driving information occurring over a very short time period. In other words, a detected impulse in recorded sensor data and/or driving information, indicative of a significant change in the state of motion of the vehicle occurring over a short time period. For example, a sudden increase in the g-forces the vehicle is subjected to, may be indicative of a collision and if observed, result in a driving incident being determined to have occurred by the processor module 33.

Predefined threshold values may also be used to automate the detection of a driving incident. For example, each data type and/or derived driving information (e.g. acceleration, velocity, g-force, pitch, roll, yaw etc.) may be associated with a threshold value. When any one of these threshold values is exceeded, the processor module 33 may be configured to determine that a driving incident has occurred. Similarly, the automated detection of a driving incident may require that a threshold condition associated with a combination of predefined threshold values, each threshold value being associated with a different data type and/or type of driving information, must be exceeded, in order for the processor module 33 to automatically determine that a driving incident has occurred. For example, in the event of a collision, it is reasonable to expect to observe a marked variation in g-force, accompanied by a marked variation in velocity. Accordingly, the threshold condition may require that in order for a collision to be automatically detected, both a marked variation in g-force and a marked variation in speed, in excess of predefined threshold values must be observed.

Similarly, the occurrence of a driving incident may also be recorded manually by the user via the application GUI. This may be beneficial for the purposes of documenting data associated with a low velocity collision - colloquially referred to as a 'fender-bender' - which may not result in any marked variations in sampled sensor data, and therefore may not be automatically detected.

Once a driving incident, such as a collision, has been detected, and the data file comprising the associated sensor data and driving information has been securely stored in protected storage 34b, the data file is transmitted to the insurance server 5 of Figure 1, at step 52. The data file informs the insurance provider that a driving incident has occurred and provides the insurance provider with the sensor data and derived driving information. This data assists the insurance provider in better understanding the collision, in addition to assisting with determining culpability, where more than one vehicle are involved.

Similarly, once a driving incident has been detected, an S.O.S. message may be automatically forwarded from the mobile telecommunications device 17 to the emergency services server 7, at step 54. The S.O.S. message may also comprise sensor data and derived driving information, which may assist the emergency services in coordinating their response.

As mentioned previously, the mobile telecommunications device 17 will continue to sample and record sensor data even once a driving incident has been detected, unless the mobile telecommunications device 17 detects that the driving period has terminated, at step 56. If the driving period has terminated, the present method is terminated and the device stops recording sensor data. The end of a driving period may be automatically detected by the processor module 33, if certain conditions are met. For example, if the measured velocity of the vehicle remains zero

for a predetermined period of time, the processor module 33 may infer that the vehicle is stationary and no longer being driven, and accordingly ceases recording sensor data, and the method is terminated. If instead the processor determines that the driving period has not yet terminated, a new data file period is initiated, at step 58, and steps 44 through 62 are repeated.

Where a driving incident is not detected at step 48, the processor module 33 will determine if the data file period has expired, at step 60. If the data file period has expired, then the sensor data and the derived driving information generated during the data file period is combined and stored in a single data file, for storage in the buffer 34b, at step 62. The processor 3 then determines, at step 56, if the driving period has terminated. If the driving period has not terminated, a new data file period is initiated, at step 58. The mobile telecommunications device 17 continues to sample sensor data, to derive driving information, and steps 44 through 62 are repeated, until the driving period is determined to have terminated.

Figure 4b provides more detail regarding how a driving incident may be automatically detected (i.e. steps 46 and 48 of Figure 4a) in a preferred embodiment, where the mobile telecommunications device 17 is configured to sample audio data, accelerometer data, and GPS data only. Each one of these types of data is analysed in turn, at steps 64, 66 and 68. The analysis may comprise comparing measured sensor data and/or derived driving information with a data model. The model may comprise defined threshold values for different data types. Sampled sensor data and/or driving information may be compared with the data model to determine if a driving incident has occurred.

For example, the analysis of sampled audio data, at step 64, may comprise comparing the recorded audio data with predetermined audio data models representing specific sounds. Such sounds may relate to the sound of tyre squeals, the sound of deforming metal, the sound of breaking glass, passenger screaming and/or shouting, the sound of airbag deployment, and any other sound which may be associated with a driving incident. Effectively, this may be considered audio fingerprinting, which serves to identify specific sounds associated with a driving incident by carrying out a signal profile analyses of the audio signal captured by the audio capture module 27. To achieve this, the storage device 34 may comprise a database of prestored audio sound files. The audio sound files represent sounds associated with a driving incident. The captured audio signal is compared with the sound files comprised in the database, to identify matches between the captured audio signal and the database of sound files. This facilitates the audio fingerprinting of specific sounds, indicative of a driving incident, present within the captured audio data signal captured by the audio capture module 27.

Similarly, the analysis of sampled accelerometer data, at step 66, may comprise comparing the sampled data with predetermined accelerometer data models. The data models represent specific states of motion of the vehicle. For example, this might comprise defining threshold values for yaw, pitch and roll, which if exceeded, indicate a state of motion of the vehicle indicative of a driving incident. For example, a measured yaw value above a predetermined threshold value may be indicative of the vehicle having lost traction and is fishtailing and/or skidding. Similarly, a roll and/or pitch value above a predetermined threshold value may be indicative of the vehicle having overturned.

Accelerometer sensor data is also used for deriving driving information such as g-forces. Analysis of g-force data is also used to determine if a driving incident has occurred. For example, approximate g-force values for detecting certain driving incidents are as follows:

- Harsh braking – a deceleration of greater than 2.5 m/s^2 or forward G-force of greater than 0.7G for more than 400msec.
- Harsh acceleration – from stationary, an acceleration greater than 2.5 m/s^2 or backward G-force of greater than 0.7G for more than 800msec.
- Harsh swerving - lateral G-forces greater than 0.7G for more than 400msec.

The data models are preferably preconfigured and are comprised within the application executed on the mobile telecommunications device. Different data models are used depending on the type of vehicle the telecommunications device is being used with. Different vehicle types will experience different states of motion during regular operation, which must be considered in determining if a driving incident has occurred. For example, a motorcycle will display more roll and/or pitch than an automobile during regular operation. Accordingly, different data models and/or threshold values must be used to automate the identification of a driving incident for different vehicle types. The specific data models used may be selected during an initial configuration of the mobile telecommunications device, by indicating the type of vehicle the device is being used with.

On the basis of the audio data analysis and the accelerometer data analysis, the mobile telecommunications device determines, at step 72, if a driving incident has occurred. If it is determined that a driving incident has occurred, then the telecommunications device proceeds with step 50 of Figure 4a. If instead a driving incident is not detected, the telecommunications device proceeds with step 60 of Figure 4a.

The GPS data analysis, at step 68, comprises analysing positional data and velocity data for any anomalous readings. For example, a sudden deceleration followed by a zero-velocity reading lasting a predetermined period of time, may be indicative of a collision. If such a zero-velocity reading is observed at step 70, in conjunction with anomalous audio and/or accelerometer sensor at step 72, then a driving incident is determined and the mobile telecommunications device proceeds with step 50 of Figure 4a. This is a further example of a threshold condition, discussed previously.

The previously described mobile telecommunications device and method may also be used to monitor and generate a driver profile. The driver profile may be indicative of the type of driver a user is. For example, this may comprise determining if a user is a calm and patient driver, or an aggressive driver. Also, this may comprise determining whether a user regularly flouts speed limits, and/or ignores safety distances. This type of information may be used by an insurance provider to conduct a personalised risk assessment for individual users. Insurance premium rates may then be tailored to the specific user on the basis of the personalised risk assessment.

For example, analysis of captured image data, such as video footage, may be used to determine if a user regularly flouts safety distances. In preferred embodiments, the mobile telecommunications device is arranged within the subject vehicle to have a clear line of sight of

the road in the direction of principle motion. Accordingly, the number plate of any vehicle preceding the subject vehicle will be captured by the image capture module. Since the physical dimensions of number plates are standardised and known in each country, they may be used as a metric to scale the captured image. When combined with the known optical characteristics of the image capture module, this enables the distance of the image capture module from the image object (i.e. the preceding vehicle) to be determined at the time of image capture. This information may then be used to see if a user adheres to recommended safety distances. A user that is observed to regularly flout recommended safety distances, may be considered to represent a greater risk, and accordingly may be required to pay a greater insurance premium than a user who regularly respects recommended safety distances.

Image analysis can also be used to determine driving conditions and the driving environments. For example, image processing can detect road signs, such as stop signs or traffic lights. Furthermore, driving conditions, as affected by the weather can be determined. For example, if the windscreen wipers are detected to be in motion, it can be inferred to be raining. Once the driving conditions are so determined, an assessment of the driving performance of a user can be made by determining whether the user reacts or behaves appropriately to the driving conditions. For example, if the driver is seen to be jumping red lights, or driving dangerously in rain or snow, then a higher risk profile may be assigned to that driver.

Similarly, accelerometer and g-force data may be used to determine if a user has an erratic driving style. For example, a user that generates sharp variations in g-force data and accelerometer data during regular operation of a vehicle, may be considered to drive erratically, and therefore at greater risk of being involved in an accident, and insurance premium rates for the user may be tailored accordingly.

The mobile telecommunications device may also be configured to interface and communicate directly with a vehicles native telemetry systems. For example, the majority of modern cars have inbuilt electronic control systems or engine management systems, arranged to collect data regarding vehicle system performance. This data may be communicated to the mobile telecommunications device either via a wired physical connection, such as USB (Universal Serial Bus), or via a wireless communication protocol such as Bluetooth®. This data may subsequently be used by the mobile telecommunications device to complement sensor data captured directly by the telecommunications device. In this way a more accurate model of a driving incident, and/or of a user profile may be generated. For example, native vehicle telemetric systems may comprise electronic tyre pressure sensors, and are able to detect if a tyre is under and/or over-inflated. This information may be communicated to the mobile telecommunications device and may help to explain the causes for a driving incident, such as a sudden loss of traction resulting from a burst tyre.

Further features of the Witness application, are set out below.

Benchmarking

It will be appreciated that different sensor types, phones, mounting positions, vehicles, drivers and road conditions may generate differing outputs for driving behaviour that is 'safe'. To account for this, the Witness application may have the following functionality:

- During a 'training mode' (e.g. first week of enabling the Witness application) the input from the sensors are used to build up a 'benchmark' for a particular driver's typical driving conditions.
    - Assuming an accident does not occur during this training mode, the benchmark data can be subsequently used to assess the occurrence of driving incident.
- There is preferably an option to notify the Witness application of a change in parameters (e.g. different driver, driving off-road etc). Thus a number of 'profiles' may be set up. Each profile may require an independent training mode period.
- If the Witness application incorrectly detects that a driving incident has occurred, it can receive feedback from the user to modify its sensitivities. E.g. a more aggressive driver is actually driving.

Crash/Collision Management

- On detection of a crash (or other driving incident) the Witness application is arranged to take one or more of the following actions:
    - Announce that it has detected an accident (audio/screen prompt)
    - Call the emergency services (with option to cancel) – e.g: Audio/screen prompt: 'Witness has detected that you have been involved in a (serious) accident and will call the emergency services. If this is not the case, please cancel within 10 seconds.'
    - Provide reassurance
    - Provide the user with a checklist of things to do:
        - Take photographs of vehicles involved in the incident (inc number plates)
        - Take down name, address, insurance details etc of 3rd parties involved in incident
    - Communicate to the insurance company that an incident has been detected (e.g. low bandwidth data or text message)
    - Protect the high quality recorded data so it is not overwritten
    - If appropriate – or in response to a request from a communication to the phone from the insurance company – transmit all or selected portions of the recorded data associated with the incident.
        - N.B. Use of the communication channels is controlled by the Witness application to prioritise essential communications such as calls to the emergency services.

- Note that data transmission from the mobile telephone to the insurance company may be automatic (for example, triggered by a detected incident) or manual (for example, in response to a request from the insurance company). In the latter case, the Witness application may include functionality to allow the insurance company to browse through the data files available on the mobile telephone so as to select one or more for transmission to the insurance company.

Data processing for generating a user profile

Further features of the user profile generation embodiment are summarised:

- If the Witness application incorrectly detects an event or incident of significance, and receives feedback that the vehicle was not involved in an accident (but was in a near miss) – this could alter the risk profile of the driver. For example – if this happens frequently, but no accident occurs over a given period, this could be an indicator that the driver is good at reacting to potential hazards.
- Erratic driving (e.g. jerky steering or braking detected by G-force sensor).
- Driving faster than the speed limit allocated to a given road (detected by GPS).

Further details regarding the features and functionality of the Witness application, in particular the graphical user interface of the Witness application, are now described.

Referring to Figure 5, a first page 80 of the Witness application user manual is shown in which an image of the Main Menu (the top-level menu) 82 is displayed. The Main Menu is displayed when a user first runs the application on a smart-phone, such as the iPhone® 4. The main menu includes the following user-selectable buttons:

- **Recording Screen** 84
- **File Management** 86
- **Settings** 88
- **Accident Management** 90
- **Information** 92 (displays up a manual, as shown in Figures 5 to 14).

Selecting the Recording Screen button 84 opens the Recording Screen 94 – the second image shown in Figure 5. The Recording Screen 94 contains a video feed 96 from the camera of the smart-phone, which occupies the majority of the visible screen area. Overlaid on to the video feed is the detected speed of the vehicle 98 (e.g. 0 mph), heading 100 (e.g. south by south-west) and the elapsed recorded time 102 (e.g. 00:00). Displayed in a left column of the Recording Screen are additional user selectable buttons:

- **Keep current video** 104 (pressing this button will automatically copy the current video - and the previous video segment - to the protected storage 34b, and prevents that

information from being overwritten. The user is advised to press this button in the event of a driving incident that needs to be recorded).

- **Take photo** 106 (captures a still photograph).
- **Exit Recorder** 108 (returns to main screen).
- **Start / Stop Recording** 110 (starts recording video footage - and other data).

Referring to Figure 6, a second page 112 of the Witness application user manual is shown, in which an image of the Recording Screen 114 is shown and described operating in a map-displaying mode rather than a video-feed mode.

During recording, (i.e. when the 'Start / Stop Recording' button 110 is pressed) the Exit Recorder button in the Recording Screen is substituted with a Map Display button 116. Pressing it will toggle between the modes showing the video feed and a map of the current location.

Referring to Figure 7, a third page 118 of the Witness application user manual is shown, in which the File Management Screen 120 is shown and described. The File Management Screen 120 can be accessed by pressing the File Management Button 86 in the Main Menu.

The File Management Screen 120 displays video and associated data (e.g. telemetry data) that has been previously recorded. The stored data is contained in either a protected area of storage or in a "Recording Stack". Data files in the protected area are saved and so not overwritten as part of a Recording Strategy. In contrast, data files in the Recording Stack may be overwritten as part of the Recording Strategy.

As illustrated in Figure 7, the bottom section of the list represents the "Kept" data files 122, whereas the top section of the list represents the "Recording Stack" 124. "Kept" data files 122 can be edited and deleted from the File Management Screen 120, whereas "Recording Stack" data files cannot. Editing "Kept" data files can involve renaming them.

The recorded data files are listed on screen along with the time and date of the recording and the electronic size of the data file. Accordingly, the user is provided with feedback about how big the data files are, and so if the smart-phone is low in storage, the user can elect to delete certain "Kept" data files. "Recording Stack" data files will be automatically overridden by the Recording Strategy.

The controls on the toolbar at the bottom of the recordings screen allow a user to change the selection mode of the video stack and includes:

- **Video** 126 (when highlighted, if a data file is selected, a video recording playback screen will be displayed).
- **Map** 128 (when highlighted, if a data file is selected, then a map will be displayed showing the area over which the recording was made).
- **Export** 130 (when highlighted, a selected data file will be passed to an Export Screen where export options will be provided).
- **Keep** 132 (when highlighted, if a "Recording Stack" data file is selected, then a user will be prompted to name it, and then it will be stored as a "Kept" data file).

The icons in the File Management Screen change in dependence on the selected mode. For example, Figure 20 shows the icons 134 displayed when the Video selection mode is highlighted; Figure 21 shows the icons 136 displayed when the Map selection mode is highlighted; Figure 22 shows the icons 138 displayed when the Export selection mode is highlighted and Figure 23 shows the icons 140 displayed when the Keep selection mode is highlighted. Advantageously, this provides improved feedback to a user about what selection mode is highlighted and so what action is likely from the selection of a data file.

Referring to Figure 8, a fourth page 142 of the Witness application user manual is shown, in which an image of a Recording Playback screen 144 is shown and described. The Recording Playback screen is invoked by highlighting the Video Mode 126 in the File Management Screen 120 and selecting an appropriate data file.

In the Recording Playback screen 144 it is possible to play back a pre-recorded video feed associated with a chosen data file. As well as playing back the recorded video feed, the Recording Playback screen also displays other associated data such as telemetry data 146. For example, date, time, speed, forward/backward G-forces, latitude, longitude and heading information is overlaid onto the video feed. As the video is played back, these values will typically change depending on the behaviour of the vehicle, as recorded by the mobile device.

Forward and backward G-forces are those that correspond to the forward and backward movement of the vehicle and are the primary metric for determining an event such as a crash. However, other G-forces (e.g. up/down and side-to-side) may also be measured by the device – even if they are not necessarily displayed on the mobile screen.

As recited in Figure 8, the Recording Playback screen provides further user controls in the form of:

- **Playback Position Scrub Bar** 148 (horizontal bar at bottom of screen)
- **Playback Speed Bar** 150 (vertical bar at left side of screen)
- **Pause** 152 (pauses playback)
- **Eject** 154 (return to previous screen)
- **Loop** 156 (plays the data file continuously)

The Playback Position Scrub Bar 148 allows a user to jump to different positions within the recording without necessarily needing to watch all of the recorded footage. Advantageously, this allows a user to more quickly locate a desired item of footage within a given data file. Also, the Playback Speed Bar 150 can be used to speed up or slow down the playback of the data file. This allows a desired item of footage to be found more quickly through sped-up playback, and also allows an item of footage to be more carefully analysed through slowed-down playback. Furthermore, it is possible to zoom in and out of a region of the video file using a ‘pinch and zoom’ movement as is standard with most multi-touch touch-screen devices.

Referring to Figure 9, a fifth page 158 of the Witness application user manual is shown, in which a different type of Recording Playback screen 160 is shown and described. Specifically, the image represents playback of a pre-recorded data file as can be invoked by highlighting the Map Mode 128 in the File Management Screen 120 and selecting an appropriate data file.

In contrast with the Video Mode playback, this Map Mode playback shows a map of the area 162 where the recording took place. A blue breadcrumb trail 164 is overlaid on to the map showing the extent of movement of the vehicle during the recorded period. A scrub slider 166 is shown, which is user-operable to adjust the time within the recorded period. As the slider is adjusted, a pin 168 moves along the blue breadcrumb 164 to show the position of the vehicle at the time as specified by the slider 166. Tapping the pin 168 displays associated telemetry data 170 at that position and time.

Referring to Figure 10, a sixth page 172 of the Witness application user manual is shown, in which an image of a Video Export Screen 174 is described. The Video Export Screen 174 may be invoked by highlighting the Export button 130 in the File Management Screen 120 and selecting an appropriate data file.

The Video Export Screen 174 allows the quality of the video associated with the selected data file to be adjusted, before that video is exported. Advantageously, this can allow the user to control the size of the data to be exported. Telemetry data (i.e. sensor data) is also exported, embedded within the video file. Video data can be exported with or without sound, depending on the permissions of the user. Export typically involves copying data files from the mobile device to a local computer (e.g. via a data cable) or a remote server (e.g. via a wireless connection).

Referring to Figure 11, a seventh page 176 of the Witness application user manual is shown, in which an image of the Settings Screen 178 is displayed and described. The Settings Screen 178 allows the operation of the Recording Strategy to be controlled. Specifically, the Settings Screen allows a user to select the number of video segments that the application should store, and the size of those segments (i.e. a data file period). Accordingly, the user is able to set a limit to the storage usage of the Recording Stack (i.e. the size of the buffer 34a) part of the program. The user can also control the storage usage of the Recording Stack through the use of the video quality buttons.

Note that the Witness application may be arranged to calculate the remaining memory available on the smart-phone and suggest the appropriate settings automatically.

The Recording Strategy involves maintaining a user-controlled number of video segments. When a new video recording is initialised – instantiating a new segment – this is written over the oldest video segment. Thus only the most recently recorded videos are maintained in the Recording Stack.

Another setting that can be controlled in the Settings Screen 178 is the G-force threshold at which the Witness application will assume that a crash has taken place. It is expected that different vehicles and driving styles will need different G-force thresholds to be set to ensure a reasonable sensitivity to crash forces whilst also prevent crash detection false positives. It should be noted that although the manual recites "*Raise the sensitivity if you find that crash detection is triggered during normal driving…*" it is the sensitivity *threshold* that is to be raised, and not the sensitivity itself. A slider 180 allows the sensitivity threshold to be set via the touch-sensitive screen.

The Settings Screen 178 also has a button 182 to allow a user to define more settings via a More Settings Screen.

Referring to Figure 12, an eighth page 184 of the Witness application user manual is shown, in which an image of the More Settings Screen 186 is displayed and described. Here, it is possible for the user to select speed units 188 and also select whether the map should be displayed during recording 190, and at which speed it should be displayed in favour of the video feed. This is a safety feature of the Witness application that hides the video feed during recording when the vehicle is detected as travelling above a predetermined speed. The video feed is replaced by a map of the location of the vehicle – as is typical with in-vehicle GPS devices. Note that although the on-screen video feed is replaced with a map, video recording continues in the background.

In alternatives, the application may be arranged to detect the vehicle speed, and at a particular speed, switch off the screen entirely. It should be understood that the device will continue to record video, telemetry and other information even when the screen is switched off. Entirely switching off the screen of the device is advantageous as it significantly reduces the drain on the battery of the mobile device.

Note that the Witness application is also arranged to interface with the phone to detect low-light conditions and in response change the brightness of the screen to prevent the user/driver being dazzled. This can also save battery life.

The More Settings Screen 186 also includes a Personal Details button 192 which, when pressed invokes a Personal Details Screen.

Referring to Figure 13, a ninth page 194 of the Witness application user manual is shown, in which an image of the Personal Details Screen 196 is displayed and described.

Here, the name 198, vehicle registration number 200, mobile number 202 and email address 204 to be used in an emergency, can be specified by the user. In the event of a detected incident, these details, along with information regarding the detected incident (e.g. time of incident, location and optionally telemetry data) will be emailed to the specified email address automatically. This can ensure that the chosen recipient of that email will be informed immediately about the occurrence and nature of the detected incident.

This Personal Details Screen 196 also allows the user to set whether it is possible for the video stack to be deleted 206. A security PIN protects the changing of this option so that if a first user having the PIN (for example, a parent) can review the driving style and behaviour of a second user not having the PIN (for example, their son or daughter) by reviewing the Recording Stack – as the Recording Stack cannot be deleted by that second user. As shown in Figure 24, the PIN can be set for the first time by entering it twice into the appropriate PIN fields 208.

Referring to Figure 14, a tenth page 210 of the Witness application user manual is shown, in which images of an Accident Management Screen 212 and Witness Details Screen 214 are displayed and described.

The Accident Management Screen 212 can be invoked by the user selecting the accident management button 90 on the Main Menu , or can be automatically switched to after the Witness application has detected that there has been an incident (e.g. via G-forces exceeding a threshold level). Similarly, data can automatically be permanently stored as “Kept” and/or sent if high G-forces are detected.

As can be seen on the Accident Management Screen 212, there are the following user selectable buttons:

- **Accident Advice / What to do** 214

This option provides guidance as to what to do during an accident – see Figures 15 and 16 for the displayed Accident Advice Screens.

- **Witnesses** 216

This option invokes functionality to allow the collection of information from or about witnesses to an incident. An image of the Witnesses Detail information summary screen 214 is shown in Figure 14. Figure 17 shows the Witness Detail information collection screen 218. Voice notes can also be taken via the microphone of the smart-phone.

- **Photos** 220

This option enables the camera to allow a user to capture images associated with an incident.

- **Drivers** 222

This option invokes functionality to allow collection about the other drivers involved in an incident, such as their vehicle and insurance details. The Drivers Detail information collection screen 224 is shown in Figure 18.

- **Your Details** 226

This option provides a readily available store of the details of the user - as to be provided to other drivers – and can contain name, address and insurance details. The 'Your Details' screen 228 is shown in Figure 19.

Details recorded via the Accident Management Screen 212 are electronically authenticated and feature a time-stamp. In alternatives, this data may be encrypted to ensure the integrity of the stored data.

Furthermore, in alternatives, the exchange of the details of the drivers and witnesses can be conducted, at least in part, via Bluetooth® (for example, between mobile devices) – and/or via email. Relevant information associated with the driver is pre-stored on the Witness application in a format that can be sent readily, via a communication channel such as Bluetooth® or email.

Finally, note that in each Screen or Menu, there is a button 230 provided to go back to the previous menu. Also, when certain actions are performed or selected by a user, the Witness application is arranged to provide an audible feedback signal (for example, a beep). For example, this could be in response to starting a recording, keeping a video segment and/or a stopped recording.

Alternatives and extensions

The Witness application can be extended to interface with remote users to allow them to control the operation of the application as well as view information logged by the application.

In particular, the present application can be extended to a scenario where the Witness application is under the control of an insurance company. Such an insurance company may provide insurance to the user, and so may have an interest in the behaviour of that user, and moreover, a vehicle under the control of that user, as described previously.

In such a scenario, the insurance company will maintain a device monitoring system that can interface with a mobile device running the Witness application. In fact, the device monitoring system may interface with a large number of mobile devices, each running an individual copy of the Witness application, logging respective user/vehicle behaviours. This could the insurance provider server 5 of Figure 1.

With such a monitoring system, it is unpractical to actively monitor each and every mobile device and receiving and handling the sheer quantity of data from each and every device would also be very difficult.

Consequently, the device monitoring system and the mobile devices are advantageously arranged to automatically and intelligently interface with one another in a way that minimises the computational and bandwidth burden on the device monitoring system.

In particular, each mobile device running the Witness application is arranged to make a determination as to whether there is a need to transfer data to the device monitoring system. For example, the Witness application may be arranged to automatically send data to the device monitoring system that only has high G-force activity associated with it, as this may be indicative of a crash or another driving incident. Alternatively, the Witness application may be arranged to send detailed or high-bandwidth information if a user indicates that an accident has occurred.

In either case, the video segments and associated sensor and/or derived driving information data associated with the relevant event will be sent. However, no other data (for example, from another date) will be sent.

Alternatively, less computationally or bandwidth intensive information may be sent on a periodic basis – for example, every day, week or month. Such general information may be sent to establish a profile of a particular user. For example, many high G-force related activities may indicate that the driver is driving aggressively. A determination about the profile can be made automatically by requesting and automatically analysing further data. For example, the location and speed information can be used to determine whether a vehicle is found to frequently break the speed limit. If this is the case, then the profile of the user can be set accordingly.

Such general and periodically obtained information can also be used to remotely adjust the settings of the application. For example, many high G-force related activities may instead indicate that the set up of the car is such that the mobile device is subjected to high G forces (rather than the driver driving aggressively). If the driving is determined to be safe, but the mobile device is setting off many false positives, then the device monitoring system can automatically adjust the settings of the application. For example, the G-force sensitivity threshold may be increased remotely.

Thus, the initial data that is automatically transmitted from the mobile device to the vehicle monitoring system is limited in bandwidth so as not to overload the vehicle monitoring system as a whole. However, after processing or analysis is performed on the initial data, further information may be requested. For example, further information may be requested automatically by the system or manually by a controller acting for the insurance company. Such further information may include high resolution video logs and sensor data and derived driving information such as G-force measurements.

It will be understood that the mobile device may also automatically keep certain data at random. Furthermore, the reason for keeping certain data may also be logged (e.g. logged as a result of a manual request by the user, or in response to a high G-force event).

The mobile device and device monitoring system may also be arranged to highlight detected transgressions. For example, driving during curfew hours, or driving at locations where insurance is not valid (e.g. other countries, off-road, race tracks etc).

As will be appreciated, the interaction of the mobile device and the device monitoring system has the advantage of actively improving user driving behaviour. That is, if the user knows that their logged driving behaviour may adversely effect their insurance policy, then it is likely that the user will be dissuaded from driving recklessly. In view of this, an insurance company may be able to incentivise users through lower insurance premiums.

However, so that users do not wrongfully benefit from such incentives, it is necessary to enforce the correct and consistent use of the Witness application.

It would not be beneficial from the perspective of the insurance company if the user could choose when to enable the application. For example, if a user could choose to disable the application when speeding then the effectiveness of the application would be reduced.

Accordingly, the application may include measures to guarantee that the application is enabled whenever a given insured vehicle is being driven.

Such measures may involve matching data recorded by the Witness application with that recorded independently by the vehicle. For example, the Witness application records the distance travelled during every journey. To ensure the summed distances of all journeys tracked by the Witness application tally with the total travelled distance of the vehicle, the user may be prompted to enter the odometer mileage periodically.

If the distance recorded by the Witness application does not correlate with the difference between odometer readings, then the discrepancy will be flagged to the user and/or the insurance company. A substantial discrepancy will typically indicate that the Witness application has not been monitoring all vehicle journeys and the appropriate action can be taken (e.g. the user can be warned, insurance premium may be raised etc).

It will be appreciated that such a tallying exercise depends on the Witness application being used every time one particular vehicle is driven. However, in alternatives, if the Witness application is used with different vehicles, the Witness application may be arranged to register the different vehicles so that their respective odometer readings can be tallied with distance recordings associated with each respective vehicle.

Other measures can be implemented in conjunction with the Witness application to guarantee that the application is enabled whenever a given vehicle is being driven. For example, the mobile device on which the Witness application is installed may comprise an NFC device, such as an RFID tag. The NFC device may be compatible with a complementary device on a so-called ‘smart-holster’ into which the mobile device may be fitted during operation.

The smart-holster interacts with the NFC device on the smart-phone to determine whether or not the smart-phone is inserted into the smart-holster. The smart-holster can then be interfaced

with the engine management system of the vehicle so that the vehicle may be activated and driven only when the mobile device is in place within the smart-holster.

It will be appreciated that the mobile device has so far been described in the context of a smart-phone. However, it will be appreciated by a person skilled in the art that other devices may also be suitable for performing the functions described in relation to the Witness application. For example, the Witness application may be adapted to run on a general purpose tablet-style computing device, such as an iPad®.

Furthermore, it will be understood that features, advantages and functionality of the different embodiments described herein may be combined where context allows. In addition, a skilled person will appreciated that the functionality described above may be implemented using the mobile device suitably programmed.

Having described several exemplary embodiments of the present invention and the implementation of different functions of the device in detail, it is to be appreciated that the skilled addressee will readily be able to adapt the basic configuration of the device to carry out described functionality without requiring detailed explanation of how this would be achieved. Therefore, in the present specification several functions of the device have been described in different places without an explanation of the required detailed implementation as this not necessary given the abilities of the skilled addressee to code functionality into the device.

Claims

1. A mobile telecommunications device adapted for installation to a vehicle and configured to log driving information associated with the vehicle when driven, the mobile device comprising:

a sensor set comprising at least one of an image sensor, an audio sensor, an accelerometer and a positioning module;

a processor for processing sensor data from the sensor set to derive said driving information;

a memory for storing said derived driving information; and

a wireless telecommunications module operable to download an application;

the mobile device being arranged to execute the downloaded application to control the mobile device to:

register the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver;

process sensor data from the sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

store a selection of the driving information to the memory.

2. A mobile telecommunications device according to claim 1, comprising an adapter arranged to hold the device securely to the vehicle.

3. A mobile telecommunications device according to claim 1 or claim 2, controlled by the executed application to register the start of a driving period in response to an initialisation input generated automatically in response to the sensor data having predetermined values.

4. A mobile telecommunications device according to claim 3, wherein the initialisation input is generated in response to sensor data reflecting a detected speed above a predetermined threshold.

5. A mobile telecommunications device according to any preceding claim, comprising a registration module configured to register the installation of the mobile device to the vehicle.

6. A mobile telecommunications device according to claim 5, wherein the registration module is arranged to determine a match between the location of the mobile device and the location of the vehicle.

7. A mobile telecommunications device according to any preceding claim, controlled by the executed application to manage voice-calls incoming to the mobile device during a driving period.

8. A mobile telecommunications device according to any preceding claim, controlled by the executed application to enable a hands-free mode of operation on detection of a driving period.

9. A mobile telecommunications device according to claim 8, wherein the hand-free mode of operation comprises enabling voice-activated commands on the mobile device.

10. A mobile telecommunications device according to any preceding claim, controlled by the executed application to down-sample sensor data from a first sampling rate to a second sampling and store the sensor data as driving information at said second sampling rate.

11. A mobile telecommunications device according to any preceding claim, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response store driving information associated with that event to the memory.

12. A mobile telecommunications device according to any preceding claim, controlled by the executed application to detect the occurrence of a predetermined event of significance, such as a crash, and in response transmit driving information associated with that event via the wireless telecommunication module to a remote data-logging system.

13. A mobile telecommunications device according to any preceding claim, comprising an event detector for detecting the occurrence of a predetermined event by correlating the sensor data against an event indication model.

14. A mobile telecommunications device according to claim 13, wherein the event indication model comprises a set of predetermined data values that the event detector is arranged to compare against corresponding sensor data.

15. A mobile telecommunications device according to claim 14, wherein the event indication model comprises a sequence of predetermined data values, the sequence being associated by a function of time.

16. A mobile telecommunication device according to claim 13 or claim 14, wherein the event indication model comprises a pattern of predetermined data values and the event detector is arranged to detect the occurrence of an event by carrying out pattern recognition by matching sensor data values to the pattern of predetermined data values of the event indication model.

17. A mobile telecommunication device according to any one of claims 13 to 15, wherein there are a plurality of event indication models.

18. A mobile telecommunications device according to any preceding claim, controlled by the executed application to process sensor data from the sensor set during a plurality of driving periods to derive driving information associated with how the vehicle is driven for each of the driving periods, the sensor data being processed during a first set of driving periods defining a benchmark against which sensor data is compared during subsequent sets of driving periods.

19. A mobile telecommunications device according to claim 18 when dependent on claims 14 to 17, controlled by the executed application to modify one or more event indication models in response to the benchmark.

20. A mobile telecommunications device according to any one of claims 11 to 19, controlled by the executed application to take at least one predetermined action in response to a detected event.

21. A mobile telecommunications device according to claim 20, wherein the at least one predetermined action comprises transmitting driving information via the wireless telecommunication module of the mobile device, to a remote system.

22. A mobile telecommunications device according to claim 20 or claim 21, wherein the at least one predetermined action comprises storing driving information captured at a higher sampling rate than when an event is not detected.

23. A mobile telecommunications device according to any one of claims 20 to 22, wherein the at least one predetermined action comprises providing feedback to a user to indicate that an event has been detected.

24. A mobile telecommunications device according to claim 23, configured to receive a user interaction to confirm or deny whether the detected event has actually occurred following said feedback.

25. A mobile telecommunications device according to claim 23 or claim 24, wherein the feedback comprises notifying a user that a further action has been scheduled, and will be taken within a predetermined period.

26. A mobile telecommunications device according to claim 25, configured to receive a user interaction to confirm or deny whether the further scheduled action should be taken within a predetermined period.

27. A mobile telecommunications device according to any one of claims 20 to 26, wherein the at least one predetermined action comprises providing the user with options to control the mobile device to take further actions.

28. A mobile telecommunications device according to any one of claims 20 to 27, wherein the at least one predetermined action comprises communicating to a remote system that an event has been detected.

29. A mobile telecommunications device according to claims 28, configured to receive from the remote system a request to transmit to the remote system selected portions of the driving information associated with the detected event, and operating the wireless telecommunication module to transmit the requested driving information.

30. A mobile telecommunications device according to any preceding claim, wherein the memory comprises a long term memory for persistently storing driving information and a short term memory for transiently storing driving information, the short term memory being arranged to receive driving information at a higher update rate than the long term memory.

31. A mobile telecommunications device according to claim 30, controlled by the executed application to write driving information to the short term memory at a predetermined update rate during the driving period in a predetermined sequence, the mobile device being further controlled to overwrite the driving information previously written to the short term memory in accordance with the predetermined sequence.

32. A mobile telecommunications device according to claim 30 or claim 31, when dependent on any one of claims 20 to 29, wherein the at least one predetermined action comprises transferring data from the short term memory to the long term memory.

33. A mobile telecommunications device according to any preceding claim, further arranged to interface with an external device having access to external driving information associated with the behaviour and/or condition of the vehicle, the mobile device being arranged to receive at least a portion of the external driving information from the external device.

34. A mobile telecommunications device according to claim 33, wherein the external device is an engine management system of the vehicle.

35. A mobile telecommunications device according to claim 33 or claim 34, further arranged to interface with the external device wirelessly.

36. A mobile telecommunications device according to any preceding claim, controlled by the executed application to determine a unique identifier associated with the mobile device and

retrieve from the memory and transmit via the wireless telecommunication module to a remote system said driving information paired with said unique identifier.

37. A mobile telecommunications device according to any preceding claim, controlled by the executed application to process the driving information to generate a driving score to be stored on the memory of the mobile device.

38. A mobile telecommunications device according to any preceding claim, controlled by the executed application to process the driving information to generate a driving score to be transmitted via the wireless telecommunication of the mobile device to a remote system.

39. A mobile telecommunications device according to claim 38 or claim 39, wherein the driving score is associated with a particular driver.

40. A data-logging system for logging driving information comprising:

a database for storing a plurality of accounts, each account having a unique identifier and the database being arranged to store driving information associated with at least one of a vehicle and a driver;

a communications interface arranged to communicate with a remote mobile device according to any preceding claim, and receive therefrom:

a unique identifier for association of the mobile device with a corresponding one of the plurality of accounts; and

driving information to be logged to that corresponding account.

41. A data-logging system according to claim 40, wherein the driving information comprises at least one of a driving score and sensor data captured and processed by the mobile device during a driving period during which the mobile device is installed to a vehicle being driven by a driver.

42. A data logging system according to claim 40 or 41, further arranged to process the driving information logged to the corresponding account to generate a driving score.

43. A data logging system according to claim 42, wherein the driving score is used to determine a risk profile for at least one of the vehicle and driver.

44. A data logging system according to any one of claims 42 to 44, wherein the driving score is used to define an insurance premium associated with the account.

45. A data logging system according to any one of claims 40 to 44, further arranged to communicate to a mobile device an insurance offer generated in response to the driving information received from the mobile device.

46. A data logging system according to claim 45, arranged to receive from the mobile device a user-acceptance of the insurance offer.

47. A method of logging driving information associated with a vehicle when driven, the method comprising:

adapting and installing a mobile device to the vehicle, the mobile device comprising a memory;

registering the start of a driving period during which the mobile device is installed to the vehicle and the vehicle is being driven by a driver;

processing sensor data from a sensor set during the driving period to derive driving information associated with how the vehicle is driven; and

storing a selection of the driving information to the memory of the mobile device.

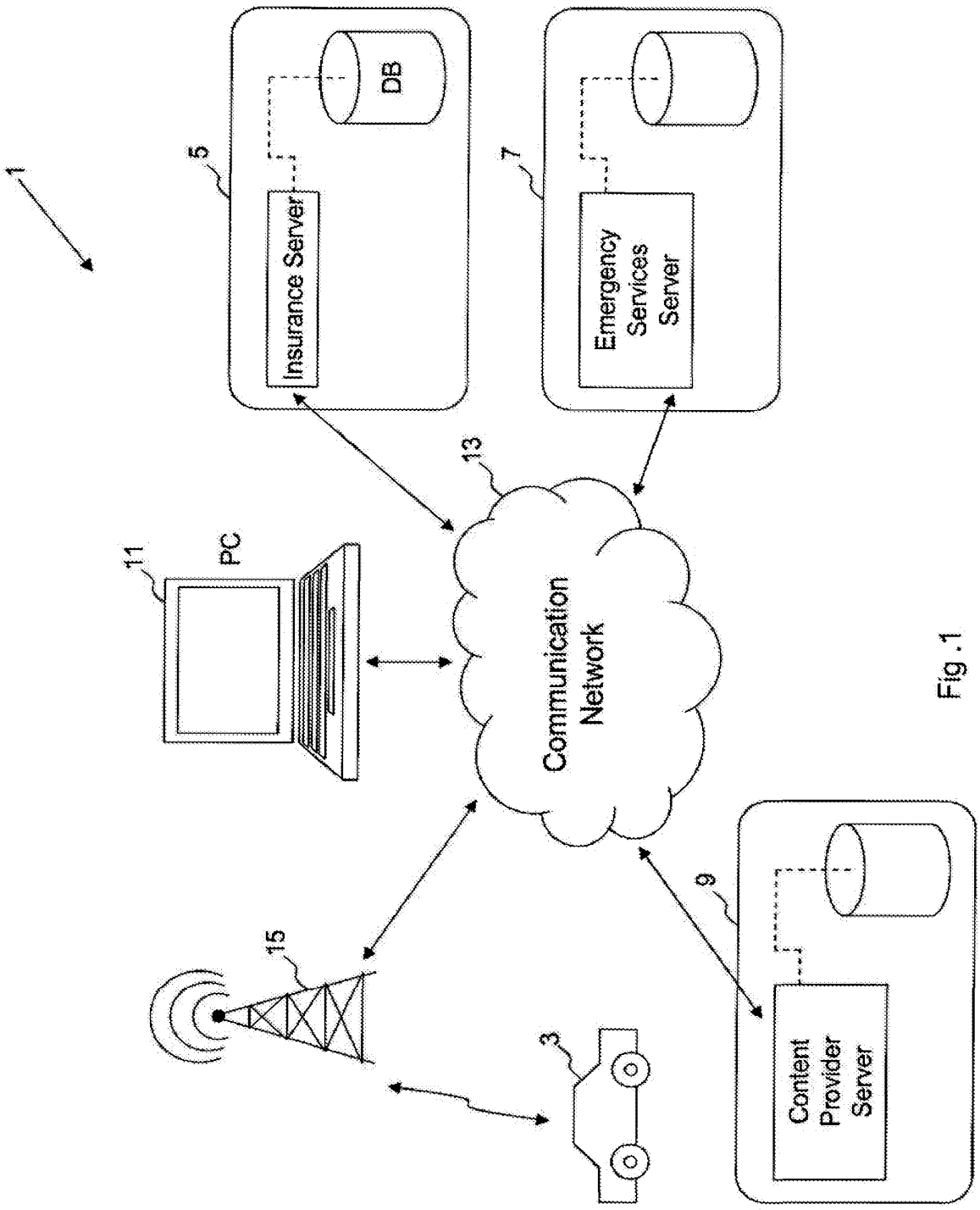

1
5
DB
Insurance Server
7
Emergency Services Server
13
Communication Network
11
PC
15
3
9
Content Provider Server

Fig .1

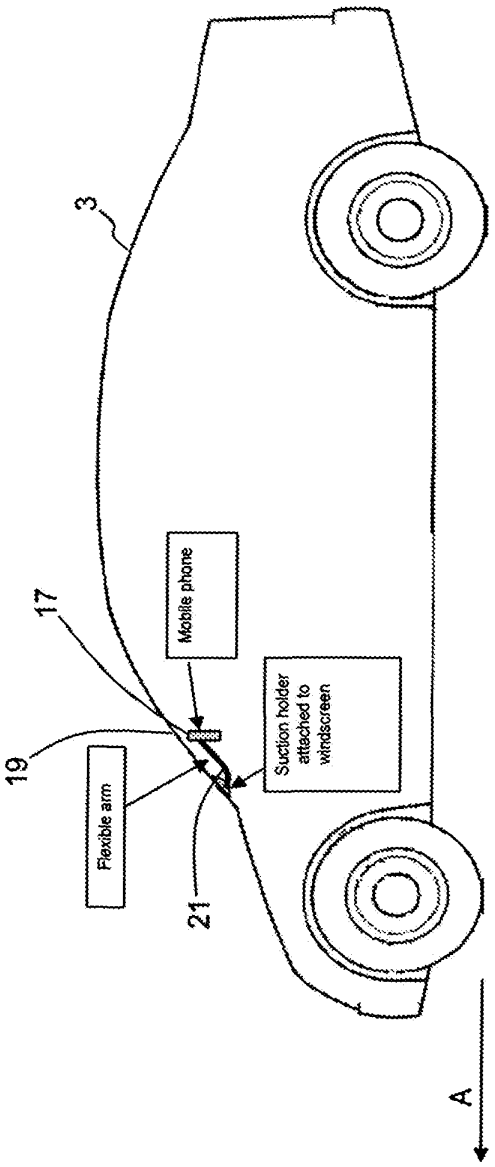

3
17
Mobile phone
Suction holder attached to windscreen
19
Flexible arm
21
A

Fig .2

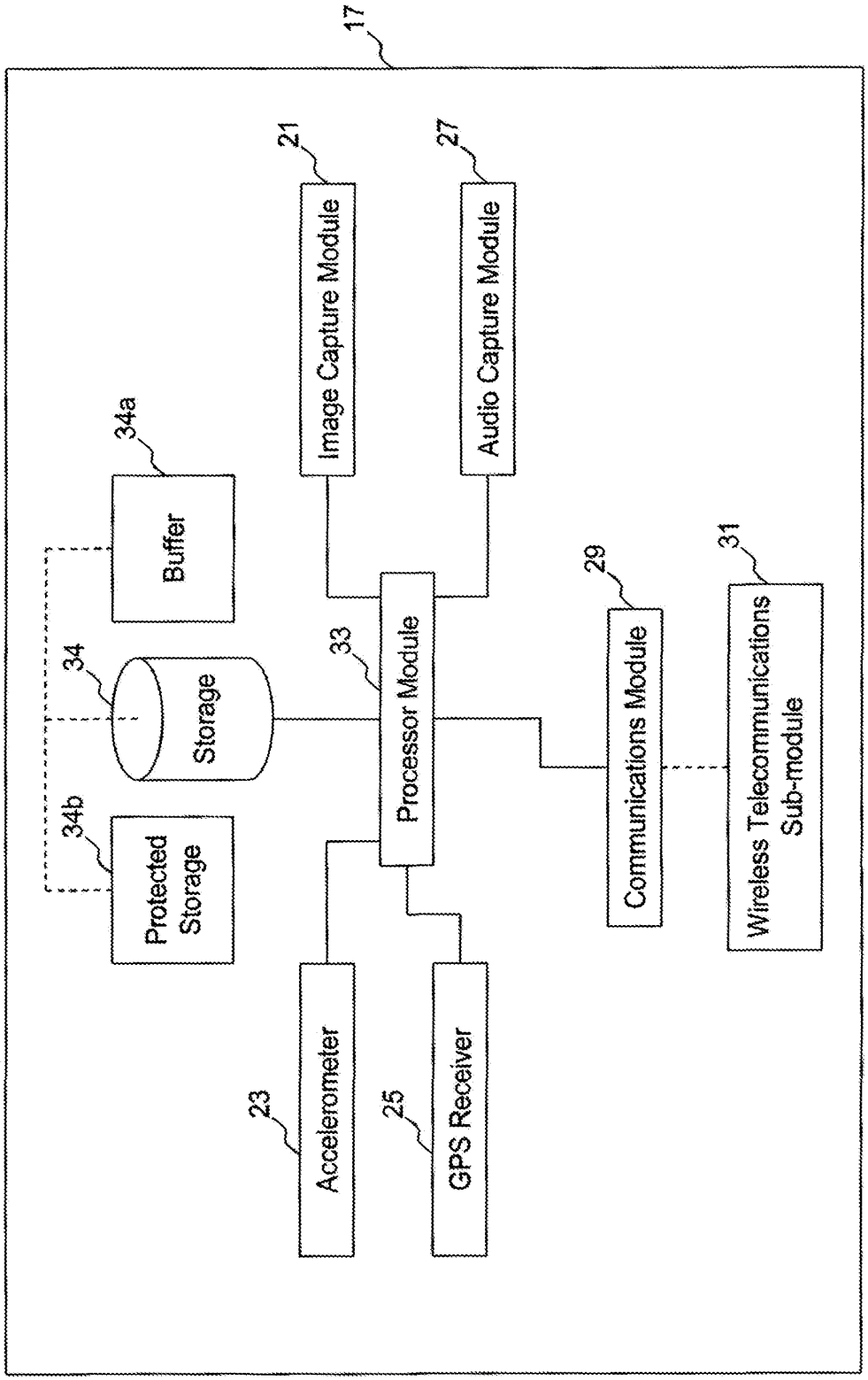

17
21
Image Capture Module
27
Audio Capture Module
34a
Buffer
34
Storage
33
Processor Module
29
Communications Module
31
Wireless Telecommunications Sub-module
34b
Protected Storage
23
Accelerometer
25
GPS Receiver

Fig .3

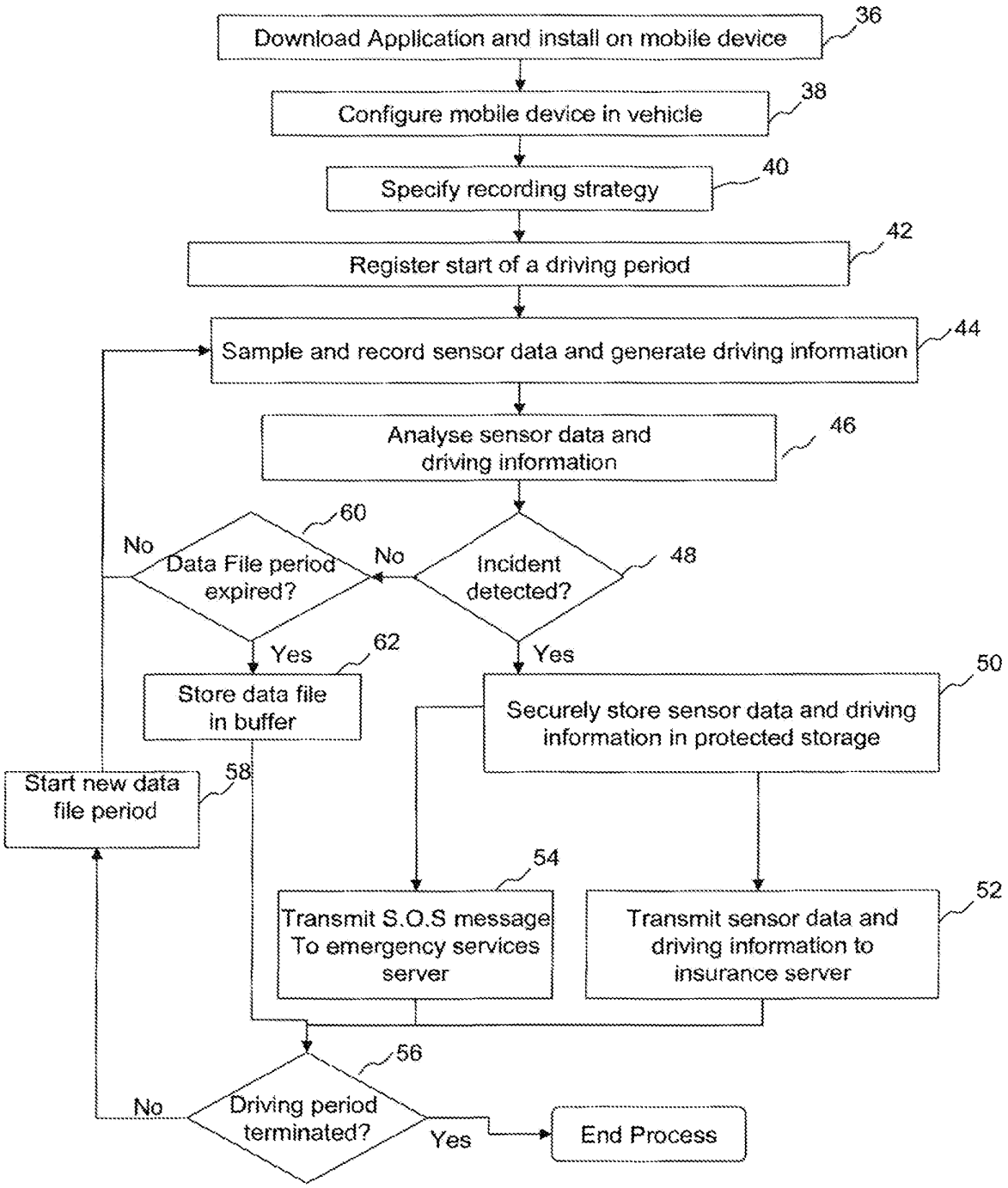
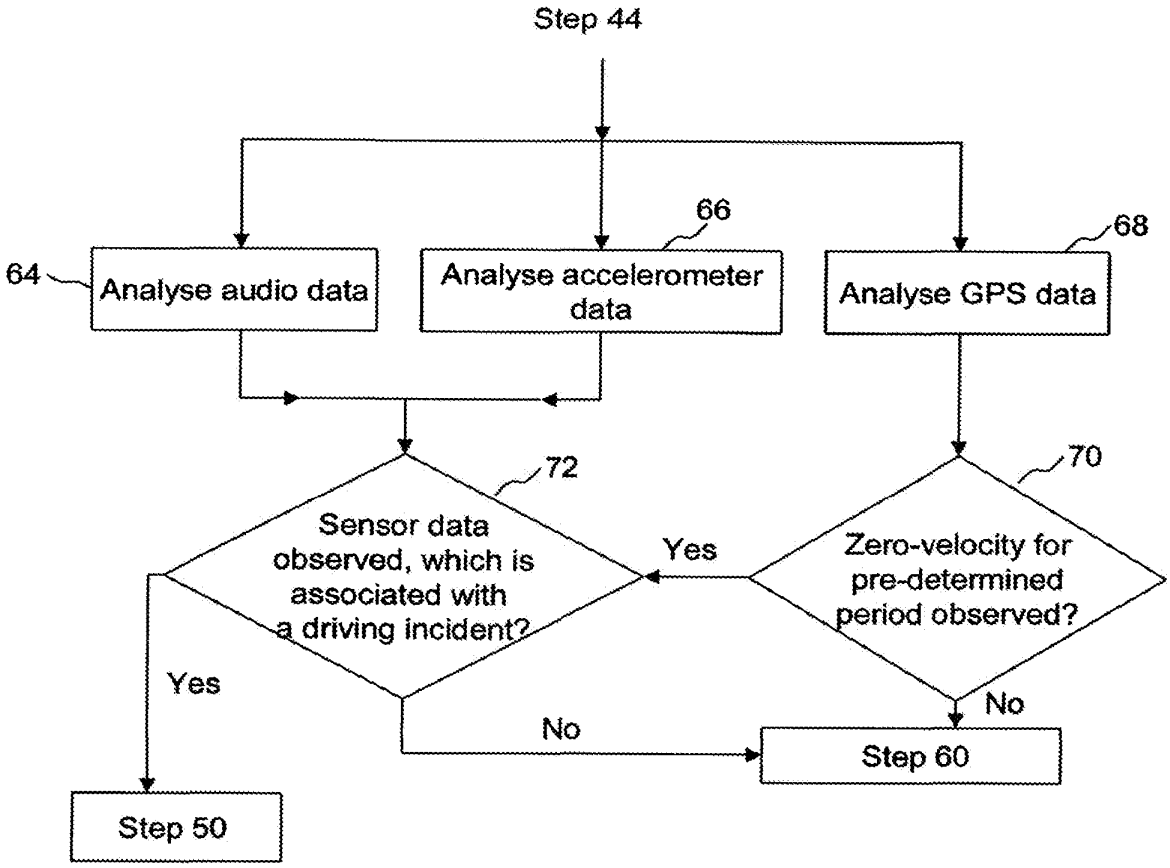

Download Application and install on mobile device
36
Configure mobile device in vehicle
38
Specify recording strategy
40
Register start of a driving period
42
Sample and record sensor data and generate driving information
44
Analyse sensor data and driving information
46
60
No
Data File period expired?
No
Incident detected?
48
Yes
62
Yes
Store data file in buffer
Securely store sensor data and driving information in protected storage
50
Start new data file period
58
54
Transmit S.O.S message To emergency services server
Transmit sensor data and driving information to insurance server
52
56
No
Driving period terminated?
Yes
End Process

Fig. 4a


Step 44
64
Analyse audio data
66
Analyse accelerometer data
68
Analyse GPS data
72
Sensor data observed, which is associated with a driving incident?
70
Zero-velocity for pre-determined period observed?
Yes
Yes
No
No
Step 50
Step 60

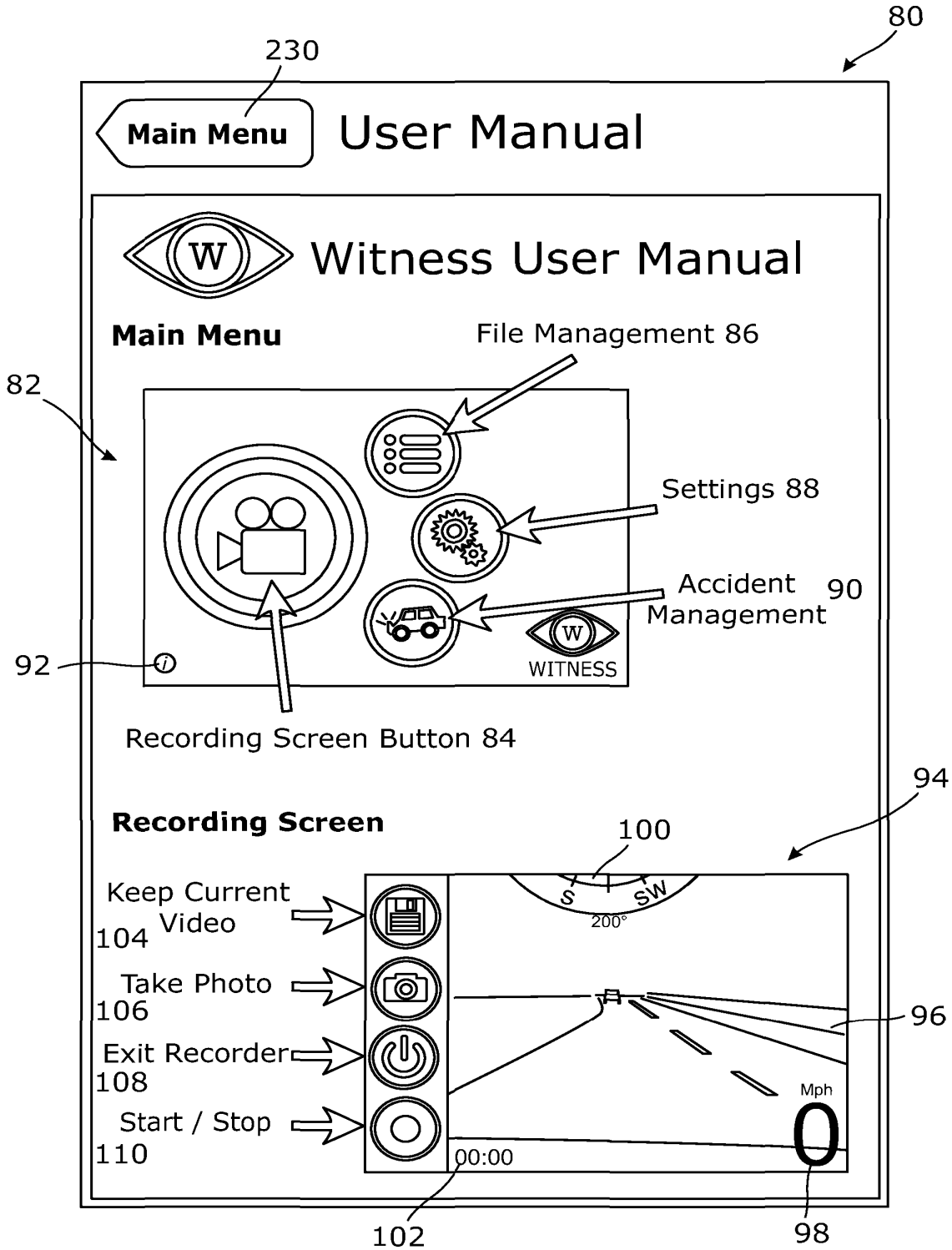

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Main Menu
User Manual
W
Witness User Manual
Main Menu
File Management 86
82
Settings 88
Accident Management 90
92
WITNESS
Recording Screen Button 84
94
Recording Screen
100
Keep Current Video
104
Take Photo
106
Exit Recorder
108
Start / Stop
110
S
SW
200°
96
Mph
0
00:00
102
98

Fig. 5

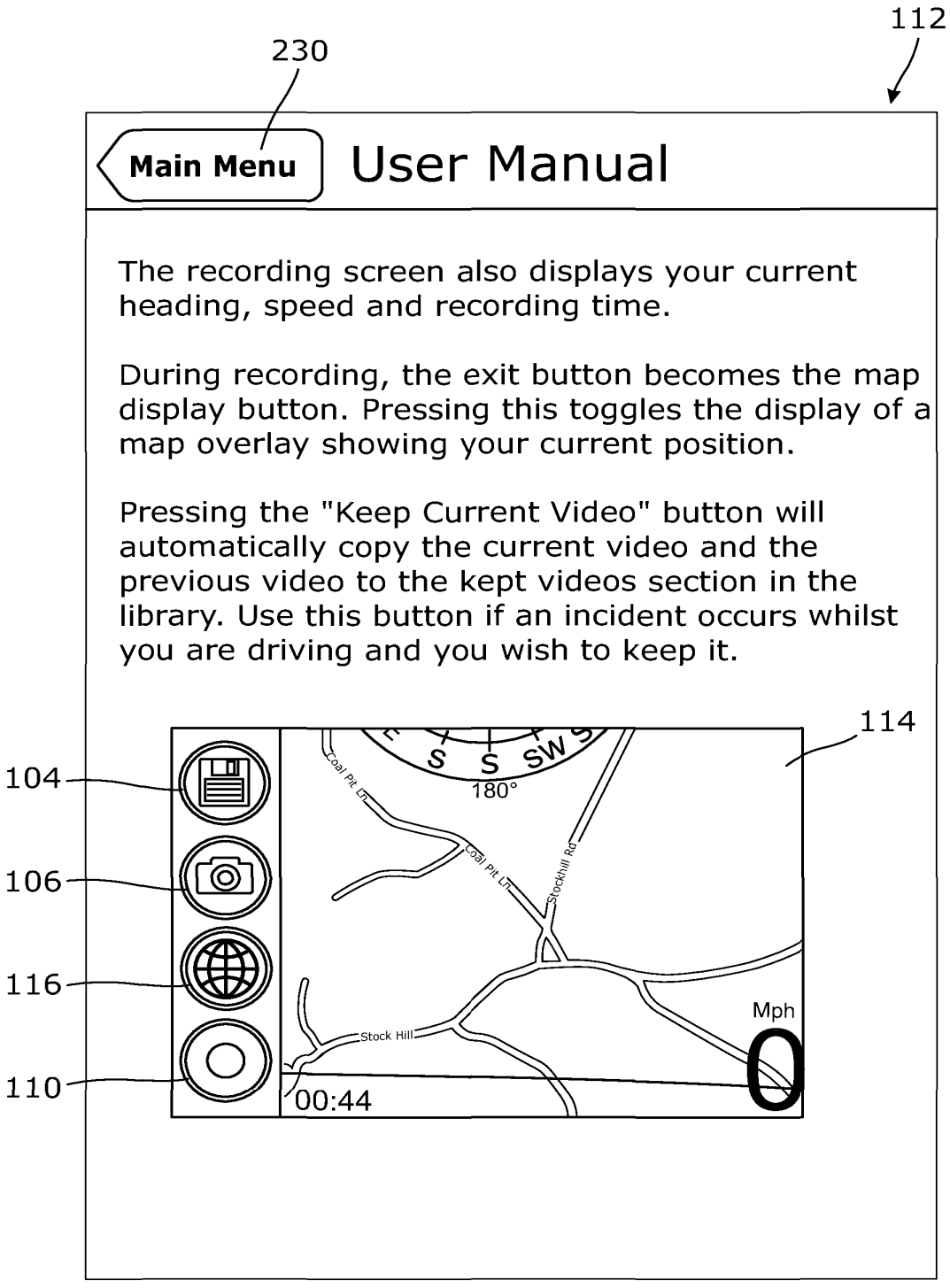

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Main Menu
User Manual
The recording screen also displays your current heading, speed and recording time.
During recording, the exit button becomes the map display button. Pressing this toggles the display of a map overlay showing your current position.
Pressing the "Keep Current Video" button will automatically copy the current video and the previous video to the kept videos section in the library. Use this button if an incident occurs whilst you are driving and you wish to keep it.
114
104
106
116
110
S
S
SW
180°
Coal Pit Ln
Coal Pit Ln
Stockhill Rd
Stock Hill
Mph
0
00:44

Fig. 6

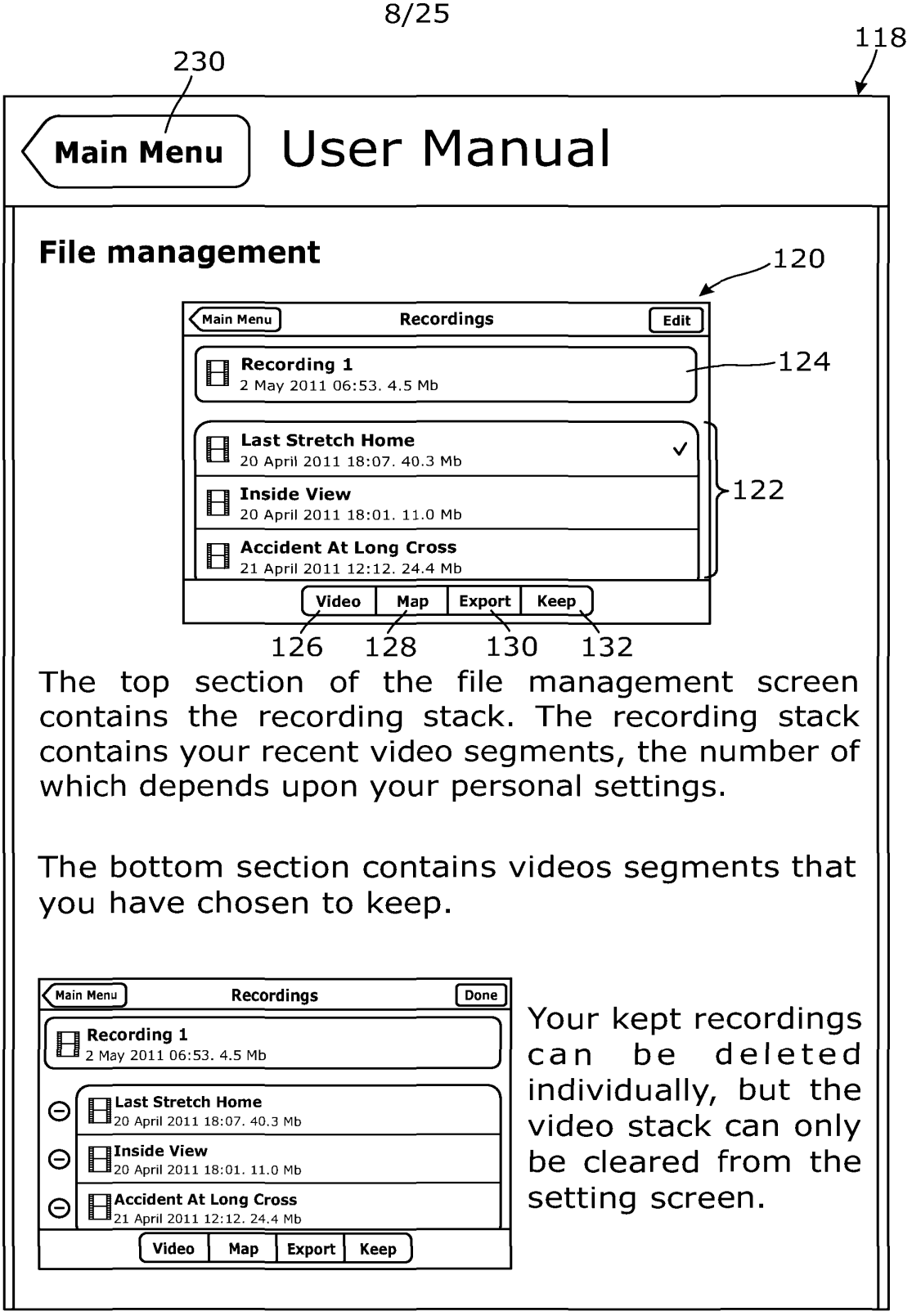

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118
Main Menu
User Manual
File management
120
Main Menu
Recordings
Edit
Recording 1
2 May 2011 06:53. 4.5 Mb
124
Last Stretch Home
20 April 2011 18:07. 40.3 Mb
Inside View
20 April 2011 18:01. 11.0 Mb
Accident At Long Cross
21 April 2011 12:12. 24.4 Mb
122
Video
Map
Export
Keep
126
128
130
132
The top section of the file management screen contains the recording stack. The recording stack contains your recent video segments, the number of which depends upon your personal settings.
The bottom section contains videos segments that you have chosen to keep.
Main Menu
Recordings
Done
Recording 1
2 May 2011 06:53. 4.5 Mb
Last Stretch Home
20 April 2011 18:07. 40.3 Mb
Inside View
20 April 2011 18:01. 11.0 Mb
Accident At Long Cross
21 April 2011 12:12. 24.4 Mb
Video
Map
Export
Keep
Your kept recordings can be deleted individually, but the video stack can only be cleared from the setting screen.

Fig. 7

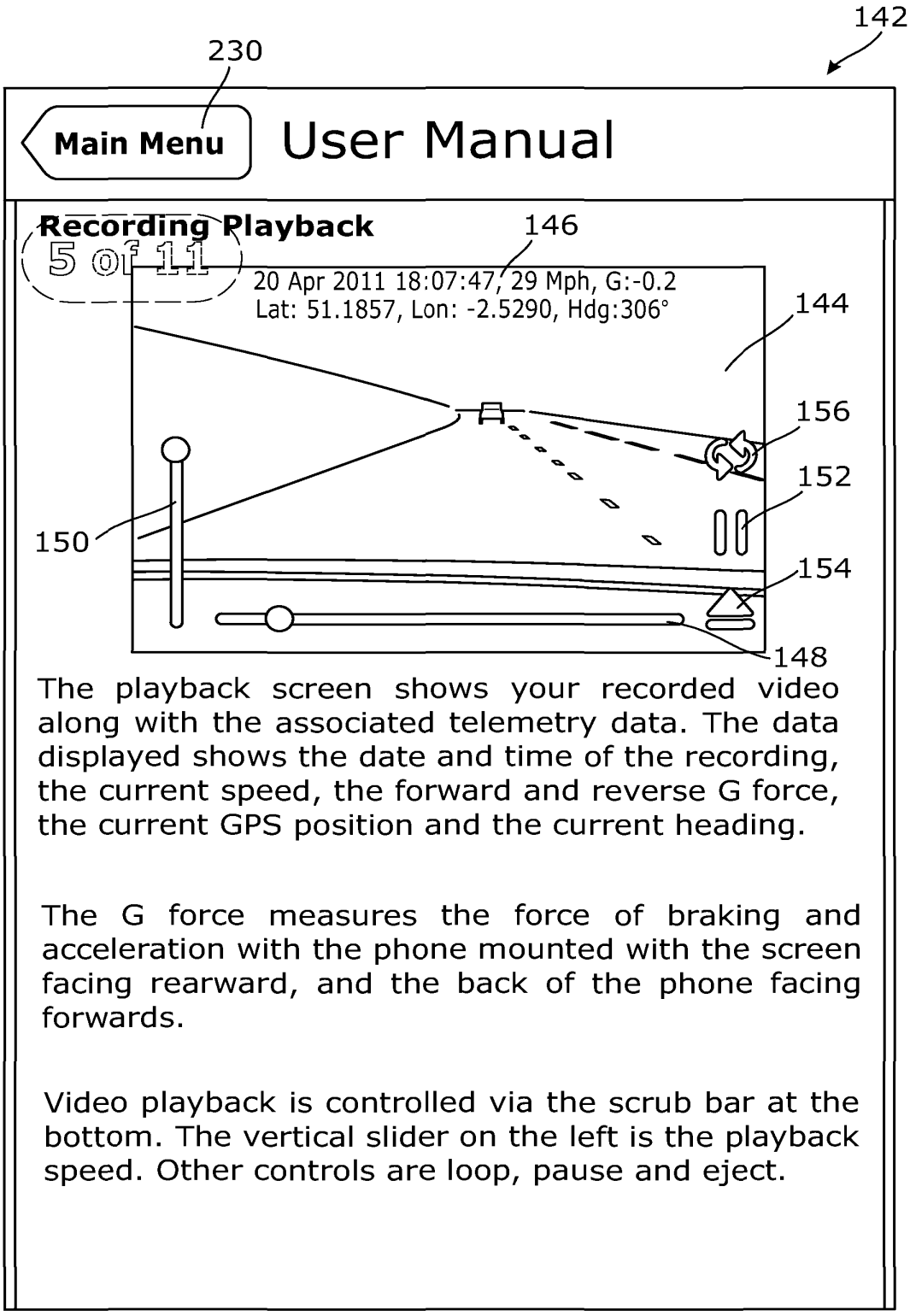

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230
Main Menu
User Manual
Recording Playback
5 of 11
146
20 Apr 2011 18:07:47, 29 Mph, G:-0.2
Lat: 51.1857, Lon: -2.5290, Hdg:306°
144
156
152
150
154
148
The playback screen shows your recorded video along with the associated telemetry data. The data displayed shows the date and time of the recording, the current speed, the forward and reverse G force, the current GPS position and the current heading.
The G force measures the force of braking and acceleration with the phone mounted with the screen facing rearward, and the back of the phone facing forwards.
Video playback is controlled via the scrub bar at the bottom. The vertical slider on the left is the playback speed. Other controls are loop, pause and eject.

Fig. 8

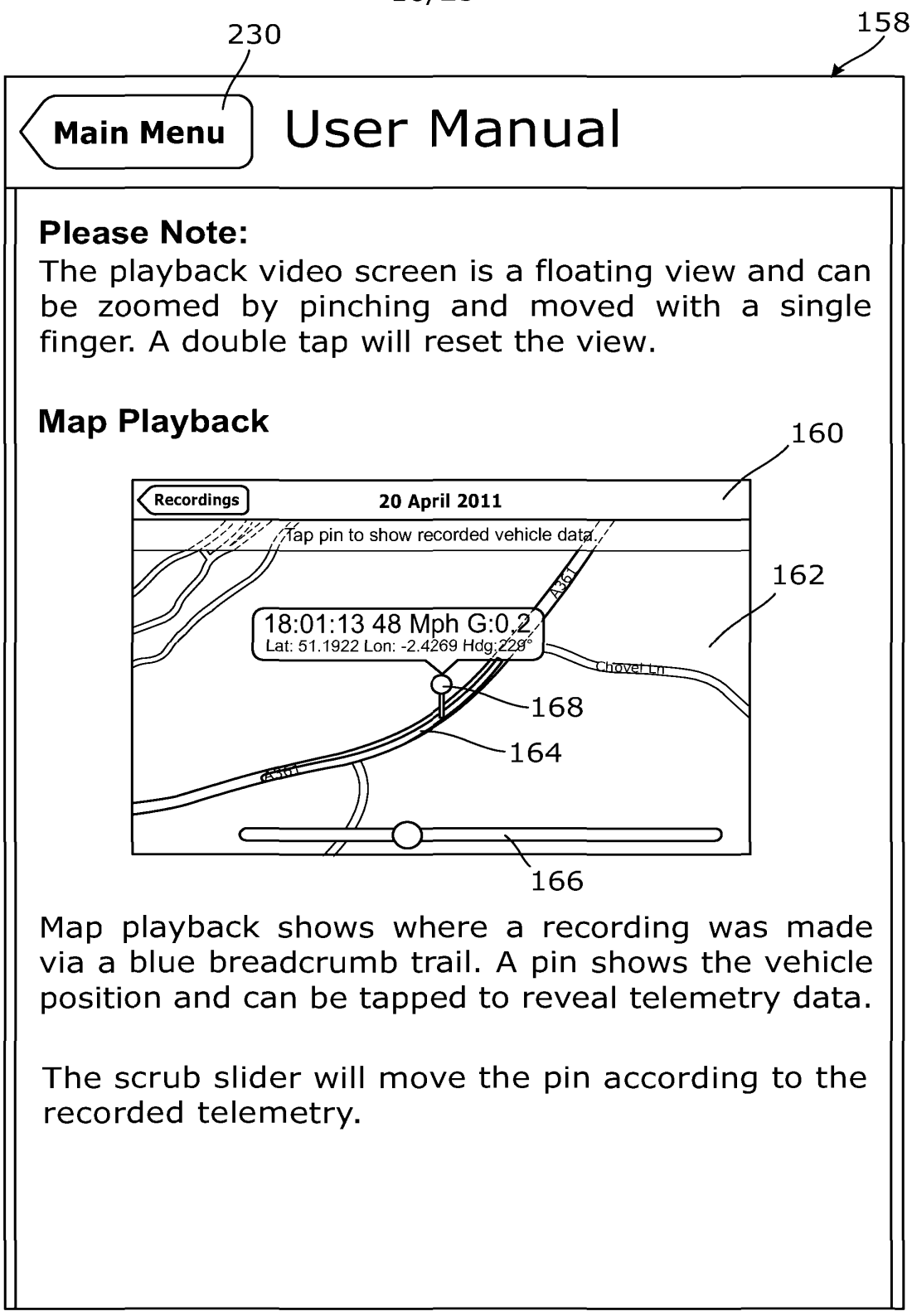

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158
Main Menu
User Manual
Please Note:
The playback video screen is a floating view and can be zoomed by pinching and moved with a single finger. A double tap will reset the view.
Map Playback
160
Recordings
20 April 2011
Tap pin to show recorded vehicle data.
162
A361
18:01:13 48 Mph G:0.2
Lat: 51.1922 Lon: -2.4269 Hdg:228°
Chovel Ln
168
164
A361
166
Map playback shows where a recording was made via a blue breadcrumb trail. A pin shows the vehicle position and can be tapped to reveal telemetry data.
The scrub slider will move the pin according to the recorded telemetry.

Fig. 9

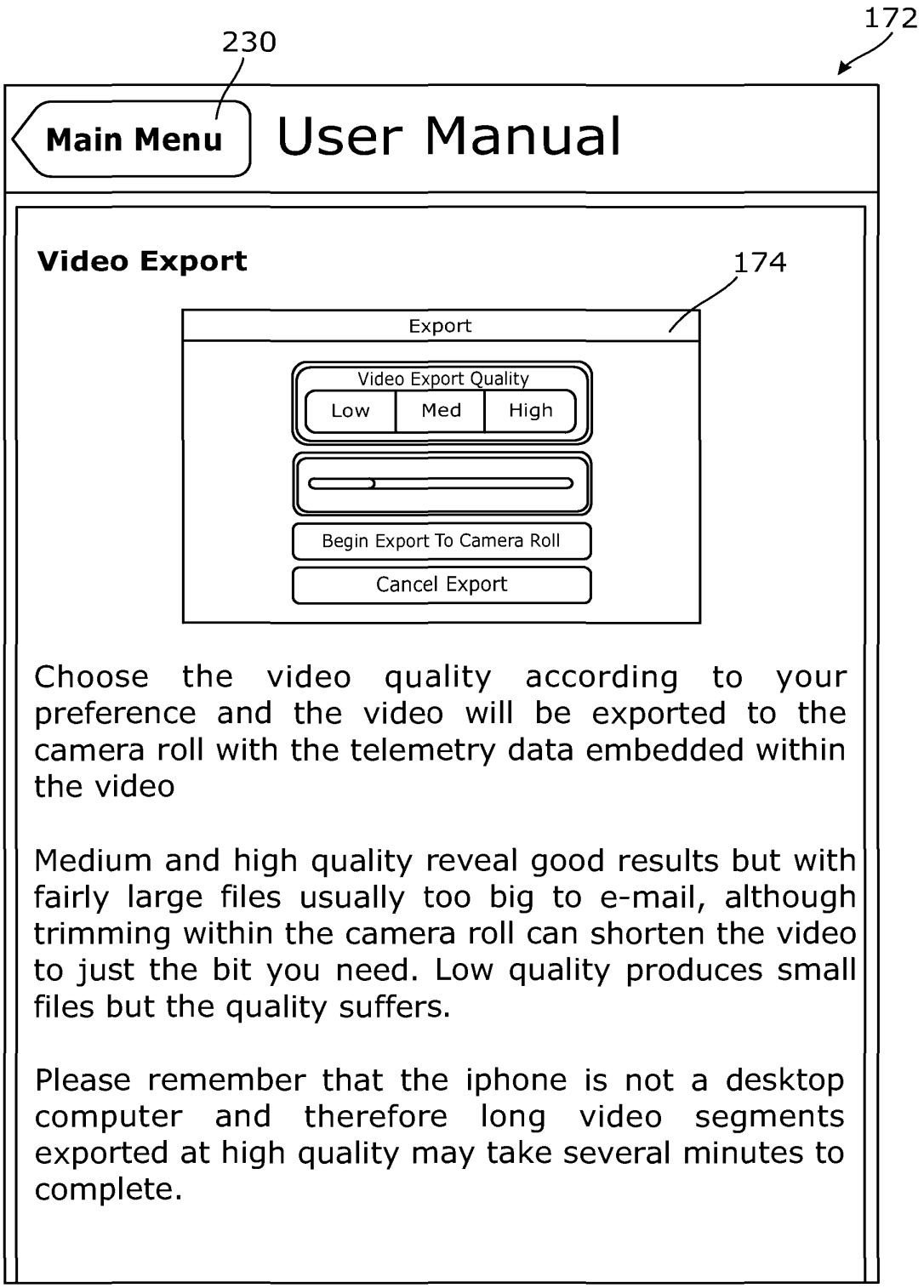
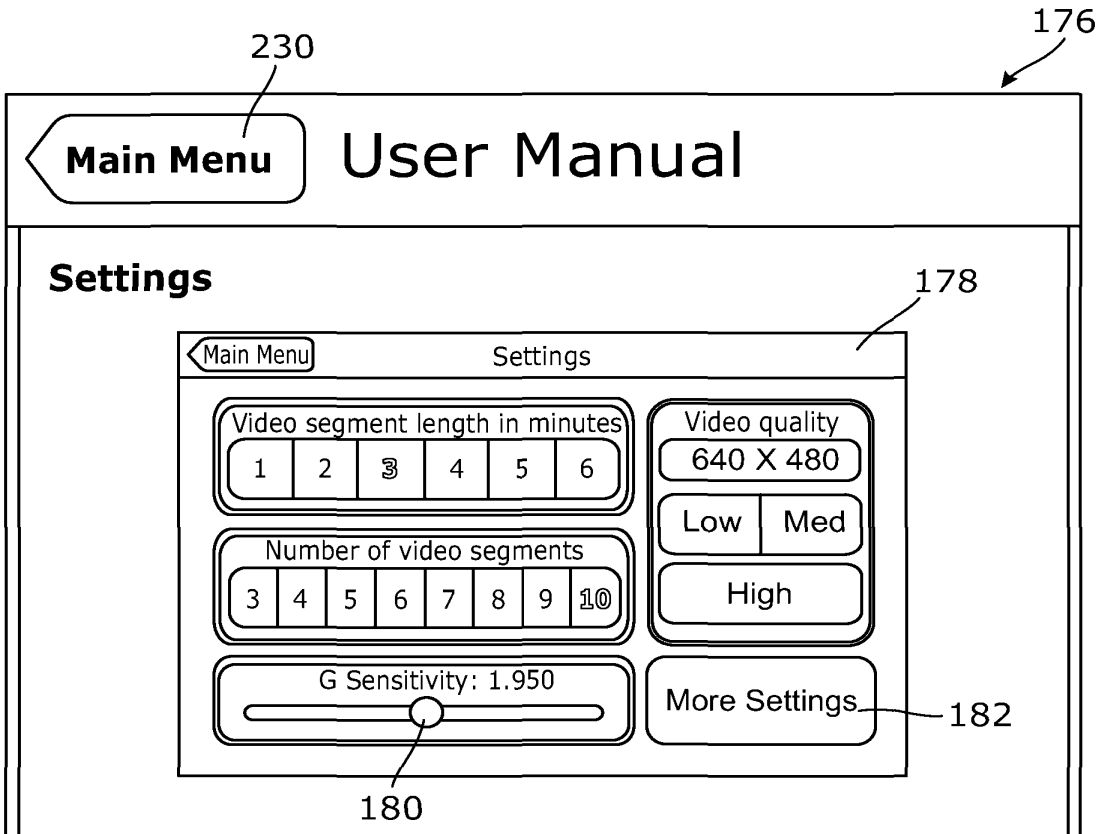

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Main Menu
User Manual
Video Export
174
Export
Video Export Quality
Low
Med
High
Begin Export To Camera Roll
Cancel Export
Choose the video quality according to your preference and the video will be exported to the camera roll with the telemetry data embedded within the video
Medium and high quality reveal good results but with fairly large files usually too big to e-mail, although trimming within the camera roll can shorten the video to just the bit you need. Low quality produces small files but the quality suffers.
Please remember that the iphone is not a desktop computer and therefore long video segments exported at high quality may take several minutes to complete.

Fig. 10

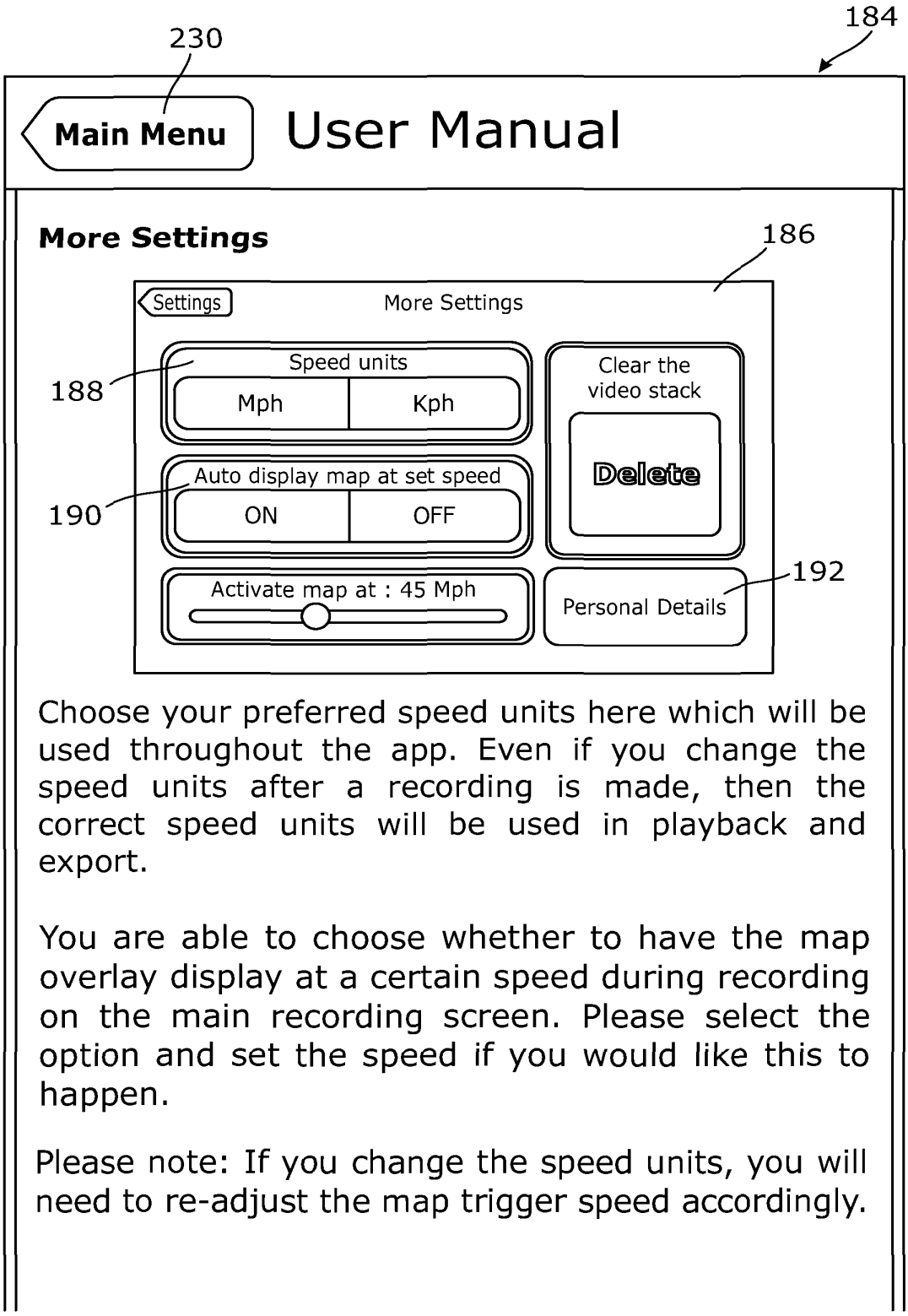


Video recording can be adjusted to allow up to an hour of recorded video in the video stack.

Choose the segment length in minutes and the number of segments you would like according to the available space on your device. Each minute of video at high quality will use 26Mb of space. 1 hour will use 1.5Gb.

G Sensitivity adjusts the automatic triggering of crash detection. Raise the sensitivity if you find that crash detection is triggered during normal driving due to differences in vehicle suspension.

Fig. 11



Choose your preferred speed units here which will be used throughout the app. Even if you change the speed units after a recording is made, then the correct speed units will be used in playback and export.

You are able to choose whether to have the map overlay display at a certain speed during recording on the main recording screen. Please select the option and set the speed if you would like this to happen.

Please note: If you change the speed units, you will need to re-adjust the map trigger speed accordingly.

Fig. 12

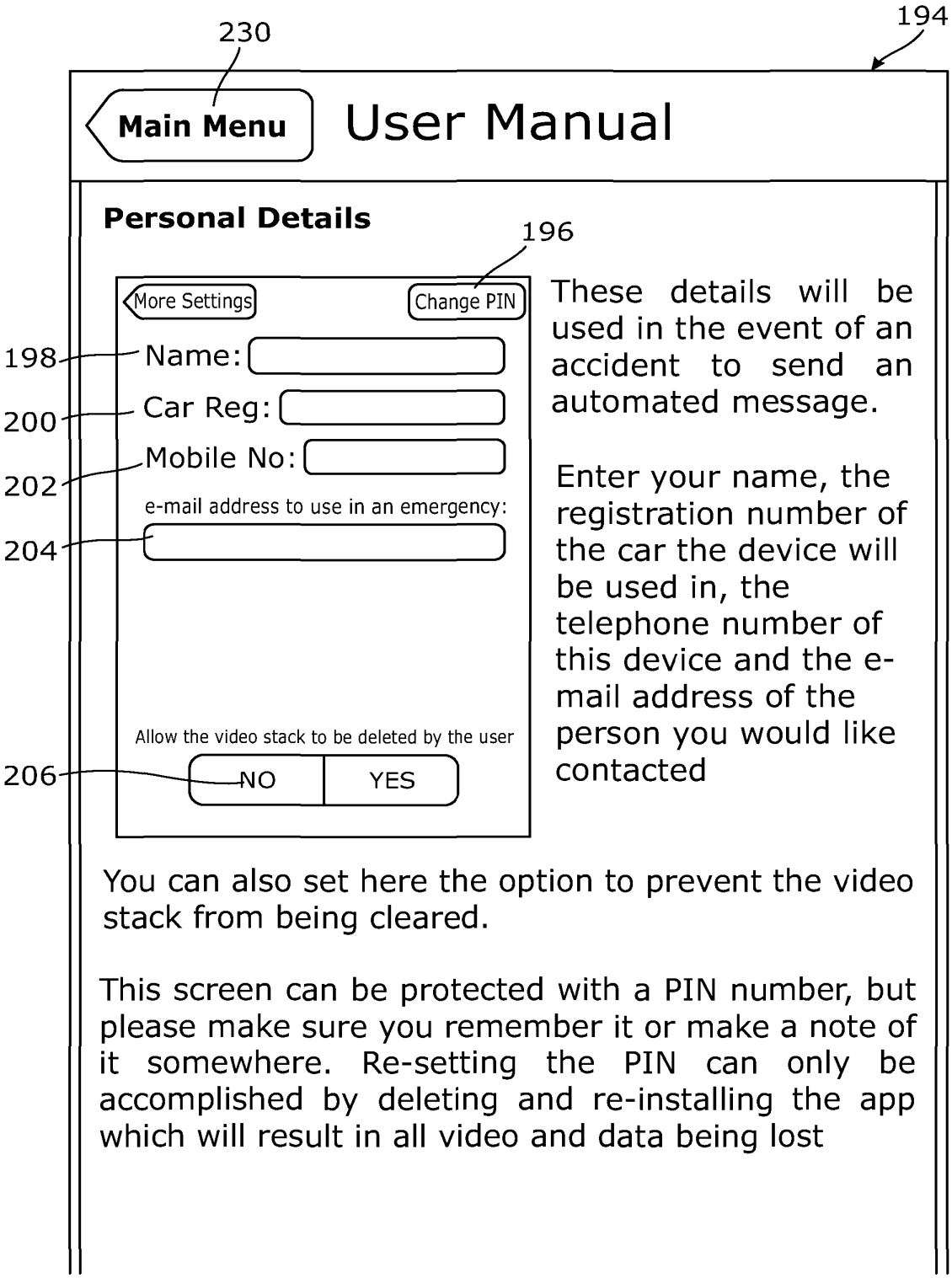

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194
Main Menu
User Manual
Personal Details
196
More Settings
Change PIN
198
Name:
200
Car Reg:
202
Mobile No:
e-mail address to use in an emergency:
204
Allow the video stack to be deleted by the user
206
NO
YES
These details will be used in the event of an accident to send an automated message.
Enter your name, the registration number of the car the device will be used in, the telephone number of this device and the e-mail address of the person you would like contacted
You can also set here the option to prevent the video stack from being cleared.
This screen can be protected with a PIN number, but please make sure you remember it or make a note of it somewhere. Re-setting the PIN can only be accomplished by deleting and re-installing the app which will result in all video and data being lost

Fig. 13

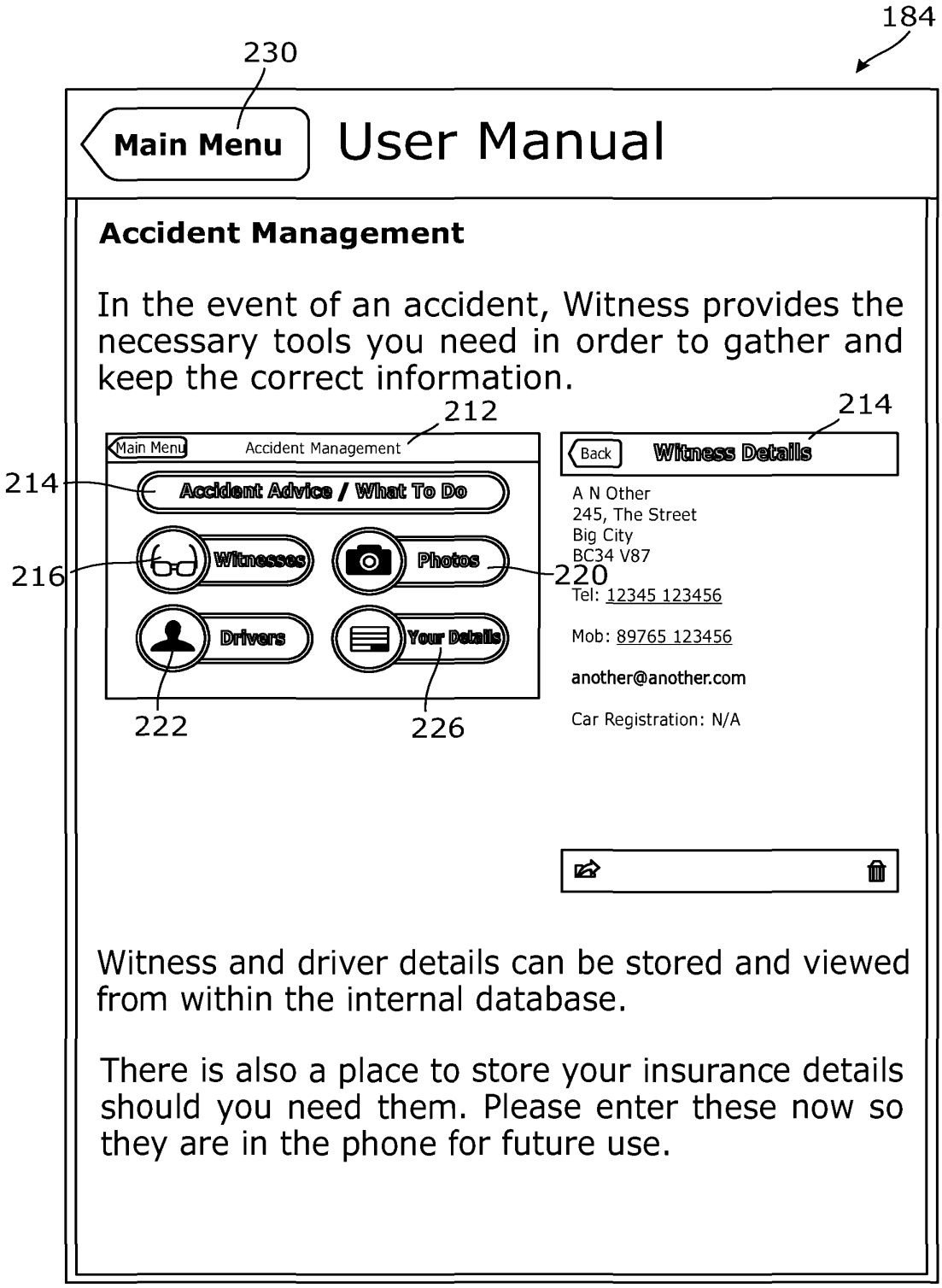

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Main Menu
User Manual
Accident Management
In the event of an accident, Witness provides the necessary tools you need in order to gather and keep the correct information.
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214
Main Menu
Accident Management
Back
Witness Details
214
Accident Advice / What To Do
A N Other
245, The Street
Big City
BC34 V87
216
Witnesses
Photos
220
Tel: 12345 123456
Mob: 89765 123456
Drivers
Your Details
another@another.com
Car Registration: N/A
222
226
Witness and driver details can be stored and viewed from within the internal database.
There is also a place to store your insurance details should you need them. Please enter these now so they are in the phone for future use.

Fig. 14

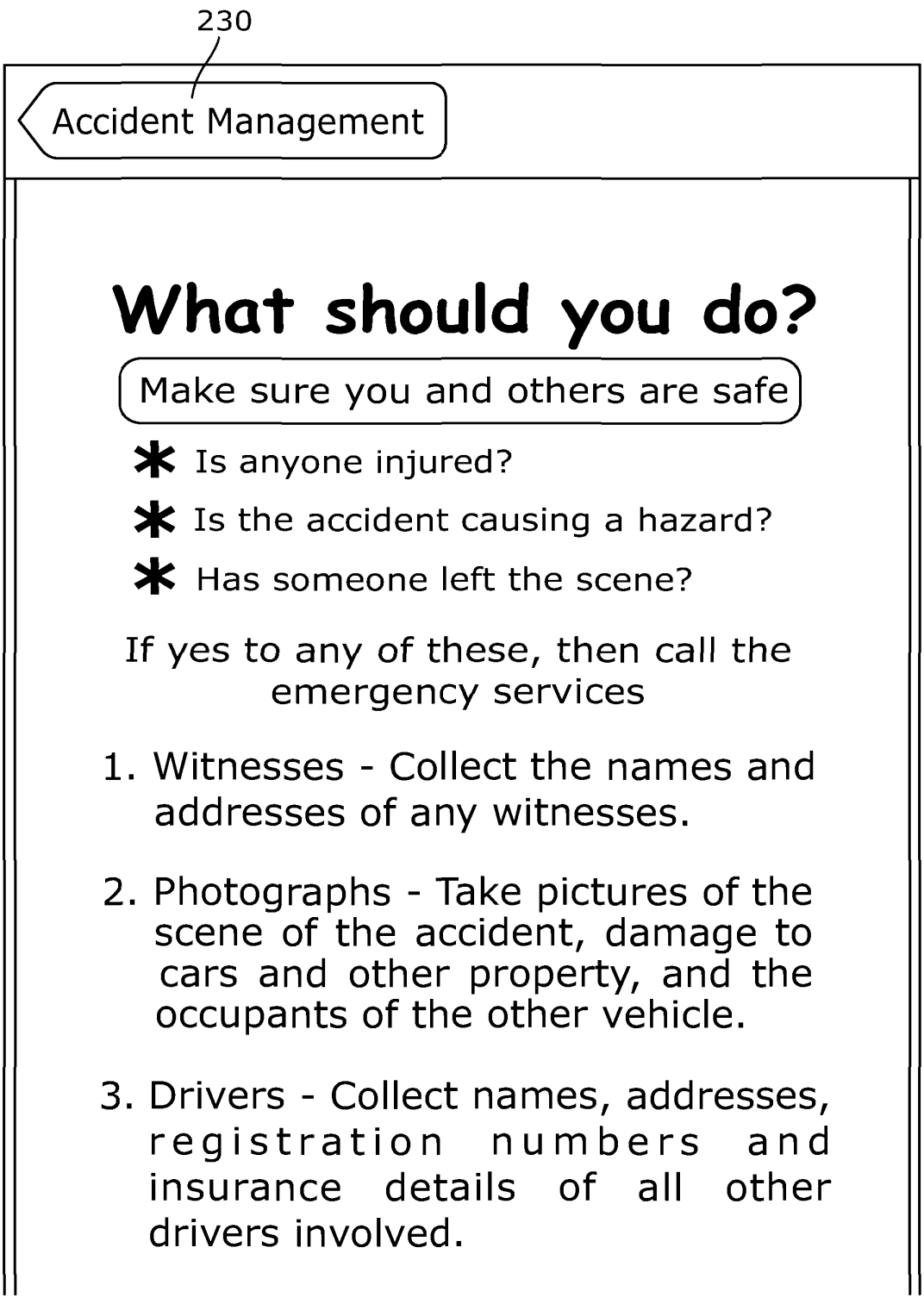

230
Accident Management
What should you do?
Make sure you and others are safe
* Is anyone injured?
* Is the accident causing a hazard?
* Has someone left the scene?
If yes to any of these, then call the emergency services
1. Witnesses - Collect the names and addresses of any witnesses.
2. Photographs - Take pictures of the scene of the accident, damage to cars and other property, and the occupants of the other vehicle.
3. Drivers - Collect names, addresses, registration numbers and insurance details of all other drivers involved.

Fig. 15

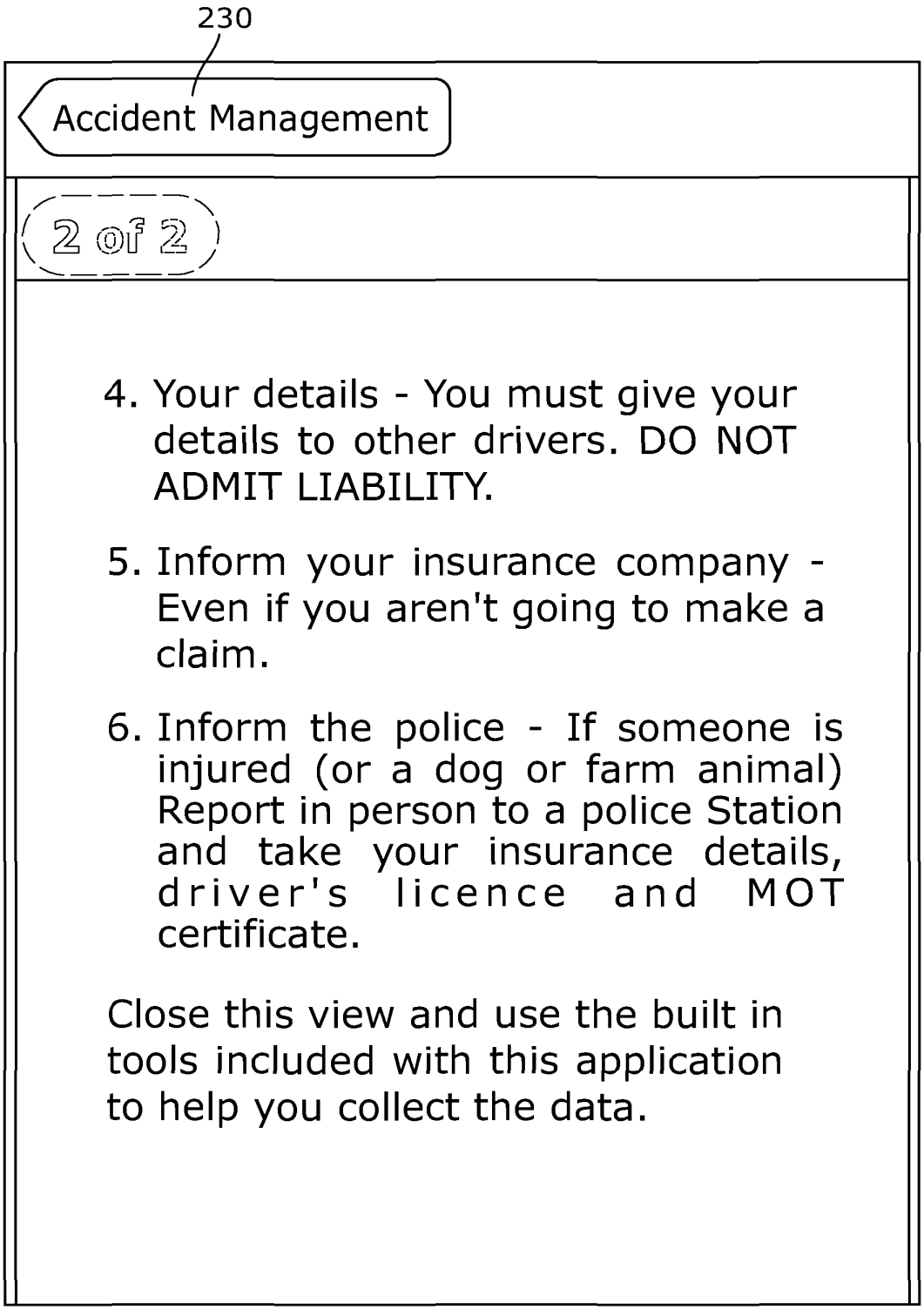

230
Accident Management
2 of 2
4. Your details - You must give your details to other drivers. DO NOT ADMIT LIABILITY.
5. Inform your insurance company - Even if you aren't going to make a claim.
6. Inform the police - If someone is injured (or a dog or farm animal) Report in person to a police Station and take your insurance details, driver's licence and MOT certificate.
Close this view and use the built in tools included with this application to help you collect the data.

Fig. 16

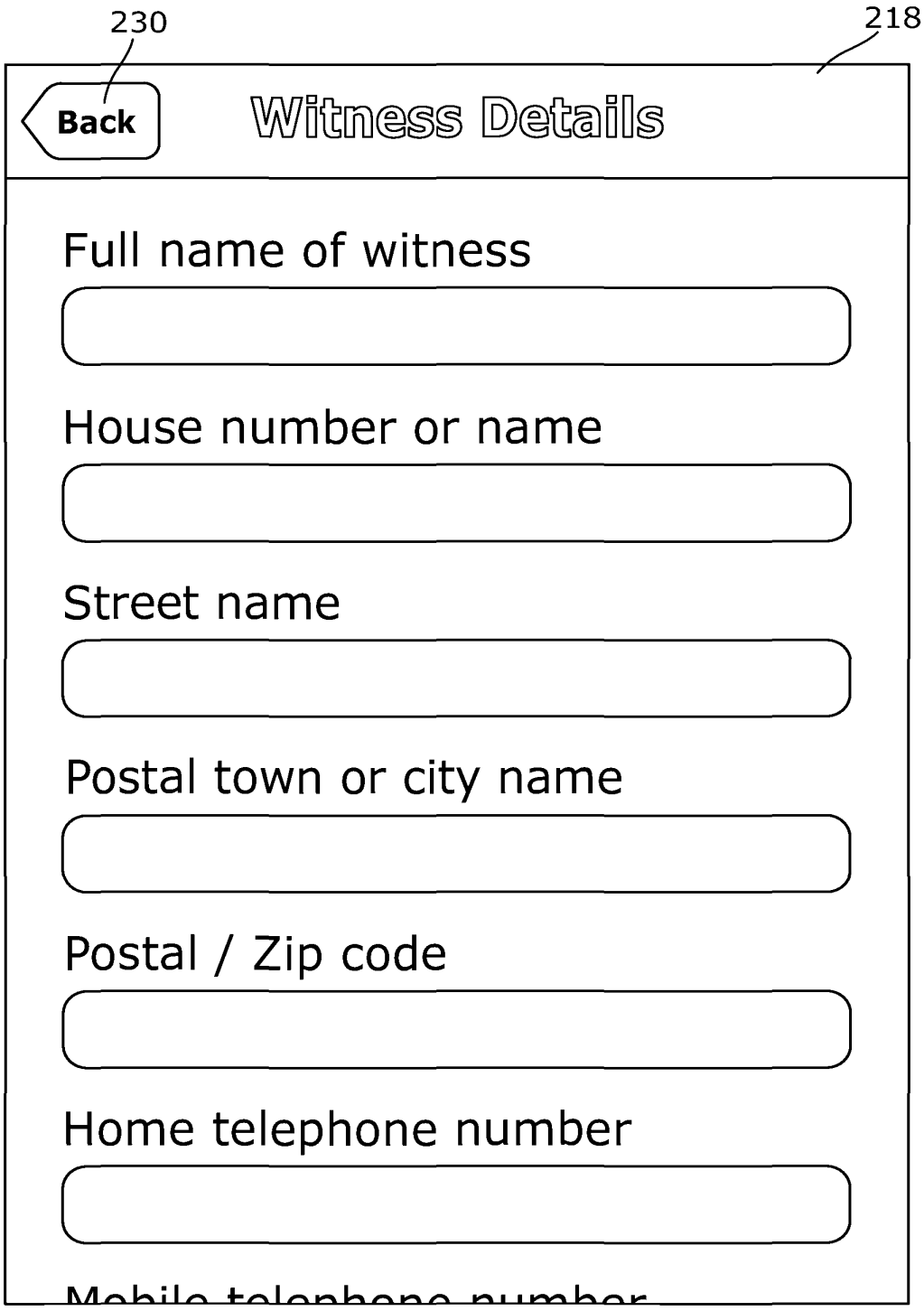

230
218
Back
Witness Details
Full name of witness
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number
Mobile telephone number

Fig. 17

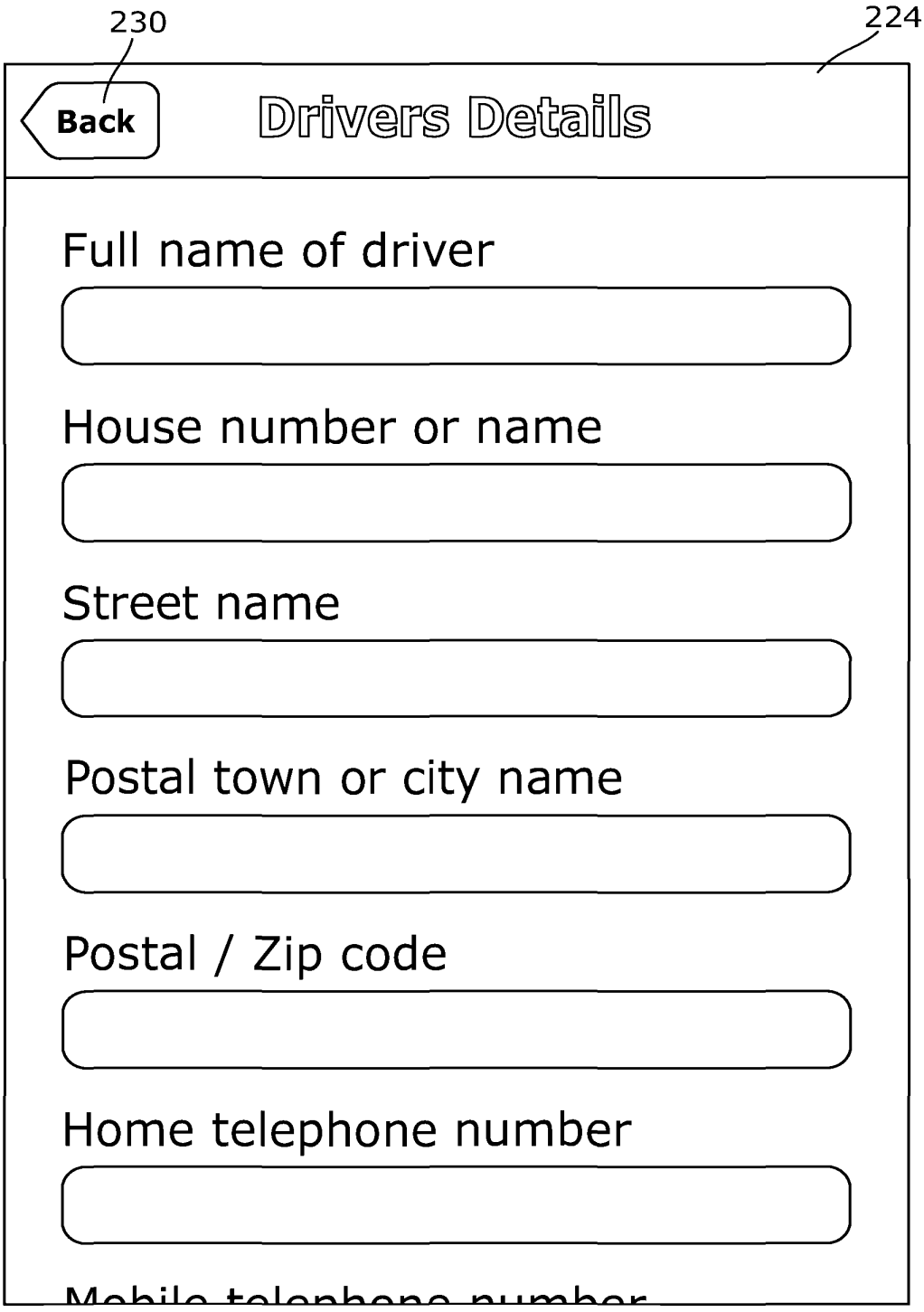

230
224
Back
Drivers Details
Full name of driver
House number or name
Street name
Postal town or city name
Postal / Zip code
Home telephone number
Mobile telephone number

Fig. 18

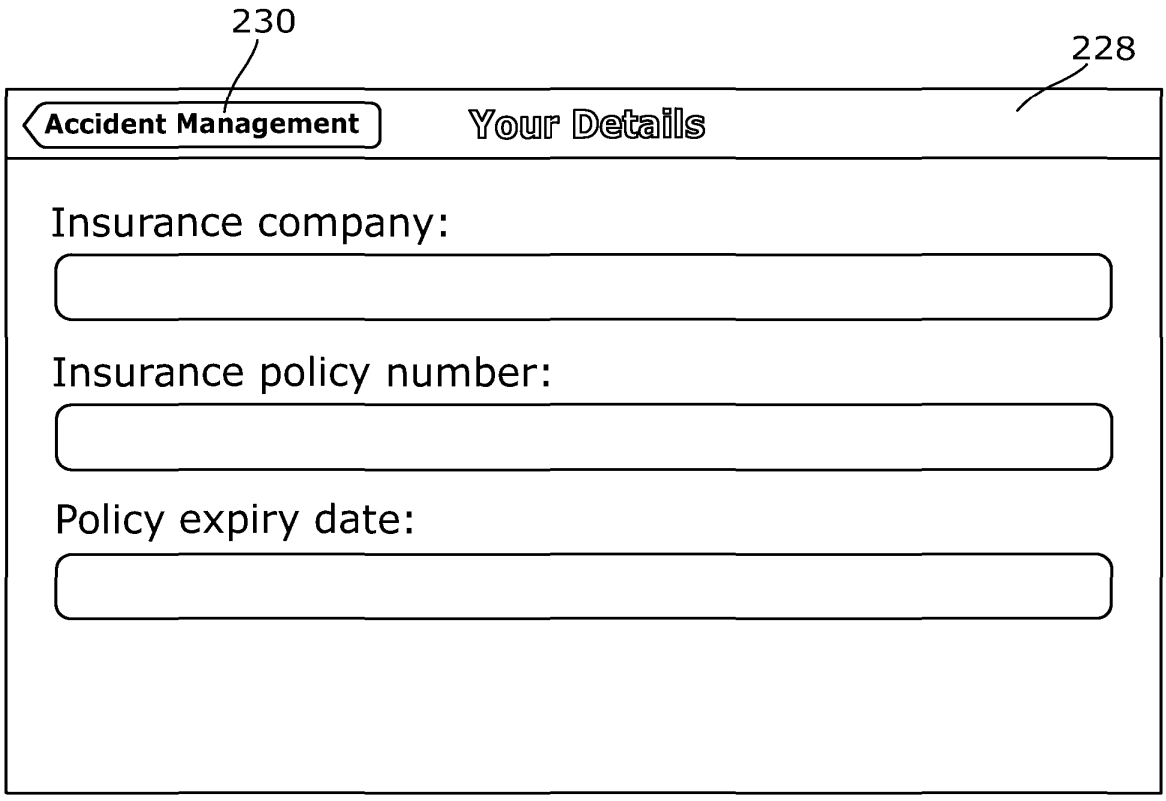

230
228
Accident Management
Your Details
Insurance company:
Insurance policy number:
Policy expiry date:

Fig. 19

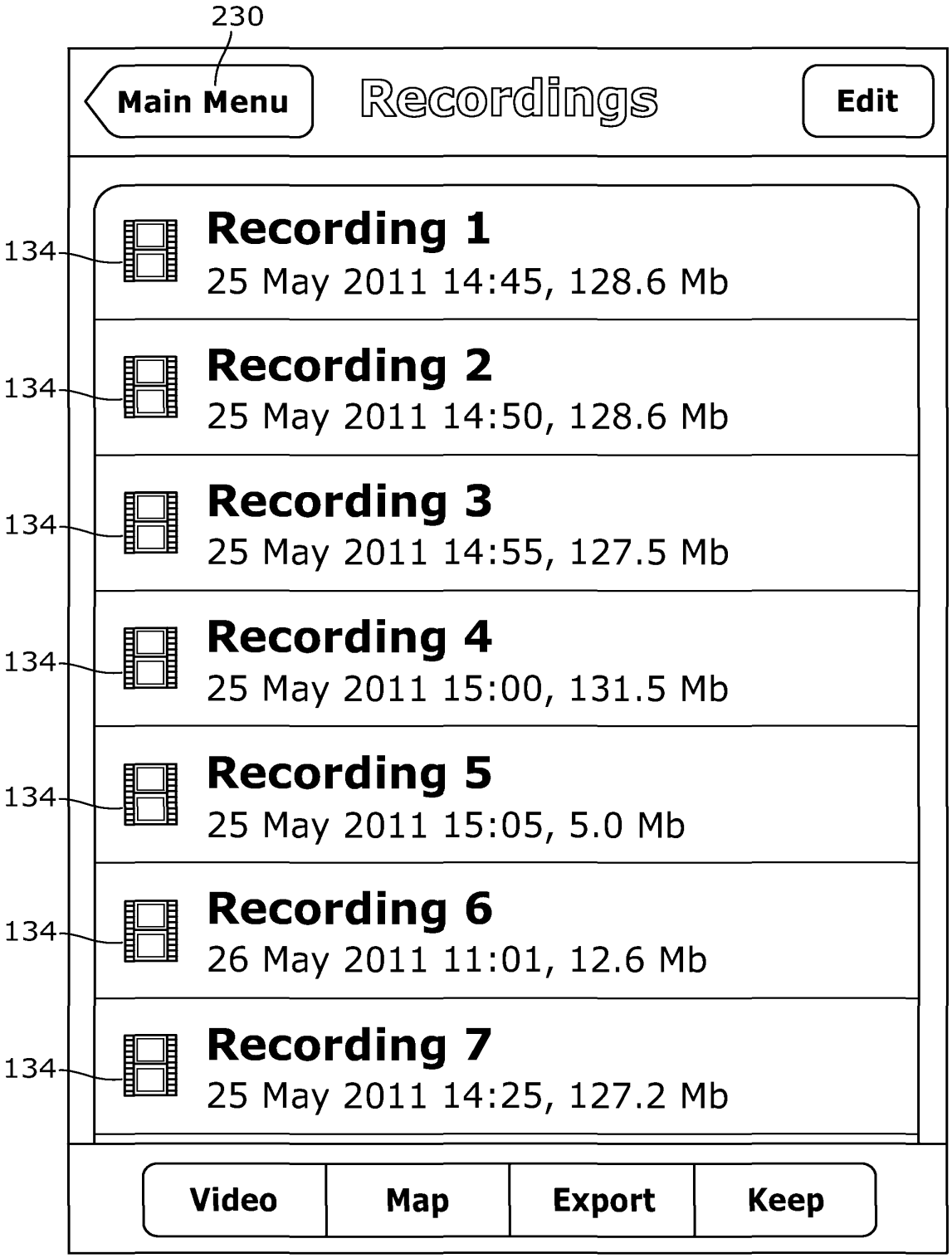

230
Main Menu
Recordings
Edit
134
Recording 1
25 May 2011 14:45, 128.6 Mb
134
Recording 2
25 May 2011 14:50, 128.6 Mb
134
Recording 3
25 May 2011 14:55, 127.5 Mb
134
Recording 4
25 May 2011 15:00, 131.5 Mb
134
Recording 5
25 May 2011 15:05, 5.0 Mb
134
Recording 6
26 May 2011 11:01, 12.6 Mb
134
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Fig. 20

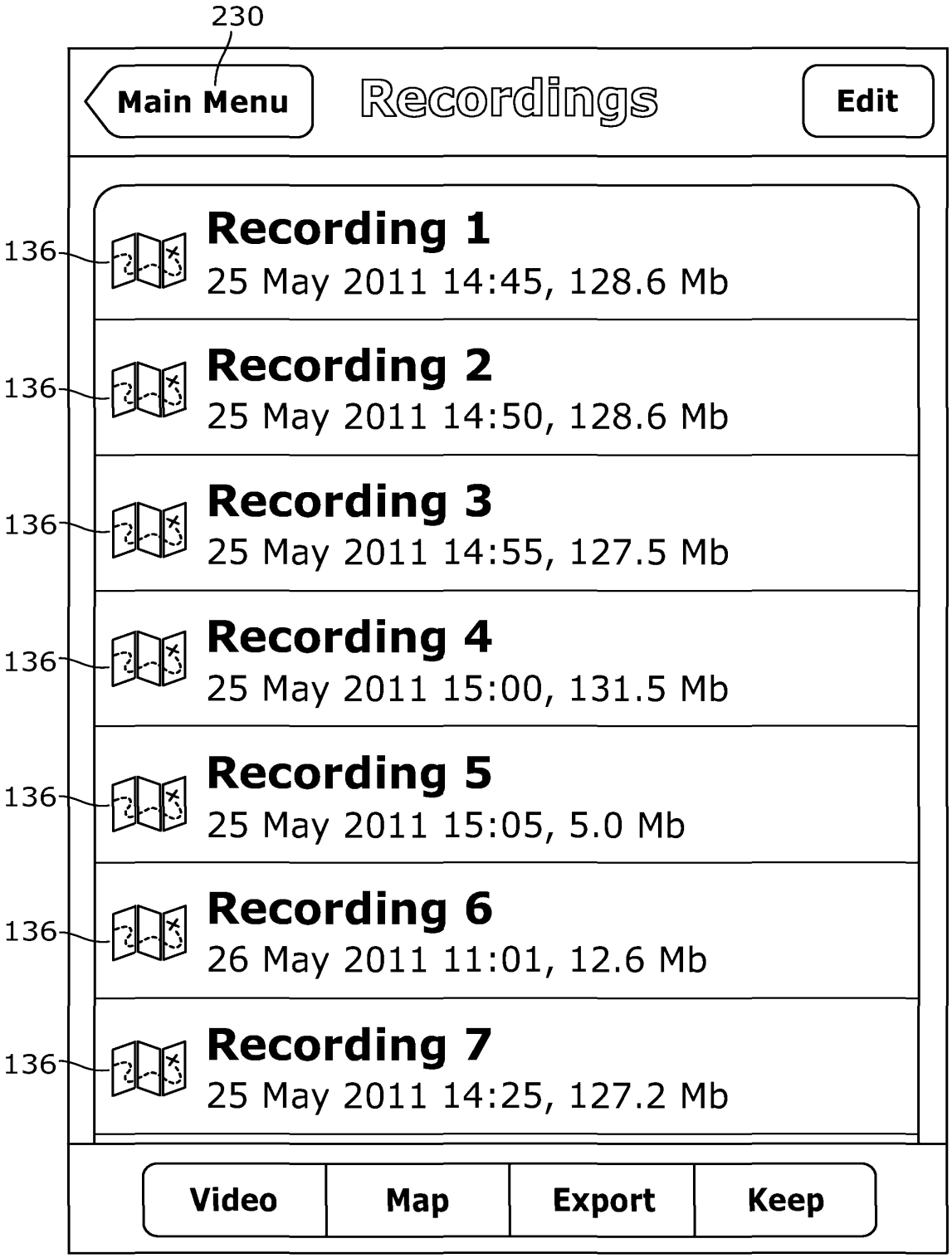

230
Main Menu
Recordings
Edit
136
Recording 1
25 May 2011 14:45, 128.6 Mb
136
Recording 2
25 May 2011 14:50, 128.6 Mb
136
Recording 3
25 May 2011 14:55, 127.5 Mb
136
Recording 4
25 May 2011 15:00, 131.5 Mb
136
Recording 5
25 May 2011 15:05, 5.0 Mb
136
Recording 6
26 May 2011 11:01, 12.6 Mb
136
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Fig. 21

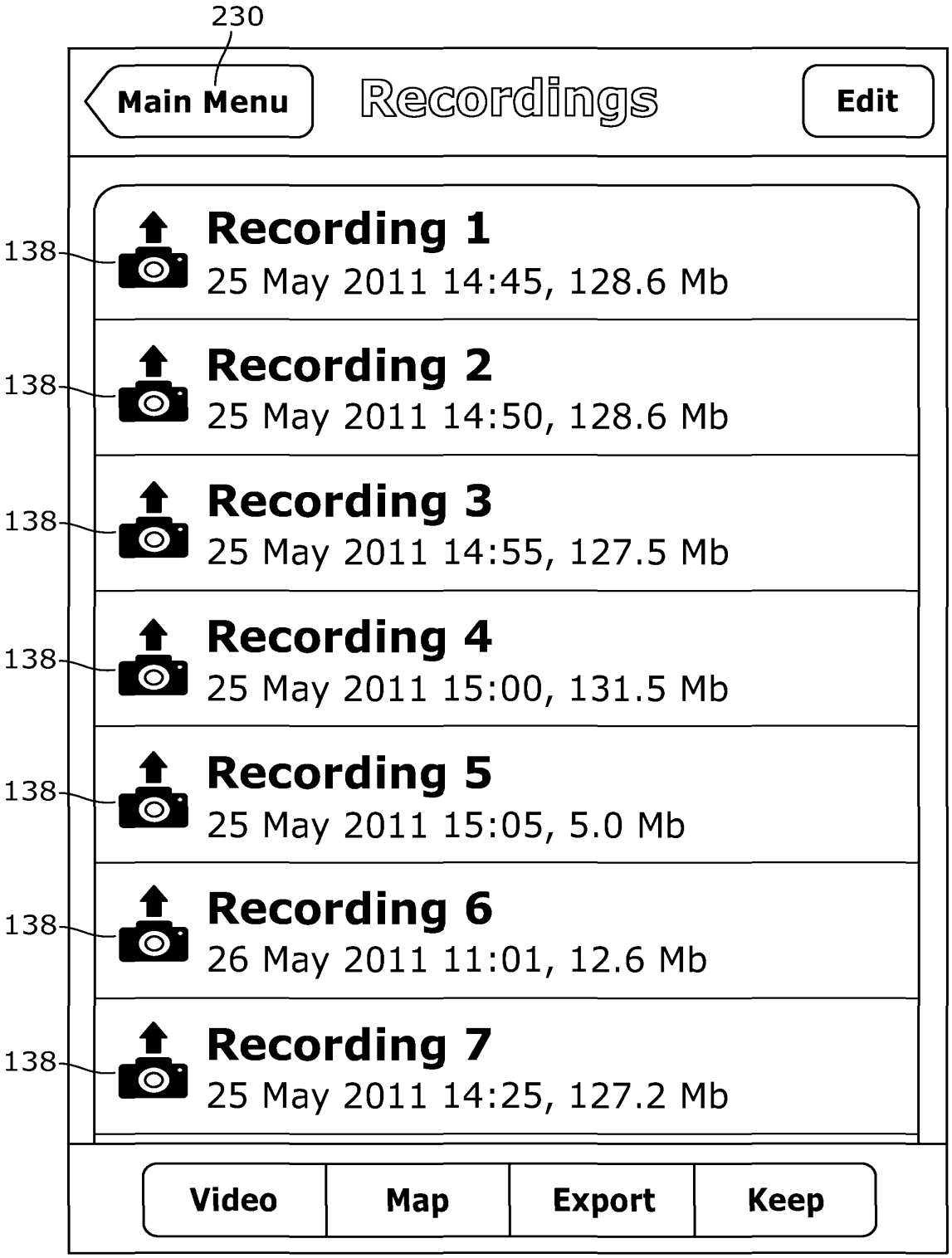

230
Main Menu
Recordings
Edit
138
Recording 1
25 May 2011 14:45, 128.6 Mb
138
Recording 2
25 May 2011 14:50, 128.6 Mb
138
Recording 3
25 May 2011 14:55, 127.5 Mb
138
Recording 4
25 May 2011 15:00, 131.5 Mb
138
Recording 5
25 May 2011 15:05, 5.0 Mb
138
Recording 6
26 May 2011 11:01, 12.6 Mb
138
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Fig. 22

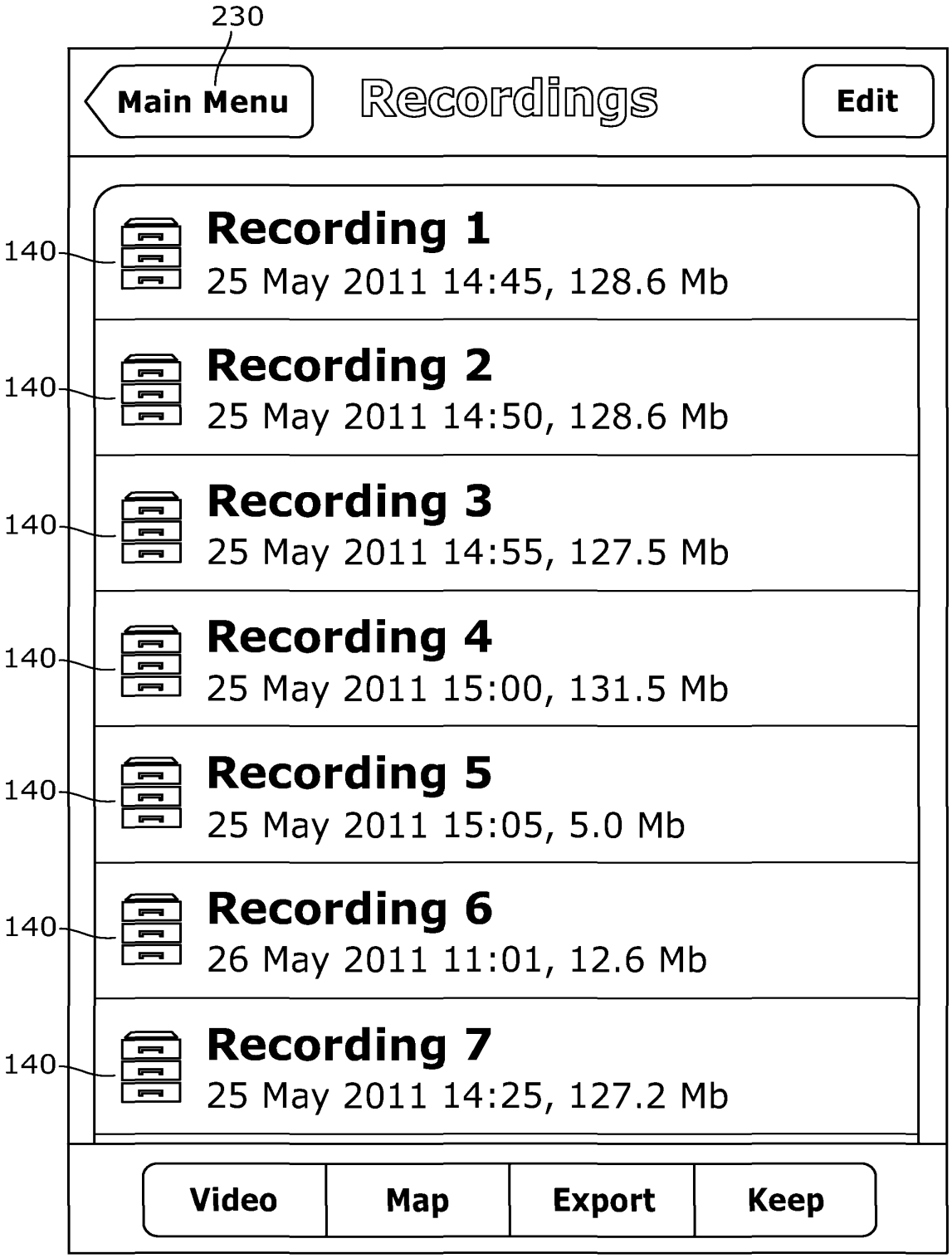

230
Main Menu
Recordings
Edit
140
Recording 1
25 May 2011 14:45, 128.6 Mb
140
Recording 2
25 May 2011 14:50, 128.6 Mb
140
Recording 3
25 May 2011 14:55, 127.5 Mb
140
Recording 4
25 May 2011 15:00, 131.5 Mb
140
Recording 5
25 May 2011 15:05, 5.0 Mb
140
Recording 6
26 May 2011 11:01, 12.6 Mb
140
Recording 7
25 May 2011 14:25, 127.2 Mb
Video
Map
Export
Keep

Fig. 23

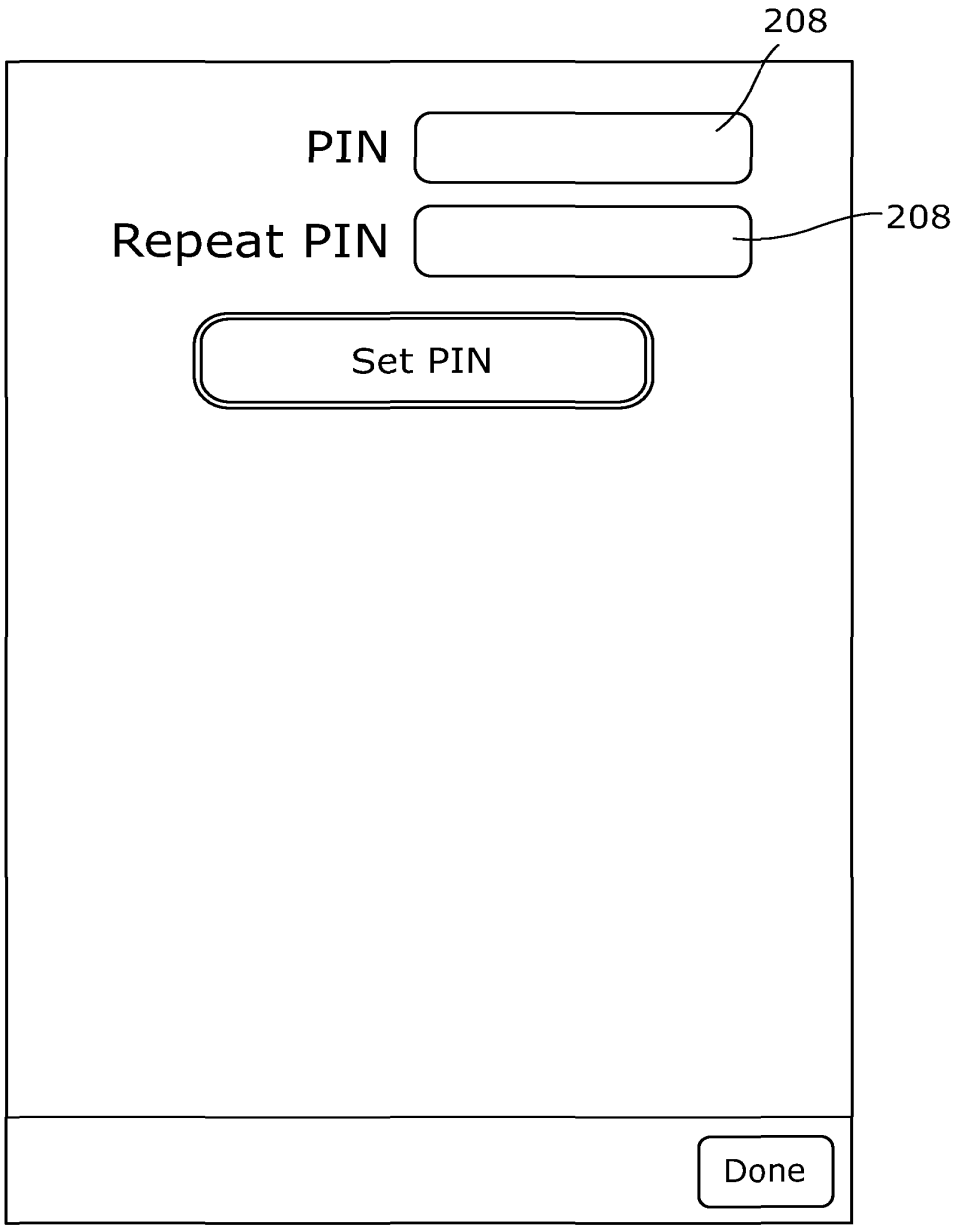


Fig. 24