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(54) Enhanced functions of a tachograph

(57) The present invention relates to a digital tachograph comprising a security protected case and at least one function module interface for communication of data between the tachograph and a connected external function module. The function module comprises at least one external function. The invention introduces means for recognizing different types of external functions of a connected external function module.

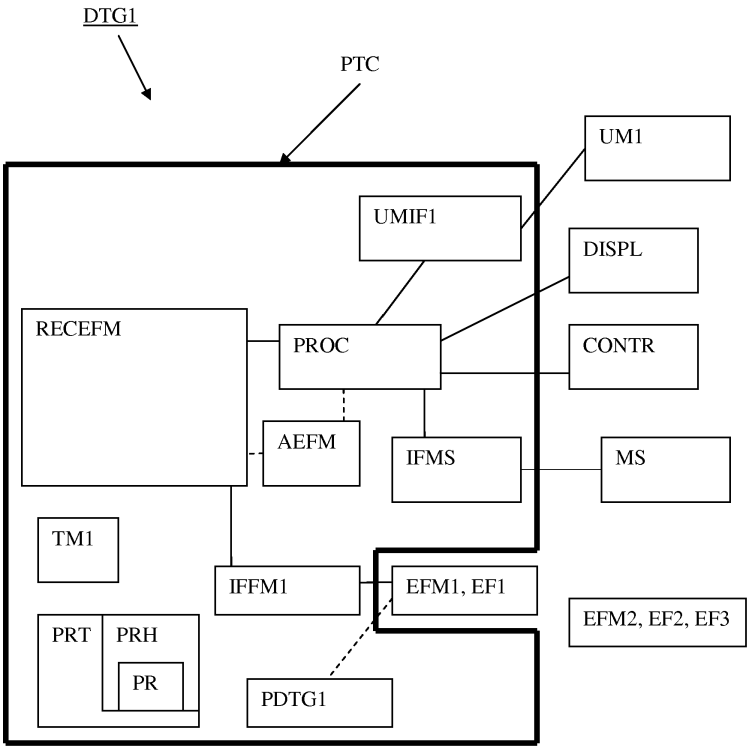

FIG 1

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Description

FIELD OF INVENTION

[0001] The present invention relates generally to tachographs, and particularly to a digital tachograph and an external function module for external functions.

BACKGROUND

[0002] Digital tachographs are like analogue tachographs used for gathering information relating to the usage of a vehicle, and to collection of driver activities, such as driving hours, distance traveled, start time, finish time, rest time, driver name, starting location and finishing location.

[0003] The digital tachograph is normally heavily regulated and must be certified to high standards regarding functionality, safety and security. It is therefore complicated to make changes and to e.g. add new functions. An extensive certification procedure can considerably contribute to a long time to market for changes and new functions.

[0004] One way to ameliorate or add new functions to a tachograph is to rebuild it of course. This is normally complicated and expensive and could take considerable time, partly due to the reasons mentioned above. Software could sometimes be upgraded but it is more cumbersome to upgrade hardware.

[0005] Hardware can be over specified for later system growth but will add an additional cost. The most obvious way to add on an external sub system is just to have it attached to one or several of the external connectors, and let the connector mechanics be the mechanically load bearing/stressed part of the interface. There already exist for instance external "dongles" on the market which can be connected to the front connector.

[0006] Another alternative can be to have an external unit connected with cables and fitted into a free compartment for electronics hardware in the vehicle, e.g. a free DIN slot. There are certain functions that can be added externally.

[0007] The solutions for upgrading a tachograph or add more functions, are today expensive and not very flexible or user friendly.

SUMMARY OF THE INVENTION

[0008] An object of the present invention is to provide a tachograph and a method facilitating upgrading a digital tachograph or adding new functions to it.

[0009] This object, among others, is according to the present invention attained by a digital tachograph and a method, respectively, as defined by the appended claims.

[0010] The invention discloses a tachograph suitable for connection to an external functional module. The tachograph comprises a security protected case and at least function module interface (IFFM1) for communication of data between the tachograph and a connected external function module. The function module comprises at least one external function. The invention introduces means (RECEFM) for recognizing different types of external functions of a connected external function.

[0011] Several embodiments, as defined by the claims, comprise different ways of use of, and adaption to, an external function module connected to the tachograph.

[0012] In one embodiment the function module interface is a secure interface. In another embodiment there is also a power interface between the tachograph and an attached external function module. Different mechanical solutions how to connect an external function module are defined in the different embodiment in the claims.

[0013] An advantage with the inventions is and easy, fast and cheap way to add new functions to a tachograph. Customized application could be added at reasonable costs.

[0014] Another advantage of some of the embodiments is that the same solutions could be used for different types of tachographs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The objects, advantages and effects as well as features of the present invention will be more readily understood from the following detailed description of exemplary embodiments of the invention when read together with the accompanying drawings, in which:

Fig. 1 schematically illustrates a digital tachograph according to the present invention.

Fig. 2 illustrates an example of a design of an external function module.

Fig. 3 illustrates examples of different mechanical solutions of external functions modules

DETAILED DESCRIPTION OF EMBODIMENTS

[0016] While the invention covers various modifications and alternative constructions, embodiments of the invention are shown in the drawings and will hereinafter be described in detail. However it is to be understood that the specific description and drawings are not intended to limit the invention to the specific forms disclosed. On the contrary, it is intended that the scope of the claimed invention includes all modifications and alternative constructions thereof falling within the spirit and scope of the invention as expressed in the appended claims.

[0017] Fig 1 illustrates a tachograph DTG1 according to the present invention.

[0018] The tachograph comprises a protected case PTC which is not to be open by a normal user without

authorization. Different security solutions is possible, e.g. an attached security label, or the case in itself, will be broken if the case is disassembled.

[0019] The protected case comprises a control function PROC for handling functions in the tachograph. The tachograph also comprises different tachograph basic functions e.g. storing of driving data, arithmetic units for different calculations, clock functions, encryptions functions etc. It also comprises at least one memory TM1 for storing data. All this functions could be distributed or integrated in the control function.

[0020] The tachograph in this particular embodiment also comprises a printer unit PRT, which comprises a paper roll holder PRH for holding a paper roll PR.

[0021] A user interface could be integrated in the protected case PTC or placed externally. The user interface consist in this particular embodiment of control knobs CONTR and a display DISP.

[0022] This embodiment also comprises the following interfaces which all could be wired or wired:

- A motion data interface IFMS for connection to a motions sensor MS
- A user identification interface UMIF1 for connection to a user module UM1
- A function module interface IFFM1 for data connection to an external function module EFM1, EFM2.
- If the external function module needs power, the tachograph could also have an interface PDTG1 for power connection to an external function module EFM1.

[0023] The function module interface could preferably have some security solutions. Different solutions are possible, e.g. some kind of encryption or safe protocol could be used.

[0024] The user module could comprise means for identification. It could also comprise memories and other functions. Tachographs use today driver cards with smart card interface as a user module.

[0025] The tachograph comprises means RECEFM for recognizing different types of external functions EF1, EF2, EF3 of a connected external function module EFM1, EFM2. When an external function module is attached, the tachograph will be informed of what kind of functions it comprises. The means for recognizing different types of functions EF1, EF2, EF3 could be manual or automatic, mechanical or electrical. Preferable RECEFM recognize the functions electrical via the data interface IFFM1 when an external function module is attached to the tachograph.

[0026] The tachograph has the possibility to recognize at least two different functions EF1, EF2, EF3. Examples of possible functions that could be recognized by the tachograph:

- data base function: the external function comprises data that could be retrieved by the tachograph, e.g. time, position (GPS), law requirements, personal data, authorization keys etc,
- arithmetic unit function: the external function can be used for calculations, e.g. calculations of time limits for driving time
- alarm functions, the external function comprises a warning system for make the drivers attention if certain values are out of range, e.g. speed limit
- telematic function: the external function is used as a download equipment of data from tachograph or driver data memory wireless to a memory or a server
- second motion sensor function: the external function is a second motion sensor and the tachograph can compare data from the first motion sensor and the second motion sensor
- memory function: the external function is a memory for storing data, e.g. driver related data from the tachograph or from driver data memory
- crash/event recorder function: the external function is a crash/event recorder that stores data registered by the tachograph
- area access payment: the external function has functions for payment of e.g. road tolls
- automatic diagnosis and fault detection: the external function can detect faults of the tachograph
- cargo information system: the external function keep track of cargo of a vehicle, e.g. temperature in the trailer, unload an load status
- mobile phone functions
- wireless interface e.g. Bluetooth, for communication of data between tachograph and external equipment
- geographical information, e.g. a GPS function
- user profiles: the tachograph adapts its functions in accordance with the settings in the user profile.

[0027] The external function module could also be configurable by the user or by the producer. This is an easy way to be able to get customized functions in a tachograph.

[0028] The information of what kind of external functions the external function module that is attached comprises could be used in several ways. User interface could be adapted to the need of the external function.

Processors and memories could be used different, menus in the display could be extended, interfaces could be adapted etc. Examples of tachograph adaptation to different external functions are:

- data base function: the tachograph uses specific field in the tachograph display
- arithmetic unit function: the tachograph communicate specific data with the external function, e.g. rest time
- telematic function: the tachograph communicate specific data with the external function, e.g. driving times
- second motion sensor function: the tachograph compares data between first and second motion sensor
- memory function: store certain data on the external function, e.g. different driver related data
- crash/event recorder function: the tachograph communicate specific data with the external function, e.g. speed or time,
- area access payment: the tachograph communicate specific data with the external function, e.g. driver related data
- cargo information system: the tachograph communicate specific data with the external function, e.g. driver related data, access codes
- area access: the tachograph communicate specific data with the external function, e.g. access codes

[0029] In the particular embodiment of fig.1 the tachograph also comprises means AEFM for adapting itself, at least partly, for using recognized types of external functions of a connected external function module. This means that less manual setting is needed. One example is that you do not have to manually inform the tachograph that the external functions is a second motion sensor and how it should use the data. The tachograph uses the data in a proper way automatically.

[0030] If the external function module needs power the tachograph could also have an interface PDTG1 for power connection to an external function module EFM1. This could be power for feeding the external function module or power for charging a power source in the external function module. This could be by wire or by wireless connection (inductive).

[0031] The external function module could also control a printer and/or a user interface, e.g. display or buttons, on the tachograph. For example, if an external function needs to print out some data, it could then use the already existing printer on the tachograph.

[0032] The illustration in fig. 1 is one way to design and connect the different building blocks of the tachograph, other ways are of course also possible.

[0033] Fig 2 illustrates an external function module EFM3. It comprises a data interface IFDT1 for connection to a tach0graph DTG2. It also comprises basic hardware HW and software SW. HW and SW could be configurable so that they can be adapted to demands from costumers. The EFM3 also comprises different external functions, EF11-13.

[0034] There could also be an interface for power feed PEFM1. This could be for connection to the tachograph but also for connection to any power source. The external function module could also comprise a rechargeable power source.

[0035] The external module could also comprise different kind of user interfaces MUIF, e.g. buttons or displays.

[0036] The external function module could also have a data interface for connection to a computer. A user could then customize the external function module via a computer before connect it to the tachograph.

[0037] Concerning the mechanical solution the tachograph can have a cavity corresponding to the size of an external function module in the tachograph case. The module will be mechanically situated outside the protected case. An electrical interface for data and/or power could be integrated in the cavity. This interface can be connected to a corresponding interface on the external function module when the module is placed in the cavity. This cavity could be on the backside. The external function module can also be connected via a wire to an electrical interface on the backside for the front side of the tachograph.

[0038] Fig 3a shows another mechanical solution. The external function module EFM4 is suitable for being placed in the paper holder for printing paper of a tachograph. A wire connected to the EFM4 could be made flat and flexible so it can go trough the paper slit and be attached to the front contact of a digital tachograph. The connections could also be wireless of course.

[0039] The paper roll has to be taken out of the paper holder for the described solution to work. One way to be able to keep the paper roll in the paper holder is to put the extended function module EFM6 in the middle of the paper roll, fig 3c. To make the interfaces against the tachograph less complicated they can preferable be wireless in this case.

[0040] If you have a detachable paper holder, as in the Stoneridge SE5000 for example, the whole paper holder can easily be replaced. You could then replace the entire printer paper holder with an extended function module. It can then be connected to the tachograph either through the front connector, through a flat cable which runs externally but recessed into the tachograph casing, or through a connector inside the printer compartment. This connector could be a special additional connector which can be used as an interface between tachograph and the

extension function module.

[0041] In the case of Stoneridge SE5000 the front connector is placed in the cavity for the paper holder and could preferably be used as interface between tachograph and EFM to get total integration.

[0042] It is also possible to integrate a small external functional module into a detachable paper holder EFM5 and in that way still have the paper holder function intact when you add new functions by changing the paper holder. This is illustrated in figure 3b. This solution does not affect any printer functions of the tachograph DTG3.

[0043] Another solution is to integrate the external function module in a user module. In that case you could integrate, at least part of, the tachograph interface for connection to a user module with the tachograph interface for data connection to an external function module.

[0044] It will be obvious that the present invention may be varied in a plurality of ways. Such variations are not to be regarded as departure from the scope of the present invention as defined by the appended claims. All such variations as would be obvious for a person skilled in the art are intended to be included within the scope of the present invention as defined by the appended claims.

Claims

1. A tachograph suitable for connection to an external functional module comprising:

   - a security protected case (PTC),
   - at least one, wired or wireless, function module interface (IFFM1) for communication of data between the tachograph and a connected external function module (EFM1, EFM2, EFM3), said external function module comprises at least one external function (EF1, EF2, EF3) **characterized in that** the tachograph comprises:
   - means (RECEFM) for recognizing different types of external functions of a connected external function module

2. A tachograph according to any of the preceding claims, comprising a, wired or wireless, module power feeding interface (PDTG1) for powering a connected external function module and/or for charging a power source in a connected external functional module

3. A tachograph according to any of the preceding claims, whereas the function module interface comprises a secure communication of data.

4. A tachograph according to any of the preceding claims, comprising means (AEFM) for adapt itself for using recognized types of external functions of a connected external function module

5. A tachograph according to any of the preceding claims whereas the recognition of functions and/or adaptation of the tachograph is done, at least partly, automatically when a external functional module is connected to the tachograph

6. A tachograph according to any of the preceding claims, which can adapt to a certain external function of connected functional module in at least one of the following ways:

   - add an extra menu, related to the external function, in a user interface of the tachograph,
   - configure a display of a tachograph to use a field in the display for displaying data related to the external function,
   - configure itself to transmit specific data to the external function,
   - configure itself to receive data from the external function,
   - configure itself so that a printer of a tachograph could be controlled by the external function

7. A tachograph according any of the preceding claims, whereas the function module interface comprises a mechanical interface consisting of at least one cavity or recess on the outside of the security protected case.

8. A tachograph according to any of preceding claims whereas the tachograph comprises a printer unit (PRT) for printing on paper, said printer unit comprises a paper holder (PRH) for a printing paper roll (PR), whereas the tachograph is configured to connect to an external function module (EFM4) received by the paper holder

9. A tachograph according to any of preceding claims whereas the tachograph comprises a printer unit, said printer unit comprises a mechanical interface for a detachable paper holder, whereas the tachograph is configured to connect to an external function module received by the mechanical interface for the detachable paper holder (PRH)

10. A tachograph according to any of preceding claims whereas the tachograph comprises a printer unit, said printer unit comprises a mechanical interface for a detachable paper holder, whereas the tachograph is configured to connect to an external function module (EFM5) integrated in a detachable paper holder

11. A tachograph according to any of preceding claims whereas the tachograph comprises a printer unit comprises a paper roll holder, whereas the tachograph is configured to connect to an external function module (EFM6) placed in the center of a paper roll

placed in the paper roll holder.

12. A tachograph according to any of preceding claims, whereas the tachograph is configured to connect to an external function module placed in a connected user module.

13. A tachograph according to any of the preceding claims whereas the functional module comprises at least one of the following functions which can be recognized and used by the tachgraph:

- location information
- area access payment
- arithmetic unit using data from tachograph and external functional module
- navigator
- mobile phone functions
- cargo information
- driver profiles for storing driver related data
- warning systems for e.g. driving time
- diagnosis and fault detection
- motion sensor
- crash/event recorder
- calculate drive time and warnings functions
- area access payment
- processor and memory programmable by a user for personalized functions
- telematic functions for wireless downloading data from tachograph or driver data memory
- data base function for storing e.g. driver related data
- user profiles for adapting the tachograph to personal settings of a user

14. A detachable extended function module (EFM1-EFM6) configured for connection to a tachograph according to any of claims 1-12, comprising:

- mechanical interface for connection to a tachograph
- tachograph data interface (IFTD1) for connection to a tachograph
- at least one external function (EF11, EF12, EF13) that can be recognized and used by a tachograph

15. An extended function module according to claim 13 further comprising:

- a power interface (PEFM1) for receiving power

16. An extended function module (EFM4, EFM6) according to claim 13 or 14 configured to be able to be received and connected to a tachograph by at least one of the following mechanical interfaces of a tachograph comprising a printer unit for printing on paper:

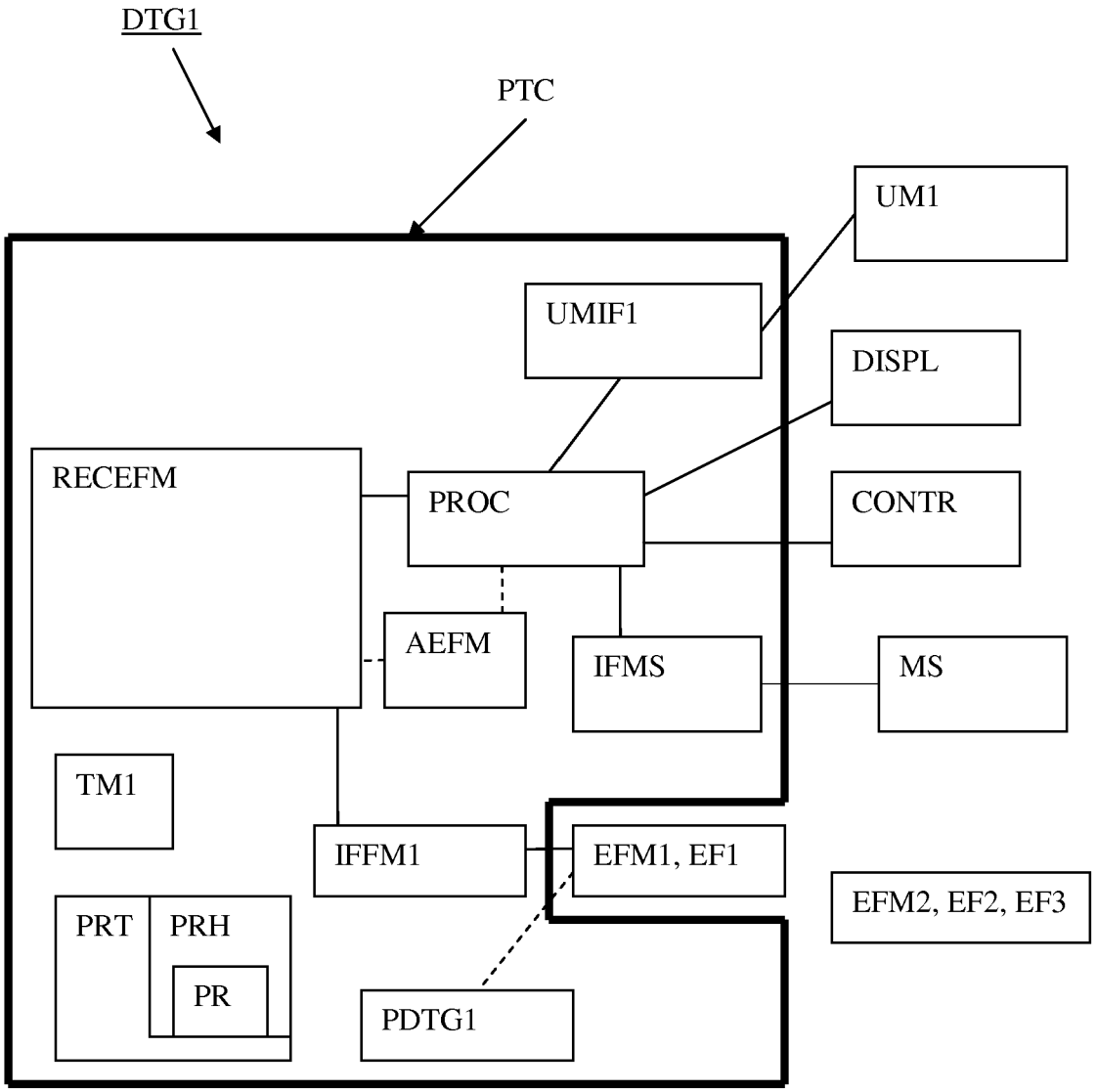
- the paper holder interface of the printer unit,
- the paper roll interface of the printer unit, or
- the centre of a paper roll for a the printer unit

17. An extended function module according to any of claims 13 to 15 integrated in a user module or in a paper holder (EFM5) of a printer unit of a tachograph

18. An extended function module according to any of claims 13 to 16 comprising a module user interface (MUIF), e.g. a display

19. An extended function module according to any of claims 13 to 17 comprising at least one of the following external functions:

- location information
- area access payment
- arithmetic unit using data from tachograph and external functional module
- navigator
- mobile phone functions
- cargo information
- driver profiles for storing driver related data
- warning systems for e.g. driving time
- diagnosis and fault detection
- motion sensor
- crash/event recorder
- calculate drive time and warnings functions
- area access payment
- processor and memory programmable by a user for personalized functions
- telematic functions for wire-less downloading data from tachograph or driver data memory
- data base function for storing e.g. driver related data
- user profiles for adapting the tachograph to personal settings of a user


DTG1
PTC
UM1
UMIF1
DISPL
RECEFM
PROC
CONTR
AEFM
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IFFM1
EFM1, EF1
EFM2, EF2, EF3
PRT
PRH
PR
PDTG1

FIG 1

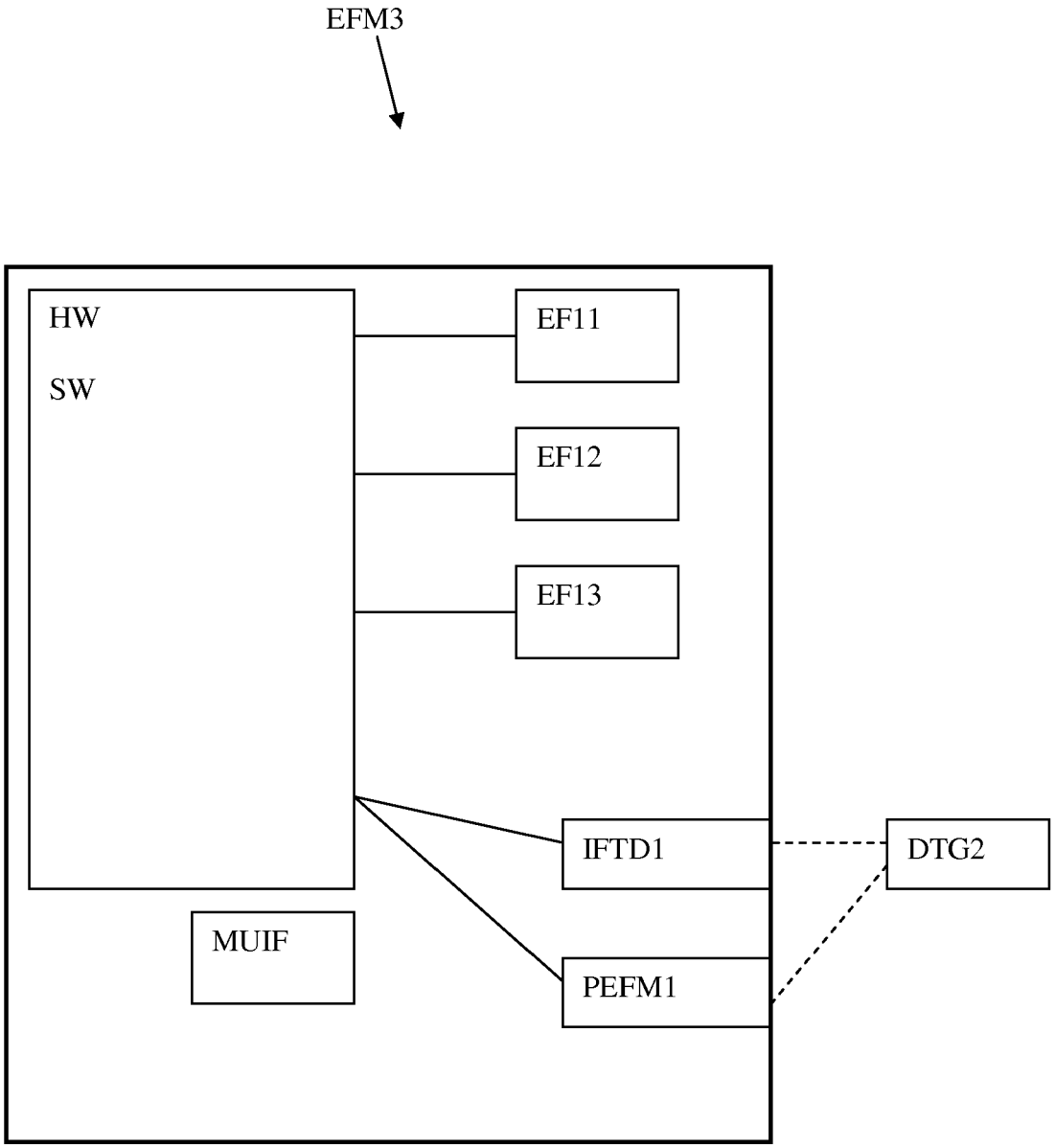

FIG 2

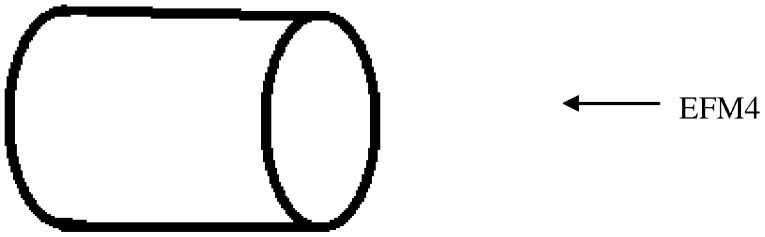

FIG 3a

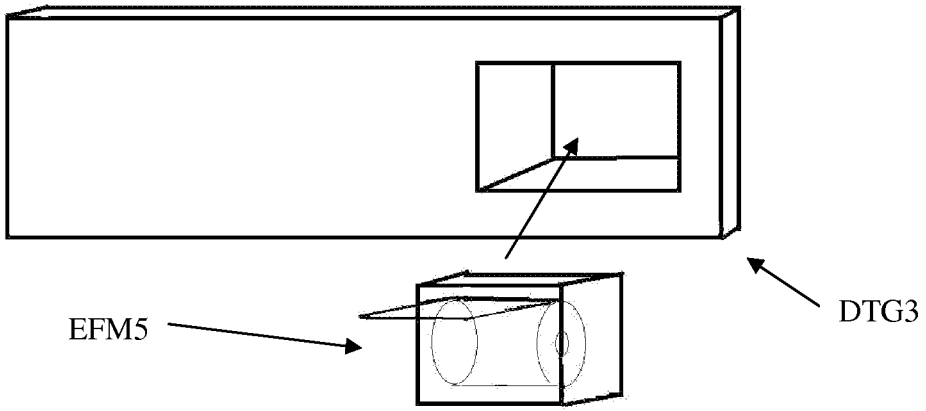

FIG 3b

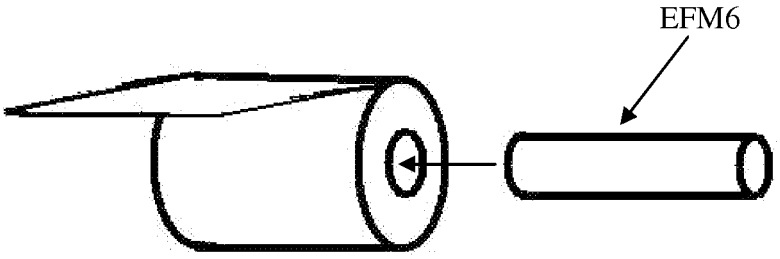

FIG 3c

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 4288

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	FR 2 878 355 A1 (ACTIA SA [FR]) 26 May 2006 (2006-05-26) * figure 1 * * page 2, line 9 - line 17 * * page 3, line 12 - line 13 * * page 7, line 10 - page 9, line 26 * * page 10, line 29 - page 11, line 6 * * page 14, line 3 - line 5 * * page 15, line 3 - line 7 * -----	1-3,7, 12-14,19 4-6,9, 10,16-18	INV. G07C5/08 G07C7/00
X A	DE 10 2007 058163 A1 (CONTINENTAL AUTOMOTIVE GMBH [DE]) 23 April 2009 (2009-04-23) * figure 1 * * paragraph [0010] - paragraph [0011] * * paragraph [0071] - paragraph [0075] * * paragraph [0089] - paragraph [0090] * * paragraph [0104] * -----	1,3,14 6,13,19	
Y A	DE 10 2005 022115 A1 (SIEMENS AG [DE]) 16 November 2006 (2006-11-16) * claim 1 * * figures 1-6 * * paragraph [0005] * * paragraph [0008] * -----	4-6 13,19	TECHNICAL FIELDS SEARCHED (IPC) G07C B60R B41J
Y A	EP 1 615 178 A2 (EAS SURVEILLANCE GMBH [DE]) 11 January 2006 (2006-01-11) * paragraph [0044] * * paragraph [0011] * * paragraph [0048] * * paragraph [0075] * -----	18 2,13,19	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 October 2010	Roth, Lucia

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons
.....
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2

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 4288

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 6 287 028 B1 (SILVERBROOK KIA [AU]) 11 September 2001 (2001-09-11) * column 18, line 35 - line 42 * * column 3, line 13 - line 63 * -----	8-11,16, 17	
A	EP 1 575 000 A1 (DELPHI TECH INC [US]) 14 September 2005 (2005-09-14) * paragraph [0001] - paragraph [0008] * * paragraph [0024] - paragraph [0029] * -----	8-11,16, 17	
			TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	20 October 2010	Roth, Lucia

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
O : non-written disclosure
P : intermediate document

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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
EP 10 15 4288

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 10 15 4288

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7, 14, 15(completely); 12, 13, 18, 19(partially)

   Digital tachograph and module for expanding functionality of the tachograph, by means of adapting the tachograph according to the module.

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2. claims: 8-11, 16, 17(completely); 12, 13, 18, 19(partially)

   Tachograph with printer and paper holder comprising mechanical fixing means for an electronic device.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 15 4288

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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20-10-2010

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