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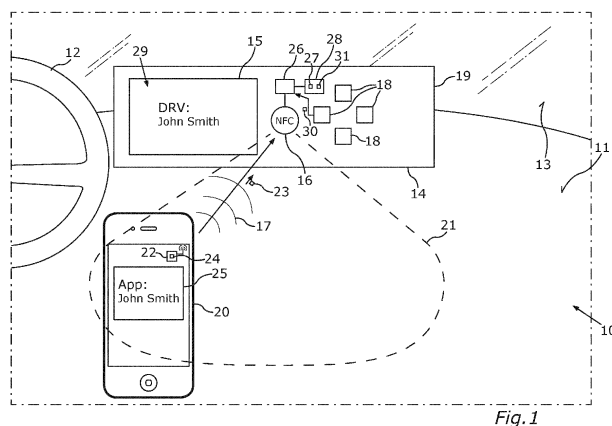
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(54) **METHOD FOR REGISTERING AND/OR DE-REGISTERING A USER AS A CURRENT DRIVER IN A DIGITAL TACHOGRAPH OF A VEHICLE, CORRESPONDING TACHOGRAPH AND VEHICLE**

(57) The invention is concerned with a method for registering and/or de-registering a user as a current driver in a digital tachograph (14) of a vehicle (10). A receiving unit (16) of the tachograph (14) detects the presence of the mobile device (20) of the user in a predefined limited notification zone (21) of the tachograph. If the receiving unit (16) detects the mobile device (20) in the notification zone (21), the receiving unit (16) requests and/or receives an identification code (23) by means of a predefined wireless transmission technology (17) from the mobile device. A processing unit (26) of the tachograph (14) searches for user identification data (27) in a data storage (28) of the tachograph (14), wherein in the data storage

(28) the user identification data (27) is associated with the received identification code. If the user identification data are available, the processing unit (26) triggers a predefined registration dialog for displaying the user identification data (27) to the user and for receiving a user confirmation input (30) that confirms that the user wants to register or deregister as the driver of the vehicle. The processing unit (26) sets status data (31) in the tachograph (14) in accordance with the received user confirmation input (30), wherein the status data (31) indicate whether the user is currently registered or de-registered as the driver of the vehicle (10).



Description

[0001] The invention is concerned with a method for registering and/or de-registering a user as the current driver in a digital tachograph of a vehicle. The invention also provides a tachograph that is operated according to the inventive method as well as a vehicle that comprises such a tachograph.

[0002] Vehicles like trucks comprise digital tachographs to track driving and rest times of a driver. When a user takes over a shift as the driver, the user need to registers in the tachograph as the current driver. After the shift, the user needs to de-register again. The time between the registering and the de-registering can be counted as the driving time or working time of that user.

[0003] Tachograph systems use different technologies for identifying the current driver of the vehicle and for storing driver related status data. For example, in North-Africa the driver has to sign a diagram chart. The diagram chart is basically a paper disc where driving time, speed and rest times are shown. A pen marks the individual activity while the disc slowly rotates underneath the pen. In Europe, smart cards are used. Besides the driver identification, driving time, rest times and additional tachograph data is electronically stored in encrypted data sets. For identification of the driver common digital tachographs can comprise a reader for specific identity cards. The login procedure at common digital tachographs comprises an insertion of a driver's identity card into the reader of the digital tachograph. The identity card comprises data to identify the driver. In Brazil, the driver identification process used in most digital tachographs is the manual entry of driver data, but there are other options available e.g. via USB sticks (USB - universal serial bus) or via RFID cards (RFID - radio frequency identification). Driver data as well as tachograph data is stored inside the tachograph.

[0004] In Europe and in AETR countries (AETR - Accord European sur les Transports Routiers) the legislation has defined that driver identification has to be done in conjunction with a driver card. For fleet owners, a company card is used to assign all drivers to a company. In other countries, for example in Brazil, where also a tachograph legislation exists, driver identification has to be done manually because no secure card ecosystem has been defined in the regulation. Tachograph manufacturers have developed different concepts in order to make the registration process more comfortable in the tachograph.

[0005] But it has been observed that using the tachograph keys on the front panel for entering the name or using smartcards, USB-sticks or dedicated smart cards with RFID technology are not comfortable and therefore drivers sometimes even forget to register or de-register as the driver of a specific vehicle. Additionally, a USB stick may get lost because it is seen as a commodity and may also be used in conjunction with notebooks/PCs for personal data exchange.

[0006] For big fleets, the manual driver identification is not an easy and user-friendly process and takes times to be done, despite of the limitation given related to number of users to be added (generally not more than up to 50). Whereas using smartcards, USB-sticks or dedicated smart cards with RFID technology is not comfortable, as a specific tool needs to be carried by the driver.

[0007] It is an object of the present invention to support a user in registering and/or de-registering as the current driver in a tachograph of a vehicle.

[0008] The object is accomplished by the subject matter of the independent claims. Advantageous developments with convenient and non-trivial further embodiments of the invention are specified in the dependent claims, the following description, and the drawings.

[0009] The invention is based on the idea that a tachograph in a vehicle may establish a wireless connection to a mobile device (like, e.g., a mobile phone or smart-phone) and the tachograph may then read out of that mobile device all the information concerning a user, such that the user may be automatically registered or de-registered at the tachograph based on those information. All the user needs to do is to hold the own mobile device close to the tachograph and the tachograph will identify the user based on an identification code from that mobile device and register the user as the current driver. Likewise, for de-registering, the user only needs to hold the mobile device close to the tachograph again and the user will be de-registered.

[0010] The invention provides a method for registering and/or de-registering a user as a current driver in a digital tachograph of a vehicle. The method comprises the following steps:

- a receiving unit of the tachograph detects the presence of the mobile device of the user in a predefined limited notification zone adjacent to the tachograph;
- if the receiving unit detects the mobile device in the notification zone, the receiving unit requests and/or receives an identification code by means of a predefined wireless transmission technology from the mobile device;
- a processing unit of the tachograph searches for user identification data in a data storage of the tachograph, wherein in the data storage the user identification data is associated with the received identification code;
- if the user identification data are available, the processing unit triggers a predefined registration dialog for displaying the user identification data to the user and for receiving a user confirmation input that confirms that the user wants to register or de-register as the driver of the vehicle;
- the processing unit sets status data in the tachograph in accordance with the received user confirmation input, wherein the status data indicate whether the user is currently registered or de-registered as the driver of the vehicle.

[0011] The receiving unit will not detect the mobile device anywhere inside the vehicle, but rather only in a limited notification zone inside the vehicle, for example, only at a distance of a maximum value smaller than 30 cm from the tachograph. This ensures that not any mobile device that is brought inside the vehicle will trigger the registration dialog. The user needs to actively hold the mobile device close to the receiving unit, i.e. into the notification zone. When a mobile device is inside the notification zone, the said wireless connection is established such that the processing unit of the tachograph may identify the user. To this end, the mobile device itself only needs to provide an identification code, such that a mobile device itself does not necessarily need to be equipped with the user identification data. The user identification data (for example, a name of the user) only needs to be provided in the data storage of the tachograph itself. The processing unit will associate the received identification code with the corresponding user identification data.

[0012] In order to prevent an accidental registration or de-registration, the processing unit will additionally trigger the registration dialogue that needs to be handled or answered by the user. Thus, even if the data storage comprises the user identification data, i.e. the user is known to the tachograph, this does not automatically continue the registration or de-registration, but rather only the registration dialogue is triggered. Only when the user confirms the will of registering or de-registering, the processing unit will set the corresponding status data in the tachograph. The status data may comprise, for example, a driving time or a pausing time and/or driven speed values.

[0013] The method provides the benefit that a two-way confirmation or authentication is provided. Thus, although the user only needs to hold the mobile device into the limited notification zone for starting the registration or de-registration, it is still reliably prevented that this will accidentally trigger the change of the status of the user as driver or as "non-driver". The registration dialogue ensures that the user actively confirms the input. Nevertheless, the procedure is highly comfortable as moving the mobile device into the notification zone and then pressing a button for confirmation on a registration dialogue can be done with one hand or even in one movement.

[0014] The invention also comprises embodiments that provide additional technical advantages.

[0015] The registration / de-registration should be independent of any internet connection. One embodiment comprises that the processing unit requests an identification code that is permanently stored in the mobile device and thus available in the mobile device without the need of an internet connection while the mobile device is located in the notification zone. In other words, while the mobile device is inside the vehicle or inside the notification zone, the mobile device does not need to operate an internet connection to connect to a server of the internet. All the data needed for registering or de-register-

ing the user at the tachograph (i.e. the identification code) are stored inside the mobile device itself. This makes operating the tachograph possible even in areas where no internet connection is available, for example, in rural areas or in mountainous areas.

[0016] One embodiment comprises that as the mobile device a mobile phone is detected. In other words, the identification code is provided by a mobile phone. It can be expected that a mobile phone is considered to be valuable by the user. Consequently, the user will take care of the own mobile phone. A mobile phone is also called smartphone. In contrast to a USB stick or an RFID-card, a mobile phone is less likely to be forgotten or lost by a user, as a mobile phone also provides additional functionality (telephone calls, internet access). Therefore, the user does not have the burden of carrying a specific tool for registering at the tachograph.

[0017] Limiting the notification zone is preferably limited to a maximum distance less than 50 cm from the tachograph or its receiving unit. One embodiment comprises that the wireless transmission technology comprises a near field communication, NFC, for which the receiving unit operates an electromagnetic coil for generating and/or receiving an alternating magnetic field, and wherein the receiving unit reads out the identification code from a microchip of the mobile device. NFC provides the advantage that any accidental wireless connection of the tachograph to any mobile device in the vehicle is prevented by the short range for receiving and sending data. Additionally, a mobile device with NFC-technology can also be used for other purposes, for example, wireless payment functionalities and/or identification functionalities at other devices than a tachograph. The identification code may be accessed via the NFC by the receiving unit of the tachograph without any contribution of the user (other than holding the mobile device inside the notification zone). Thus, no operation of elements like a button is required while the user is holding the mobile device inside the notification zone. Using NFC also provides the advantage that encrypted data transfer and/or a digital signature may be provided by the microchip of the mobile device that is part of the NFC technology.

[0018] One embodiment comprises that the identification code identifies the mobile device and/or a transmission circuit of the wireless transmission technology and is independent of the user. In other words, any user may use the mobile device for registering or de-registering at the tachograph without a specific preparation of the mobile device. The connection or the association of the identification code to the name of the user or, in general, the user identification data is provided in the tachograph itself. One example of an appropriate identification code is a MAC address (MAC - media access control) or an ID of an NFC microchip or a SIM (Subscriber Identity Module). Alternatively, the identification code identifies the user independently of the mobile device. This provides the advantage that the user may change the mobile device and equip the new mobile device with the same

identification code without any need to adapt the tachograph. The identification code may comprise the name of the user or a user-specific driver number. Alternatively, the identification code identifies a unique combination of the user and the mobile device. This provides the advantage that only one specific user may use this one specific mobile device for the registration and/or de-registration.

[0019] Alternatives or supplements to the NFC technology may be utilized. One embodiment comprises that the wireless communication technology comprises a transmission of the identification code on the basis of a flashing light pattern generated by a flashlight of the mobile device and received by a photo diode of the receiving unit. This provides the advantage that metal objects cannot disturb the transmission of the identification code. In contrast to this, metal may disturb electromagnetic waves due to reflections. This embodiment may be based on the so called Li-Fi technology. In one embodiment, a QR-Code is displayed on a display screen of the mobile device and it is read by a camera of the receiving unit. This provides the advantage that the QR-Code may be dynamically generated and may therefore comprise additional security data, for example, a time stamp. In one embodiment, an infrared signal is sent out by the mobile device and it is received by an infrared sensor of the receiving unit. This provides the advantage that the identification code may also be transferred in light conditions where bright day light may have an influence on a transmission based on a flashlight. In one embodiment, an acoustic signal is sent out by a loudspeaker of the mobile device and it is received by a microphone of the receiving unit. This provides the advantage that no exact positioning of the mobile device inside the notification zone is needed as sound may also reach the microphones by way of reflection or deflection. The identification code may be transformed into the acoustic signal by means of an electronic modem circuit. In one embodiment, a vibration signal is generated by a haptic actuator of the mobile device and it is received by an acceleration sensor of the receiving unit. This provides the advantage that the mobile device may use the haptic actuator that is available in the mobile device for haptic feedback also, as, for example, for simulating the clicking of a keyboard key or for a non-acoustical announcement of a telephone call.

[0020] One embodiment comprises that a maximum extent of the limited notification zone is set by a signal strength of the receiving unit and the extent allows a communication at a maximum distance value that is less than 20 cm between the mobile device and the receiving unit. In other words, the described limitation of the notification zone is intrinsic by choosing the signal strength such that that outside the resulting reception zone, a signal of the mobile device may not be received by the receiving unit due to the insufficient signal strength for successfully receiving and/or decoding the received identification code. A maximum distance value less than 20 cm reliably avoids an accidental setup of a wireless connection between the receiving unit of the tachograph and the mobile

device.

[0021] One embodiment comprises that the presence of the mobile device is detected by the receiving unit on the basis of the following steps: request messages are sent out at predefined time intervals (in the range of, e.g., 0.1 s to 2 s) and an answer of the mobile device to one of the request messages is received. In other words, the receiving unit is actively scanning or searching for a mobile device by sending request messages at predefined time intervals. This process is also called "polling". The receiving unit will therefore only accept a mobile device whenever it is sending out request messages itself. This can be used, for example, for preventing an accidental registration or de-registration. For example, an operating element, for example, a switch or a button, may be provided at the tachograph for starting this procedure of sending out request messages. Additionally or alternatively, the "polling" may be started whenever the ignition of the motor vehicle is turned on. Before the start, a mobile device may be held inside the notification zone without the consequence of triggering the registration dialogue as no request messages will be sent out for detecting the mobile device. Alternatively, the receiving unit is operated in a listening mode and a notification signal of the mobile device is received. This provides the advantage that the receiving unit will react as soon as a mobile device is sending out a notification signal inside the notification zone. The user does not have to wait until the next request message is provided like in the case of the described "polling". Alternatively, the receiving unit operates a proximity sensor (capacitive or magnetic) that is coupled to an electronic circuit that provides the wireless communication technology. In other words, a second detection technology, i.e. a proximity sensor, triggers the receiving unit for detecting or accepting the identification code via the wireless connection technology.

[0022] So far, only the case of an already known user has been discussed, i.e. user identification data exist in the data storage of the tachograph. One embodiment comprises that, if the user identification data are missing in the data storage, a notification dialog for entering new user identification data is displayed, wherein, if a current user is already active, the current user is automatically de-registered. If the data storage does not comprise or contain user identification data that match or are associated with the received identification code, the new user will automatically be provided with the possibility of entering the new user identification data by means of a notification dialogue. Such a notification dialogue and a registration dialogue may be based on a graphical user interface that may be displayed on a display that may be part of the tachograph or the mobile device. If the new user triggers the notification dialogue while another user is already registered as current driver, the current user will be automatically de-registered, as it is clear that a new user now tries to become the driver.

[0023] One embodiment comprises that the registration dialog is displayed on a display of the tachograph.

In other words, the registration dialogue may be displayed on the tachograph such that the mobile device does not need to be equipped for displaying a registration dialogue. Such an application software (also called "app") may be installed in the computer system of the mobile device. The user may be provided with the registration dialogue on the display of the mobile device, such that the user may enter the described user information input by means of the mobile device. The user does not need to stretch out a hand to reach the tachograph in the vehicle. The user information input may then be transferred to the tachograph by means of the wireless connection technology or an additional communication technology, for example, Bluetooth or WiFi. Alternatively, the registration dialog is displayed on a display of the mobile device by means of triggering an application software in the mobile device via the wireless communication technology.

[0024] One embodiment comprises that the processing unit stores historic status data of the user in the data storage and sends the historic status data to a billing software of the mobile device and/or a data archiving software. The historic status data of the user may describe past drives with the vehicle that were performed by the user. By transferring the historic status data to the mobile device, the user may be provided with a balance or a proof that the user has worked a certain amount of working time. For example, the billing software may enable the mobile device to transfer the historic status data from the tachograph to a server of the employee of the user where the user may upload the historic status data in order to receive a payment. A data archiving software may be used by a company in order to archive driver data that has to be shown to control authorities in the scope of enforcement.

[0025] One embodiment comprises that the processing unit stores collected historic status data of several different users and provides the collected historic status data to a data interface, if a predefined master password is provided to the processing unit. In other words, an authorized person who knows the master password may get an overview of the usage of the vehicle on the basis of collected historic status data of the several users.

[0026] One embodiment comprises that a two-way authentication procedure is provided in that a random code number is generated in the tachograph by the processing unit and then the random code number is shown on the tachograph display and also transmitted to the mobile phone. This ensures that the correct mobile phone is used.

[0027] The invention also provides a digital tachograph for a vehicle, where the tachograph comprises a receiving unit for a predefined wireless communication technology and a processing unit, wherein the receiving unit and the processing unit are designed to perform a method according to any of the preceding claims. The tachograph allows a user to register as a driver at the beginning of a drive and/or to de-register at the end of the drive.

[0028] The invention also provides a vehicle with an embodiment of a tachograph according to the invention. The vehicle can be designed as a truck or a passenger vehicle (e.g. a taxi). The tachograph may be installed next to a driving wheel in a center console or a dashboard of the vehicle.

[0029] The invention also comprises the combinations of the features of the described embodiments.

[0030] In the following an exemplary implementation of the invention is described. The figures show:

Fig. 1 a schematic illustration of an embodiment of the inventive vehicle with an inventive tachograph; and

Fig. 2 a diagram for illustrating an embodiment of the inventive method.

[0031] The embodiment explained in the following is a preferred embodiment of the invention. However, in the embodiment, the described components of the embodiment each represent individual features of the invention which are to be considered independently of each other and which each develop the invention also independently of each other and thereby are also to be regarded as a component of the invention in individual manner or in another than the shown combination. Furthermore, the described embodiment can also be supplemented by further features of the invention already described.

[0032] In the figures elements that provide the same function are marked with identical reference signs.

[0033] Fig. 1 shows a perspective view of an interior of a vehicle 10. The vehicle 10 may be, for example, a truck or a passenger vehicle. Fig. 1 shows a dashboard 11 as it may be seen from a perspective of a driver of the vehicle 10. Also shown is a steering wheel 12 and a wind-screen 13. The vehicle 10 may comprise a tachograph 14 that may be installed in the dashboard 11, for example, next to the steering wheel 12. When a user (not shown) wants to drive the vehicle 10, the user needs to register at the tachograph 14 as the current driver DRV. To this end, the tachograph 14 may comprise a display 15, a receiving unit 16 for a wireless transmission technology 17. Navigations keys or operating keys 18, for example, switches or buttons, may also be provided in a casing 19 of the tachograph 14.

[0034] For registering as the driver DRV, the user may hold a mobile device 20, especially a mobile phone or a smartphone, inside a notification zone 21 that corresponds to a receiving zone of the receiving unit 16. Preferably, the receiving unit 16 is based on a near field communication NFC, and the notification zone 21 is the zone where the NFC-signal may be received by the receiving unit 16. The mobile device 20 may provide a transmission unit 22, for the same transmission technology as provided by the receiving unit 16. When the mobile device 20 is inside the notification zone 21, the receiving unit 16 may detect the presence of the mobile device 20, espe-

cially the transmission unit 22, for example, by means of a polling procedure or detection procedure. The receiving unit 16 may receive identification data comprising an identification code 23 that identifies the mobile device 20 and/or the user of the mobile device 20. The identification code 23 may be part of a microchip 24 of the transmission unit 22, for example, an NFC microchip, and/or at least a part of the identification code 23 may be provided by an application software 25 (app) that may be personalized, i.e. it may be associated with the name of the user, for example John Smith. Once, the receiving unit 16 of the tachograph 14 receives the identification code 23, it may be provided to a processing unit 26 of the tachograph that may be based on a microprocessor. The processing unit 26 may look up user identification data 27 in a data storage 28. The user identification data 27 may be associated with the identification code 23. In other words, the processing unit 26 verifies that the user is known to the tachograph 14. Based on the user identification data 27, the processing unit 26 may trigger or start a registration dialogue 29 that may be displayed as a graphical user interface on the display 15 of the tachograph 14. For example, the registration dialogue 29 may signal to the user that the user with the name given in the user identification data 27, for example John Smith, will now be registered as the driver DRV. The user may then operate the registration dialogue 29, for example based on a touchscreen or at least one of the keys 18, to confirm or provide user confirmation input 30 for confirming that the user now wants to be registered as a driver. The processing unit 26 may then store corresponding status data 31 indicating, for example the time, when the user was registered as driver DRV.

[0035] When the user wants to leave the vehicle 10 or at least wants to de-register as driver DRV, the user may again position or hold the mobile device 20 inside the notification zone 21. By means of the identification code 23 that will be transmitted again, the processing unit 26 identifies the user identification data 27 again. As the status data 31 indicate that the user is currently registered as the driver, the registration dialogue 29 may be adapted such that a de-registration may be confirmed by the user on the basis of a touchscreen or at least one of the keys 18. The status data 31 will then be changed indicating that the user is currently de-registered as driver DRV. From the start of the registration to the de-registration, a specific time has passed, which can be notified as driving time of the user.

[0036] Fig. 2 gives an overview of the method that may be performed by the tachograph. In a step S10, the receiving unit 16 may detect the presence of the mobile device 20 in the notification zone 21. In a step S11, the receiving unit 16 may request and/or receive the identification code 23 by means of the wireless transmission technology, for example NFC, from the mobile device 20. In a step S12, the processing unit 26 may search the user identification data 27 in the data storage 28 on the basis of the received user identification code. In a step

S13, the processing unit 26 may trigger the registration dialogue 29 for receiving the user confirmation input 30. In a step S14, the processing unit may set the status data 31 in accordance with the received user confirmation input 30. If the user indicated by the user confirmation input 30 that no registration is wanted (for example, the mobile device 20 has been erroneously placed inside the notification zone), the registration may be aborted.

[0037] Nowadays a lot of people use their mobile phone for many applications. Even banks use apps in order to identify their clients. The invention is to use the NFC technology embedded in the mobile phones in order to identify the driver. Moreover, data can be stored on the mobile phone and later be uploaded to a data center (e.g. cloud service). The big advantage is that NFC only works over a short distance, i.e. in the range of <5cm from the receiver. This ensures that no other mobile phone is identified in parallel.

[0038] Moreover, the invention is to use the secured NFC technology embedded in the mobile phones in order to identify the driver, to allow for a single or multiple way authentication process and to securely store driver data on the mobile phone. In detail the advantages are: Comfortable registration process (single path / multipath): Necessary information for a driver identification is usually a unique identifier of the driver, driver name and driver license (in Brazil, for example: driver name and driver license number are required). This information can be stored on the NFC chip set on the mobile phone. No need to manually re-enter this information. In order to register the driver, the mobile phone needs to be briefly held in front of the tachograph. If the tachograph shows the identification data on the display, the driver can verify the correctness of the data and confirm the completeness of the registration process. Vice versa, in order to de-register, the mobile phone needs to be held once again in front of the tachograph. On the display, either on the tachograph and/or on the mobile phone, the de-registration process can be highlighted, for example, by a dedicated question. If the driver confirms the de-registration, the process is completed.

[0039] The idea therefore provides a comfortable authentication of driver via mobile phone. This is a one device fits all strategy, as there is no need to have additional USB stick/SmartCards. Additionally, historic tachograph status data can be stored on mobile phone and later uploaded to fleet owner servers if necessary. The Authenticity is also given: The big advantage is that NFC only works over a short distance, i.e. in the range of <5cm from the receiver. This ensures that no other mobile phone is identified in parallel. NFC technology also ensures that if several devices are close to a reading device, data collisions are avoided. As to data integrity: For NFC data transmission a secured connection is required. Nowadays, in conjunction with the latest NFC generations, advanced encryption technologies like AES are used. These reflect state-of-the art encryption technologies and ensure data integrity as well as authenticity.

Moreover, these new chip sets do not allow to clone or manipulate the content of the identification data.

[0040] For data archiving, driver status data can be stored on the mobile phone and later on be uploaded to a data center (e.g. cloud service) in order to archive the data. For data integrity dedicated encryption can be used that protects the data. Note that this is done on application layer and independent of the invention described. Availability and stability are also given: For the registration/identification process no Internet connection is required. Authorization is done offline, only in the tachograph.

[0041] The following steps describe a preferred registration process: For driver authorization, the tachograph has to be turned-on. Usually this is done if ignition is turned on. This may also be achieved, if the tachograph wakes-up on a pressed button or by a signal that is received by the tachograph via an electronic data interface it is connected to (e.g. a CAN-Bus interface). If the tachograph is on, the device scans permanently for NFC devices in the vicinity. As soon as an NFC device is available and a connection is established an authorization procedure is started. For authorization purposes, driver name and license number may be displayed in the tachograph. If necessary, a two-way authentication procedure can be added. For this purpose a random code number is generated in the tachograph, then it is shown on the tachograph display and transmitted to the mobile phone (as NFC technology can be a bi-directional communication that allows sending and receiving data). If the code shown on the tachograph display matches the code displayed on the mobile phone, the two way authorization is completed (1. Visual authentication by showing name and driver license on tachograph display; 2. Visual authentication by showing the code (this is a kind of PIN - personal identification number) on the display of the mobile phone and on the tachograph). After the driver has completed his shift, driver data can be sent to the mobile phone. For download, a registration procedure similar to above described procedure can be used. An App on the mobile phone may download data via NFC interface after driver has been correctly authenticated and save the data. This procedure may also apply for a fleet owner who has more access rights and may also download driver data from the tachograph. The authentication process is similar to the driver authentication, but as the fleet owner has more access rights, he may download driver data to his mobile phone. For fleet owners an additional identification step may be required, e.g. by entering a PIN that clearly identifies the fleet owner. Every communication session can be closed if the communication/registration process is aborted, interrupted, the link is manually terminated or if the device is put away such that the wireless link can no longer be established. Note: the registration/authentication process may need special case handling: if another driver is registered as a driver, an exception handling procedure has to be implemented.

a) The previously registered driver is automatically de-registered.

b) The tachograph asks the new driver what to do.

5 This action can be shown on the display or via a message sent to the mobile phone. The exception handling may be complemented by an alert sound, if available in the tachograph or in conjunction with the App on the mobile phone.

10 **[0042]** Overall, the example shows how a driver authentication at a tachograph can be based on NFC communication of a mobile phone.

15 Claims

1. Method for registering and/or de-registering a user as a current driver in a digital tachograph (14) of a vehicle (10), comprising the following steps:

- a receiving unit (16) of the tachograph (14) detects the presence of the mobile device (20) of the user in a predefined limited notification zone (21) of the tachograph;

- if the receiving unit (16) detects the mobile device (20) in the notification zone (21), the receiving unit (16) requests and/or receives an identification code (23) by means of a predefined wireless transmission technology (17) from the mobile device;

- based on the received identification code (23) a processing unit (26) of the tachograph (14) searches for user identification data (27) in a data storage (28) of the tachograph (14), wherein in the data storage (28) the user identification data (27) is associated with the received identification code (23) ;

- if the user identification data (27) are available, the processing unit (26) triggers a predefined registration dialog for displaying the user identification data (27) to the user and for receiving a user confirmation input (30) that confirms that the user wants to register or deregister as the driver of the vehicle (10);

- the processing unit (26) sets status data (31) in the tachograph (14) in accordance with the received user confirmation input (30), wherein the status data (31) indicate whether the user is currently registered or de-registered as the driver of the vehicle (10).

2. Method according to claim 1, wherein the processing unit (26) requests such an identification code (23) that is permanently stored in the mobile device (20) and that is thus available in the mobile device (20) without the need of an internet connection while the mobile device (20) is located in the notification zone (21).

3. Method according to any of the preceding claims, wherein as the mobile device (20) a mobile phone is detected.
4. Method according to any of the preceding claims, wherein the wireless transmission technology (17) comprises a near field communication, NFC, for which the receiving unit (16) operates an electromagnetic coil for generating and/or receiving an alternating magnetic field, and wherein the receiving unit (16) reads out the identification code (23) from a microchip (24) of the mobile device (20).
5. Method according to any of the preceding claims, wherein the identification code (23) identifies the mobile device (20) and/or a transmission circuit of the wireless transmission technology (17) and is independent of the user or wherein
the identification code (23) identifies the user independently of the mobile device (20) or wherein
the identification code (23) identifies a unique combination of the user and the mobile device (20).
6. Method according to any of the preceding claims, wherein the wireless communication technology (17) comprises a transmission of the identification code (23) on the basis of
 - a flashing light pattern generated by a flashlight of the mobile device (20) and received by a photo diode of the receiving unit (16),
 - a QR-Code displayed on a display screen of the mobile device (20) and read by a camera of the receiving unit (16),
 - an infrared signal sent out by the mobile device (20) and received by an infrared sensor of the receiving unit (16),
 - an acoustic signal sent out by a loudspeaker of the mobile device (20) and received by a microphone of the receiving unit (16),
 - a vibration signal generated by a haptic actuator of the mobile device (20) and received by an acceleration sensor of the receiving unit (16).
7. Method according to any of the preceding claims, wherein a maximum extent of the limited notification zone (21) is set by a signal strength of the receiving unit (16) and the extent allows a communication at a maximum distance value that is less than 20 cm between the mobile device (20) and the receiving unit (16).
8. Method according to any of the preceding claims, wherein the presence of the mobile device (20) is detected by the receiving unit (16) on the basis of

the following steps:

request messages are sent out at predefined time intervals and an answer to one of the request messages is received or
the receiving unit (16) is operated in a listening mode and a notification signal of the mobile device (20) is received or
the receiving unit (16) operates a proximity sensor that is coupled to an electronic circuit that provides the wireless communication technology (17).

9. Method according to any of the preceding claims, wherein, if the user identification data (27) are missing in the data storage (28), a notification dialog for entering new user identification data is displayed (15), wherein, if a current user is already active, the current user is automatically de-registered.
10. Method according to any of the preceding claims, wherein the registration dialog is displayed (15) on a display (15) of the tachograph (14) or wherein the registration dialog is displayed on a display of the mobile device (20) by means of triggering an application software (25) in the mobile device (20) via the wireless communication technology (17).
11. Method according to any of the preceding claims, wherein the processing unit (26) stores historic status data (31) of the user in the data storage (28) and sends the historic status data (31) to a billing software (25) of the mobile device (20) and/or a data archiving software.
12. Method according to any of the preceding claims, wherein the processing unit (26) stores collected historic status data (31) of several different users and provides the collected historic status data (31) to a data interface, if a predefined master password is provided to the processing unit (26).
13. Method according to any of the preceding claims, wherein a two-way authentication procedure is provided in that a random code number is generated in the tachograph (14) by the processing unit (26) and then the random code number is shown on the tachograph (14) display (15) and also transmitted to the mobile phone.
14. Tachograph (14) for a vehicle (10), where the tachograph (14) comprises a receiving unit (16) for a predefined wireless communication technology (17) and a processing unit (26), wherein the receiving unit (16) and the processing unit (26) are designed to perform a method according to any of the preceding claims.

15. Vehicle (10) with a tachograph (14) according to claim 14.

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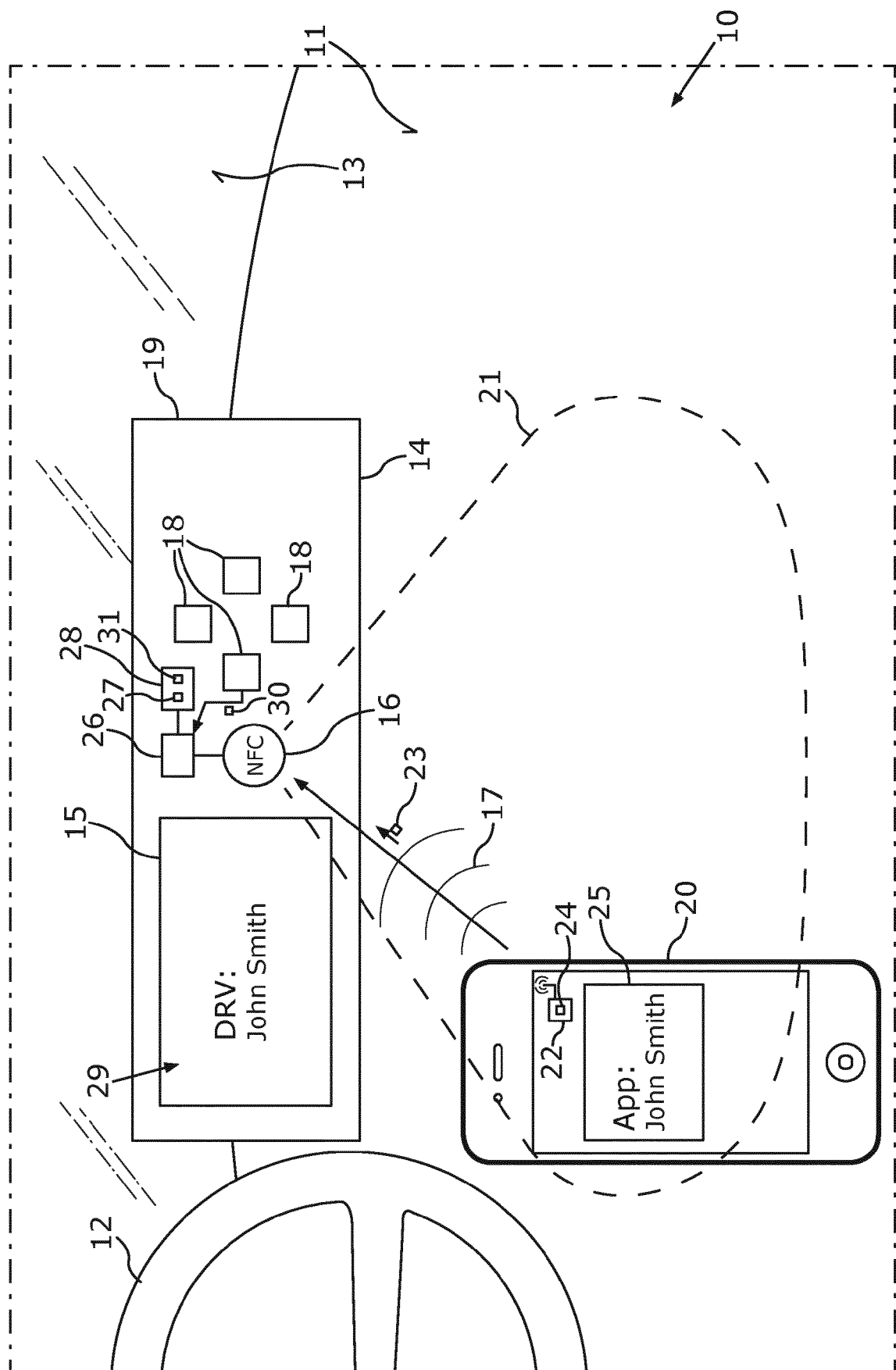


Fig. 1

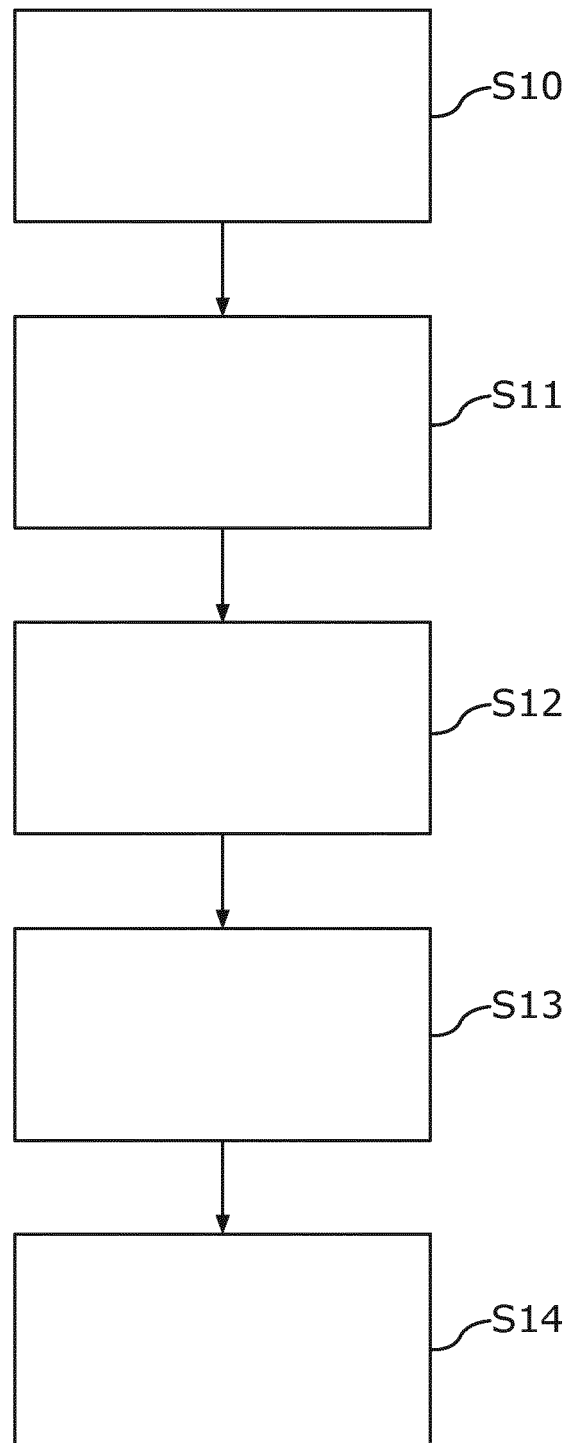


Fig. 2



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