(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 439 949 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
01.01.2020 Bulletin 2020/01

(21) Application number: **16721848.6**

(22) Date of filing: **07.04.2016**

(51) Int Cl.:
B63H 21/22 *(2006.01)* ***F02D 11/10*** *(2006.01)*

(86) International application number:
PCT/FI2016/050218

(87) International publication number:
WO 2017/174857 (12.10.2017 Gazette 2017/41)

(54) A CONTROL SYSTEM FOR AN ENGINE WITH SAFETY CONTROL

MOTORSTEUERUNGSYSTEM MIT SICHERHEITSFUNKTION

SYSTÈME DE COMMANDE DE MOTEUR AVEC FONCTION DE SÉCURITÉ

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
13.02.2019 Bulletin 2019/07

(73) Proprietor: **Wärtsilä Finland Oy**
65100 Vaasa (FI)

(72) Inventors:
- **ÖSTERBACK, Peter**
  65100 Vaasa (FI)
- **KOIVULA, Anssi**
  65100 Vaasa (FI)

(74) Representative: **Berggren Oy, Helsinki & Oulu**
P.O. Box 16
Eteläinen Rautatiekatu 10A
00101 Helsinki (FI)

(56) References cited:
EP-A1- 2 058 197
US-A- 5 513 107
US-A1- 2005 181 685
US-A1- 2007 227 429
US-A1- 2009 050 093
US-B1- 6 271 745

EP 3 439 949 B1

Printed by Jouve, 75001 PARIS (FR)

Description

TECHNICAL FIELD

[0001] The present invention relates to a control system for an engine such as a diesel engine, a gas engine or a liquid natural gas (LNG) engine, where the control system is equipped with a safety control means that may be employed e.g. to ensure safety of the maintenance personnel during maintenance operations applied to the engine.

BACKGROUND

[0002] Engines of several types, such as internal combustion engines (ICE) like diesel engines, gas engines and LNG engines, are commonly used for various industrial purposes to supply power e.g. in power plants, in marine vessels, in offshore platforms such as oil rigs, etc. In this regard, a single engine or an engine system of a plurality (e.g. two or more) engines may be employed as the power source. In such use of one or more engines, a high operational reliability and early reaction to any need for maintenance of an engine is typically a critical characteristic for the performance of the engine or engine system, while any maintenance operation to be carried out for an engine preferably requires as short downtime of the engine as possible to limit the interruptions or reductions in the power supply from the engine or engine system.

[0003] On the other hand, a maintenance operation performed on a large engine typically employed in such usage scenarios requires special attention to the safety of the maintenance personnel. As a particular example, there is typically a need to ensure that the engine is not accidentally started during a maintenance operation for safety reasons, which in known solutions is typically provided via a mechanical or electro-mechanical switch provided for the purpose of switching off the power from the engine. However, in many occasions this may lead to a cumbersome and/or unsatisfactory solution that may result in prolonged or sometimes even unnecessary downtime of the engine in view of the characteristics of the maintenance operation in question.

[0004] In related art, US 2007/227429 A1 discloses an outboard motor control system that can have a first PTT switch and a second PTT switch in a first steering station and in a second steering station respectively, and a third PTT switch in a location outside of a boat hull. Operation instruction given by each PTT switch can be input to a first microcomputer of a first ECU. The first microcomputer can determine if the inputted operation instruction is to be sent to the outboard motor, based on which PTT switch the operation instruction came from, whether the main switch is ON or OFF, and which steering station has precedence in boat control.

[0005] Further in related art, US 2005/181685 A1 discloses a main switch apparatus of a small watercraft. The main switch apparatus of a small watercraft having a main switch. The main switch apparatus includes a plurality of keys, each for operating the main switch, each assigned a different user ID information. The main switch apparatus may further include an ID information detector for detecting the user ID information assigned to one of the plurality of keys applied to the main switch, a controller for controlling the small watercraft, configured to be activated by each one of the plurality of keys, and a control pattern memory for storing a plurality of control patterns of the controller corresponding to the respective user ID information. The controller is typically configured to read out the control pattern stored in the control pattern memory corresponding to the user ID information detected by the user ID information detector and to execute a control of the watercraft based on the read out control pattern

SUMMARY

[0006] Therefore, it is an object of the present invention to provide a technique for ensuring safety during maintenance of an engine in a flexible manner.

[0007] The object(s) of the invention are reached by an apparatus, by a method and by a computer program as defined by the respective independent claims.

[0008] According to an example embodiment, an engine control system for controlling user access to one or more engine control functions is provided, where the engine control system is communicatively coupled to an engine via an engine control interface and where the engine control system comprises two or more human-machine interface, HMI, units, each HMI unit comprising a respective user interface, UI, for providing user access to respective one or more engine control functions, wherein at least two HMI units comprise a respective lock means for receiving a safety key that represents a key identification, ID, of a plurality of key IDs, wherein each key ID has respective at least one engine control function associated therewith, wherein the engine control system is arranged to, when the lock means in a first HMI unit is in receipt of the safety key that represents a first key ID of said plurality of key IDs, selectively enable via the UI of said first HMI unit one of the following: a user-operable locking function for locking, by the first key ID, said respective at least one engine control function associated with the first key ID to disable user access, via said UIs, to said respective at least one engine control function or a user-operable unlocking function for releasing said respective at least one

engine control function from locking by the first key ID to re-enable user access, via said UIs, to those ones of said respective at least one engine control function that are currently not locked by one or more other key IDs of said plurality of key IDs.

[0009] According to another example embodiment, an engine control arrangement is provided, the engine control arrangement comprising one or more engine control systems according to the example embodiment described in the foregoing and a local central control unit, LCCU, communicatively coupled to said one or more engine control systems, wherein the LCCU comprises a UI for providing user access to one or more engine control functions in said one or more engine control systems and further comprises at least one lock means for receiving a safety key that represents a key ID of said plurality of key IDs, which key ID has respective at least one engine control function associated therewith, and wherein the engine control arrangement is configured to, when the lock means in the LCCU is in receipt of the safety key that represents said first key ID, selectively enable via the UI of the LCCU one of the following: a user-operable locking function for locking, by the first key ID, the respective at least one engine control function associated with the first key ID to disable user access, via all UIs in the engine control arrangement, to said respective at least one engine control function or a user-operable unlocking function for releasing the respective at least engine control function from locking by the first key ID to re-enable user access, via all UIs in the engine control arrangement, to those ones of said respective at least one engine control function that are currently not locked by one or more other key IDs of said plurality of key IDs.

[0010] According to another example embodiment, a method for controlling user access to one or more engine control functions in an engine control system that is communicatively coupled to an engine via an engine control interface is provided, the method comprising operating two or more HMI units, each HMI unit comprising a respective UI for providing user access to respective one or more engine control functions, wherein at least two HMI units comprise a respective lock means for receiving a safety key that represents a key ID of a plurality of key ID, wherein each key ID has respective at least one engine control function associated therewith, and selectively enabling, via the UI of a first HMI unit, when the lock means in the first HMI unit is in receipt of the safety key that represents a first key ID of said plurality of key IDs, one of the following: a user-operable locking function for locking, by the first key ID, said respective at least one engine control function associated with the first key ID to disable user access, via said UIs, to said respective at least one engine control function or a user-operable unlocking function for releasing said respective at least one engine control function from locking by the first key ID to re-enable user access, via said UIs, to those ones of said respective at least one engine control function that are currently not locked by one or more other key IDs of said plurality of key IDs.

[0011] According to another example embodiment, a computer program is provided, the computer program comprising computer readable program code configured to cause performing at least the method according to the example embodiment described in the foregoing when said program code is executed on one or more computing apparatuses.

[0012] The computer program referred to above may be embodied on a volatile or a non-volatile computer-readable record medium, for example as a computer program product comprising at least one computer readable non-transitory medium having program code stored thereon, the program which when executed by an apparatus cause the apparatus at least to perform the operations described hereinbefore for the computer program according to an example embodiment of the invention.

[0013] The exemplifying embodiments of the invention presented in this patent application are not to be interpreted to pose limitations to the applicability of the appended claims. The verb "to comprise" and its derivatives are used in this patent application as an open limitation that does not exclude the existence of also unrecited features. The features described hereinafter are mutually freely combinable unless explicitly stated otherwise.

[0014] Some features of the invention are set forth in the appended claims. Aspects of the invention, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of some example embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF FIGURES

[0015] The embodiments of the invention are illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings, where

Figure 1 illustrates a block diagram of some components of an engine control system according to an example embodiment;

Figure 2 schematically illustrates a user interface (UI) of a human-machine interface (HMI) unit according to an example embodiment;

Figure 3A schematically illustrates some aspects of a UI of a HMI unit according an example embodiment;

Figure 3B schematically illustrates some aspects of a UI of a HMI unit according an example embodiment;

Figure 4 illustrates a block diagram of some components of an engine control system according to an example embodiment;

Figure 5 illustrates a block diagram of some components of an engine control arrangement according to an example embodiment;

Figure 6 illustrates a flowchart depicting a method according to an example embodiment; and

Figure 7 schematically illustrates some components of an exemplifying apparatus for providing the diagnostics system according to an example embodiment.

DESCRIPTION OF SOME EMBODIMENTS

[0016] Figure 1 illustrates a block diagram of some components of an engine control system 100 according to an example. The engine control system 100 is illustrated with local human-machine interface (HMI) units 110-1, 110-2, ..., 110-K. Each HMI unit 110-k comprises a user interface (UI) that provides user access to one or more engine control functions for controlling operation of an engine 102. Each of the HMI units 110-k is communicatively coupled to an engine control interface (ECI) 101 for transfer of engine control information and engine status information therebetween.

[0017] The ECI 101 is coupled to an engine 102 and it serves to convert the engine control information received from the HMI units 110 to respective control actions for controlling the engine 102 (e.g. by using respective drivers or actuators provided as part of the ECI 101) and to convert the engine status information (obtained e.g. by using respective sensors provided as part of the ECI 101) in format suitable for provision to the HMI units 110. The ECI 101 may be provided by hardware or as a combination of hardware and software. The engine 102 may be, for example, an internal combustion engine such as a diesel engine, a gas engine or a LNG engine, and the engine 102 may be a stand-alone engine or the engine 102 may operate as part of an engine system of a plurality (e.g. two or more) engines. The details of operation of the ECI 101 and/or the engine 102, however, are not directly relevant to embodiments of the present invention but they are outlined here to illustrate the relationship between the engine 102 and the engine control system 100.

[0018] The HMI units 110-1, 110-2, ..., 110-k illustrated in Figure 1 represent one or more HMI units 110 and for a given engine the number of HMI units 110 may be one, two, three, etc., depending on the physical size of the engine 102 in view of the desired 'ease' of accessing the HMI units 110 by the persons operating the engine 102. As an example, an engine that is small in size may require only single HMI unit 110, whereas an engine that is large in size likely benefits from a plurality of HMI units 110 to enable timely and convenient access to the control functions enabled by the HMI units 110 at multiple locations.

[0019] The engine control system 100 further comprises a safety control database (SCDB) 120, which may be provided in a data storage means that is communicatively coupled to the HMI units 110. The data storage means applied for storing the SCDB 120, in turn, may be provided e.g. as a dedicated data storage entity (as depicted in the example of Figure 1), as part of the ECI 101 or as part of one of the HMI units. Due to the communicative coupling, each of the HMI units 110-k is able to read data from the SCDB 120 and write data to the SCDB 120. The information content and purpose of the SCDB 120 is described later in this text.

[0020] In the example of Figure 1 the communicative coupling between components of the engine control system 100 is provided by a bus 105, which may comprise e.g. a controller area network (CAN) bus or another suitable bus known in the art. Although depicted as a single bus entity that serves as means for connecting the HMI units 110, the ECI 101 and to the SCDB 120 to each other, the bus 105 may be provided as one or more separate buses.

[0021] A HMI unit 110-k may be integrated to a component or part of the engine 102, e.g. by arranging the HMI unit 110-k in a housing of the engine 102. As another example, the HMI unit 110-k may be arranged in close proximity to the engine 102, e.g. in a respective 'control desk' arranged in immediate proximity to the engine 102, in an engine room or in an engine control room.

[0022] As described in the foregoing, the HMI unit 110 comprises a UI that provides access to one or more user functions that enable a user to control a respective aspect of the engine operation. In this regard, Figure 2 schematically illustrates the UI aspect of the HMI unit 110 according to an example. Herein, the HMI unit 110 comprises display means 112 for displaying visual information to a user. The display means may be provided as an electronic display, such as a light-emitting diode (LED) display, an organic light-emitting diode (OLED) display, an electroluminescent display (ELD), a liquid crystal display (LCD), etc. The HMI unit 110 further comprises a user input means 114 for receiving input from the user. In the example of Figure 2, the user input means 114 includes an arrangement of programmable push-buttons, which may referred to as softkeys. The function invoked by operating a given softkey may be described by a text or by a visual identifier in a portion of the display means 112 adjacent to the given softkey, whereas the remaining part of the

display 112 may be employed e.g. for displaying information that is indicative of the current status one or more aspects of the engine operation.

[0023] Instead of or in addition to the softkeys shown in the example of Figure 2, the user input means may comprise elements or components of other type, e.g. one or more of the following: one or more further arrangements of keys or buttons (in another location(s)) of the UI, a keyboard, a mouse or a pointing device of other type, a touchpad, etc. In a further example, the display means 112 is provided as a touchscreen, thereby providing at least part of the user input means 114 as a component integrated to the display means 112.

[0024] In the example of Figure 2 the engine control functions accessible by the user via the softkeys of the user input means 114 are described in a generic manner as "Func 1", "Func 2" and "Func 3" and they serve to represent any suitable respective engine control functions. As examples in this regard, the engine functions that are controllable via the UI provided in the HMI unit 110-k typically include at least an engine control function for starting the engine 102 and an engine control function for stopping the engine 102. The UI, however, may provide a number of additional control functions for adjusting a certain operating characteristic of the engine 102 and/or for selecting information indicative of a certain operating characteristic of the engine 102 to be displayed via the display means 112. As a few examples in this regard, control functions for adjusting an operating characteristic of the engine 102 or for selecting information indicative of a certain operating characteristic of the engine 102 to be displayed may comprise one or more of the following:

- adjusting the speed of the engine 102;
- switching a function of the engine 102 on or off;
- selecting a predefined operating characteristic of the engine to be displayed via the display means 112;
- resetting any user-controllable functions of the engine 102 to their respective predefined default statuses (e.g. on or off);
- resetting any user-adjustable control parameters of the engine 102 to their respective predefined default values.

[0025] In case the engine control system 100 comprises a plurality of HMI units 110, the engine control functions available via user functions provided in the respective UIs of the HMI units 110 may vary from one HMI unit 110 to another. In other words, a first set of engine control functions that are accessible via the UI in a first HMI unit 110-k need not be the same as a second set of engine control functions that are accessible via a second HMI unit 110-j (where $k \neq j$). Typically, though, the engine control functions available in different HMI units 110, e.g. the first and second sets of engine control functions, share one or more engine control functions, e.g. the engine control function for starting the engine 102 and/or the engine control function for stopping the engine 102.

[0026] At least one of the HMI units of the engine control system 100, referred to herein as the HMI unit 110-k, further comprises a lock means 116 for receiving a safety key. The HMI unit 110-k is configured to selectively provide via its UI a locking function or unlocking function for controlling availability of one or more engine control functions (otherwise) provided via respective UIs of one or more HMI units 110 of the engine control system 100 when the lock means 116 is in receipt of the safety key. A safety key represents a predefined key identifier (ID) assigned therefor, which key ID serves as a unique identification of the particular safety key. Each key ID, and hence each safety key, is associated with one or more engine control functions that are (normally) available via respective UI of at least one HMI unit 110 of the engine control system 100.

[0027] The information that defines the mapping between a key ID and the associated engine control function may be stored in the SCDB 120. As a non-limiting example in this regard, in order to provide the mapping between a key ID and the associated engine control functions whose availability the key ID serves to control, the SCDB 120 may include a key information table that comprises a respective table entry for each key ID configured for use in the engine control system 100. Therein, each table entry includes the respective key ID, identifications of one or more associated engine control functions associated with the key ID (i.e. one or more engine control functions whose availability via the HMI units 110 is controllable by the key ID) of the same table entry, and an indication whether the respective key ID is currently applied to lock the associated engine control function(s).

[0028] Table 1 in the following provides an illustrative example of a content of a key information table. Therein, three key IDs (#1, #2 and #3) are considered, where the key IDs #1 and #2 are associated with the engine control functions "Func 1" and "Func 2", whereas the key ID #3 is associated with the engine control functions "Func 1", "Func 2" and "Func 3". Moreover, the example of Table 1 further indicates the key ID #2 is currently being applied to lock the engine control functions associated therewith (i.e. the engine control function "Func 1"), whereas there is no indication of other key IDs being currently applied to lock the respective associated engine control functions.

Table 1

Key ID	*Associated engine control functions*	*Active?*
#1	"Func 1"	

(continued)

Key ID	*Associated engine control functions*	*Active?*
#2	"Func 1"	YES
#3	"Func 1", "Func 2, "Func 3"	

[0029] While the mapping between the available key IDs and the respective associated engine control functions complemented with information that indicates whether the key ID is currently being applied to lock the associated engine control functions would be sufficient for the HMI units 110 of the engine control system 100 to acquire information regarding the engine control functions they are currently allowed to make accessible for a user via the respective UIs, the SCDB 120 may additionally include information that defines for each engine control function that is accessible via at least one of the HMI units 110 of the engine control system 100 and whose availability is controllable through at least one key ID whether it is currently available (and/or currently non-available).

[0030] As an example in this regard, the SCDB 120 may additionally include a control function status table that comprises a respective table entry for each engine control function whose availability is controllable though at least one key ID configured for use in the engine control system 100. Therein, each table entry includes an identification of the respective engine control function and an indication whether any key IDs are currently applied to lock this engine control function. As non-limiting examples, the latter piece of information may be provided as a list of zero or more key IDs that identify those safety keys that are currently applied to lock this engine control function or as an indication of the number of key IDs that are currently applied to lock this engine control function.

[0031] Table 2 in the following provides an illustrative example of a content of a control function status table. Therein, three engine control functions ("Func 1", "Func 2" and "Func 3") are considered. According to the example provided by Table 2, the control function "Func 1" is indicated as currently locked via usage of the key ID #1 and the control function "Func 2" is indicated currently locked via usage of the key IDs #1 and #3 (the Table 2 hence exemplifying the approach where the indication whether any key IDs are currently applied to lock this engine control function is provided by listing the associated key IDs), while no key IDs are currently applied to lock the engine control function "Func 3".

Table 2

Control function	*Currently locked by*
"Func 1"	#1
"Func 2"	#1 #3
"Func 3"	

[0032] In the following, we refer to a key ID read from a safety key received by the lock means 116 in a HMI unit 110-k as the key ID(k). In response to the lock means 116 in a HMI unit 110-k receiving a safety key, the key ID(k) is obtained (e.g. read) from the safety key and the SCDB 120 is accessed to determine whether the key ID(k) is currently being applied to lock the one or more engine control functions associated therewith. This determination may be carried out e.g. by identifying the table entry of the key information table in the SCDB 120 that corresponds to the key ID(k) and determining whether the identified table entry indicates locking of the associated control function(s).

[0033] In case the determination is non-affirmative (i.e. no current locking of the associated engine control functions by using the key ID(k)), the UI of the HMI unit 110-k is updated to enable the locking function that serves to disable the engine control functions associated with the key ID(k). An illustrative example in this regard is provided in Figure 3A, where the lowermost softkey of the user input means 114 (identified by the text "LOCK" in a portion of the display means 112 adjacent thereto) enables locking of the associated engine control functions by using the key ID(k).

[0034] In case the determination is affirmative (i.e. the associated engine control functions are currently locked by using the key ID(k)), the UI of the HMI unit 110-k is updated to enable the unlocking function that serves to release (unlock) the engine control functions associated with the key ID(k) from being locked by using the key ID(k). An illustrative example in this regard is provided in Figure 3B, where the lowermost softkey of the user input means 114 (identified by the text "UNLOCK" in a portion of the display means 112 adjacent thereto) enables unlocking of the associated engine control functions. The illustrative example of Figure 3B further shows the engine control function "Func 1" associated with the key ID(k) being disabled (indicated by the de-emphasized associated text "Func 1" in a portion of the display means 112 adjacent to the uppermost softkey of the user input means 114) due to locking (at least) by the key ID(k).

[0035] Referring back to the scenario exemplified by Figure 3A (where there is no current locking of the associated engine control functions by using the key ID(k)), if the user engages the locking function via the UI of the HMI unit 110-

k (e.g. operates the softkey identified with the text "LOCK" in Figure 3A), these control functions become (temporarily) locked by the key ID(k), which may result in at least the following operations to be carried out by components of the engine control system 100:

- The SCDB 120 is updated to indicate the locking of the engine control functions associated with the key ID(k) by the key ID(k). In an example, this results in the HMI unit 110-k updating the respective table entry of the key information table in the SCDB 120 to indicate disablement of the associated engine control functions and possibly also updating the control function status table in the SCDB 120 to indicate that the engine control functions associated with the key ID(k) are disabled at least due to engagement of the locking function using the key ID(k).
- The UI of the HMI unit 110-k is updated to disable the associated engine control functions and UI of the HMI unit 100-k is further updated to enable, instead of the respective locking function, the unlocking function that allows the user to release (unlock) the associated engine control functions from being locked by the key ID(k). An illustrative example in this regard is provided in Figure 3B, where the lowermost softkey of the user input means 114 enables unlocking of the associated engine control functions and where the engine control function "Func 1" associated with the key ID(k) is disabled (as described above).
- The respective UIs of the other HMI units 110 are updated to disable the engine control functions associated with the key ID(k) where necessary, i.e. in the respective UIs of those HMI units 110 that otherwise enable one or more of the engine control functions associated with the key ID(k). The other HMI units 110 may obtain an indication of the engine control functions to be disabled in their respective UIs by accessing the key information table and/or the control function status table in the SCDB 120. The other HMI units 110 may receive such indication, for example, by periodically (e.g. at predefined time intervals) accessing the respective table(s) of the SCDB 120 or via the HMI unit 110-k sending, to the other HMI units 110, an indication regarding the locking function for locking the engine control functions associated with the key ID(k) having been engaged.

[0036] Referring back to the scenario exemplified by Figure 3B (where the associated engine control functions are currently locked by using the key ID(k), if the user engages the unlocking function via the UI of the HMI unit 110-k (e.g. operates the softkey identified with the text "UNLOCK" in Figure 3B), these control functions are released from locking by the key ID(k), which may result in at least the following operations to be carried out by components of the engine control system 100:

- The SCDB 120 is updated to indicate the release (unlocking) of the engine control functions associated with the key ID(k) from locking by the key ID(k). In an example, this results in the HMI unit 110-k updating the respective table entry of the key information table in the SCDB 120 to indicate release of the associated engine control functions from locking by the key ID(k) and possibly also updating the control function status table in the SCDB 120 to indicate that the engine control functions associated with the key ID(k) are not any more locked due to engagement of the locking function with the key ID(k).
- The UI of the HMI unit 110-k is updated to re-enable the associated engine control functions in case there are no other key IDs that are currently being applied to lock one or more of these engine control functions. Moreover, the UI of the HMI unit 100-k is updated to enable, instead of the respective unlocking function, the locking function that allows the user to lock the associated engine control functions. As an example, these operations may return the UI in the HMI unit 110-k back into the state exemplified in Figure 3A.
- The respective UIs of the other HMI units 110 are updated to re-enable the engine control functions associated with the key ID(k) where necessary, provided that there are no other key IDs that are currently being applied to lock the one or more of these engine control functions. The other HMI units 110 may obtain an indication of the engine control functions to be re-enabled in their respective UIs by accessing the key information table and/or the control function status table in the SCDB 120. The other HMI units 110 may receive such indication, for example, by periodically (e.g. at predefined time intervals) accessing the respective table(s) of the SCDB 120 or via the HMI unit 110-k sending, to the other HMI units 110, an indication regarding the unlocking function for releasing (unlocking) the engine control functions associated with the key ID(k) having been engaged.

[0037] As described in the foregoing, the locking function or the unlocking function for controlling availability of one or more engine control functions associated with the key ID(k) is available only when the lock means 116 in the HMI unit 110-k is in receipt of the safety key that represents the key ID(k). Thus, when the safety key is disconnected from the lock means 116 of the HMI unit 110-k, the UI of the HMI unit 110-k is updated such that the locking function or the unlocking function is no longer available via the UI. However, in case a safety key representing the key ID(k) was applied to lock the engine control functions associated therewith, these engine functions remain locked by the key ID(k) and thereby disabled through the respective UIs of the HMI units 110 of the engine control system 100 until released (unlocked) using the same safety key.

[0038] As becomes apparent from the example provided in the foregoing, the locking function or the unlocking function for controlling availability of one or more engine control functions associated with the key ID(k) is available only via the UI of the HMI unit 110-k in which the lock means 116 is in receipt of the safety key representing the key ID(k). This ensures that only the person accessing the engine control functions via the UI in the HMI unit 110-k has the control for locking or unlocking the associated engine control functions, thereby facilitating prevention of unauthorized persons from disabling or re-enabling the associated engine control functions.

[0039] In an example, the user may use his/her safety key to (first) enable and engage the locking function to lock the engine control functions associated with the key ID represented by his/her safety key via the UI of the HMI unit 110-k, carry out desired maintenance operations on the engine 102, and (subsequently) enable and engage the unlocking function to release the respective associated engine control functions via the UI of the same HMI unit 110-k. In another example, the user uses his/her safety key to (first) enable and engage the locking function to lock the associated engine control functions via the UI of the HMI unit 110-k, carry out desired maintenance operations on the engine 102, and (subsequently) enable and engage the unlocking function to release the respective associated engine control functions via the UI of another HMI unit 110-j (where $j \neq k$).

[0040] In an example, locking of the associated engine control functions may further require, in addition to the user engaging the locking function via the UI of the HMI-unit 110-k, receiving a valid personal identification code via the UI of the HMI-unit 110-k. Along similar lines, additionally or alternatively, releasing (unlocking) of the associated engine control functions may further require, in addition to the user engaging the unlocking function via the UI of the HMI-unit 110-k, receiving the valid personal identification code via the UI of the HMI-unit 110-k.

[0041] As an example in this regard, the user engaging the locking or unlocking function (e.g. via operating the respective softkey of the user input means 114) may be followed by the HMI unit 110-k requesting, via the UI, the user to enter the personal identification code, such as a password or a PIN code, assigned to the key ID(k) before the HMI unit 110-k proceeds with implementing the locking or release of the associated engine control functions. The user may apply e.g. a keyboard provided in the HMI unit 110-k or a touchscreen of the HMI unit 110-k to enter the personal identification code. The code entered by the user is compared to the personal identification code assigned to the key ID(k) and the HMI unit 110-k may proceed with implementing the locking or release of the associated engine control functions in response to the user-entered code matching the personal identification code assigned to the key ID(k). Usage of the personal identification code serves as an additional safety measure that facilitates prevention of unauthorized persons from locking or releasing the associated engine control functions.

[0042] In an example, the lock means 116 and the safety key(s) are provided using universal serial bus (USB) technology known in the art. As an example in this regard, the lock means 116 may be provided as an USB port and one or more safety keys may be provided as respective USB devices, e.g. as respective US memory sticks, each arranged to store information that serves as an indication of the respective key ID assigned thereto in a predefined format. In this example, the lock means 116 is in receipt of a safety key when the USB device is connected to the USB port such that HMI unit 110-k is able to read the key ID therefrom.

[0043] In another example, the lock means 116 and the safety key(s) are provided by employing a radio frequency identification (RFID) technique known in the art. As an example in this regard, the lock means 116 may be provided as an RFID reader and one or more safety keys may be provided as respective RFID tags, each arranged to store information that serves an indication of the respective key ID assigned thereto. In this example, the lock means 116 is in receipt of a safety key when the RFID reader is able to read the key ID from the ID tag.

[0044] In a further example, the lock means 116 and the safety key(s) are provided by employing a near field communication (NFC) technique known in the art. As an example in this regard, the lock means 116 may be provided as a first NFC device and one or more safety keys may be provided as respective second NFC devices, each arranged to store information that serves an indication of the respective key ID assigned thereto. In this example, the lock means 116 is in receipt of a safety key when the first NFC device is able to read the key ID from the second NFC device.

[0045] In a further example, the lock means 116 and the safety key(s) are provided by employing a fingerprint recognition technique known in the art. As an example in this regard, the lock means 116 may be comprise a fingerprint sensor and a safety key for a certain user comprises a finger of the certain user. In such an approach, the lock means 116 may store one or more predefined fingerprint templates, each fingerprint template associated with a respective key ID. The lock means 116 further compares a fingerprint obtained via the fingerprint sensor to the stored one or more predefined fingerprint templates and obtains the key ID as the key ID associated with the predefined fingerprint template recognized to match (e.g. to be similar or substantially similar to) the fingerprint obtained via the fingerprint sensor.

[0046] In a further example, the lock means 116 and the safety key(s) are provided by employing a facial recognition system or technique known in the art. As an example in this regard, the lock means 116 may comprise imaging means (such as a digital camera) and a safety key for a certain user comprises the face of the certain user (or part thereof). In such an approach, the lock means 116 may store one or more sets of predefined facial features, each set associated with a respective key ID. The lock means 116 further compares facial features extracted from an image of a face obtained from the imaging means to the stored one or more sets of predefined facial features and obtains the key ID as the key

ID associated with the set of predefined facial features found to match (e.g. to be similar or substantially similar to) the facial features extracted from the image of a face obtained from the imaging means.

[0047] In a further example, the lock means 116 and the safety key(s) are provided by employing an iris recognition system or technique known in the art. As an example in this regard, the lock means 116 may comprise imaging means (such as a digital camera) and a safety key for a certain user comprises an iris of the certain user (or part thereof). In such an approach, the lock means 116 may store one or more predefined iris templates, each associated with a respective key ID. The lock means 116 further compares an image of an iris obtained from the imaging means to the stored one or more iris templates and obtains the key ID as the key ID associated with the predefined iris template found to match (e.g. to be similar or substantially similar to) the image of an iris obtained from the imaging means.

[0048] Figure 4 illustrates a block diagram of some components of an engine control system 200 according to an example, which is a variation of the engine control system 100, operation of which is described in the foregoing by a number of examples. In addition to the one or more HMI units 110 and the SCDB 120, the engine control system 200 further comprises a local central control unit (LCCU) 130 that is communicatively coupled to the SCDB 120 and to the ECI 101, and possibly also to the HMI units 110.

[0049] Like the HMI units 110, the LCCU 130 comprises a UI that provides one or more engine control functions for controlling operation of an engine 102. Typically, although not necessarily, the UI of the LCCU 130 provides an enlarged selection of engine control functions in comparison to the respective UIs of the HMI units 110. As an example in this regard, the UI of the LCCU 130 may provide all those engine control functions that are available via the respective UIs of any of the HMI units 110 of the engine control system 200 and it may provide one or more further engine control functions that are not available via the respective UIs of any of the HMI units 110 of the engine control system 200.

[0050] The LCCU 130 is, typically, provided in a control center or in a control room that is located in the site of the engine 102, e.g. in or close to an engine room of a marine vessel (at least in part) powered by the engine 102 or in or close to engines of an engine-powered power plant that is (at least in part) powered by the engine 102. The control center/room that hosts the LCCU 130 is typically provided somewhat further away from the engine 102 (and possible other engines of the site) than any of the HMI units 110 of the engine control system 200.

[0051] Due to the communicative coupling, the LCCU 130 is able to read data from the SCDB 120 and write data to the SCDB 120. Therefore, in case the any of the HMI units 110 have been applied to engage the locking function to lock some of the engine control functions available in the engine control system 200, the LCCU 130 may access the SCDB 120 (e.g. the key information table and/or the control function status table therein) to obtain an indication in this regard and disable access to the associated engine control functions via the UI of the LCCU 130 accordingly. Along similar lines, if any of the HMI units 110 have been applied to engage the unlocking function after a time period of some of the engine control functions (otherwise) available via the UI of the LCCU 130 having been disabled due to engagement of the respective locking function, the LCCU 130 may access the SCDB 120 (e.g. the key information table and/or the control function status table therein) to obtain an indication in this regard and re-enable access to the associated engine control functions via the UI of the LCCU 130 accordingly.

[0052] Like the HMI units 110, also the LCCU 130 may comprise a lock means 136 for receiving the safety key. The operation of the LCCU 130 when in receipt of the safety key is similar to that described in the foregoing in context of the HMI unit 110-k, mutatis mutandis. In particular, a safety key may be applied in the LCCU 130 to enable, via the UI of the LCCU 130, locking or releasing (unlocking) the associated engine control functions in the HMI units 110 (as well as via the UI of the LCCU 130) of the engine control system 200.

[0053] Figure 5 illustrates a block diagram of some components of an engine control arrangement that comprises the engine control system 100 and the LCCU 130. Although not shown in the illustration Figure 5, the LCCU 130 connects to the engine control system 100 via the bus 105. Moreover, in the example of Figure 5 the LCCU 130 is provided outside the engine control system 100 and it is connected to one or more further engine control systems 100' (represented in the Figure 5 by two instances denoted by the reference designator 100'). Each of the engine control systems 100' is arranged to control operation of the respective engine via a respective ECI (e.g. along the lines described in the foregoing for the engine control system 100). Hence, in this engine control arrangement the LCCU 130 serves to provide control over a plurality of (e.g. two or more) engines via the respective engine control systems 100, 100'.

[0054] In an example in this regard, the LCCU 130 is provided with a single lock means via which control over availability of the engine control functions in each of the engine control systems 100, 100' coupled thereto may be provided by using a single safety key (e.g. by reading/writing the respective SCDBs 120 of the engine control systems 100, 100' and controlling availability of the engine control functions via respective UIs of the HMI units 110 in the engine control systems 100, 100' (and via the UI of the LCCU 130) accordingly, e.g. as described in the foregoing in context of the HMI units 110 of the engine control system 100). Alternatively, in this scenario the UI of the LCCU 130 may enable the user selecting the engine control systems 100, 100' to be affected in response to receiving the safety key in the lock means.

[0055] In another example, the LCCU 130 (in the engine control arrangement of Figure 5) may be provided with a dedicated lock means for each of the engine control systems 100, 100' coupled to the LCCU 130. In this scenario, a single safety key is useable to control availability of the engine control functions in single one of the engine control

systems 100, 100' coupled to the LCCU 130 at a time, in the engine control system 100, 100' that is associated with the lock means that is currently in receipt of the safety key.

[0056] Figure 6 depicts a flowchart that outlines a method 300 according to an example embodiment. The method 300 may implement some aspects of the engine control system 100 described in the foregoing by a number of examples. The method 300 may be carried out by one or more computing devices that are arranged to implement at least the one or more HMI units 110 and the SCDB 120. The method 300 serves to control user access to one or more engine control functions in the engine control system 100 that is communicatively coupled to the engine 102 via the ECI 101. The method 300 comprises

operating the one or more HMI units 110, each HMI unit 110 comprising a respective UI for providing user access to respective one or more engine control functions, wherein at least one HMI unit 110 comprises the respective lock means 116 for receiving a safety key storing a key ID, which key ID has at least one engine control function associated therewith, as indicated in block 310. The method further comprises selectively providing, via the UI of a first HMI unit, when the lock means 116 in the first HMI unit is in receipt of the safety key storing a first key ID one of the following: a locking function for locking said at least one engine control function by the first key ID and an unlocking function for releasing said at least one engine control function from locking by the first key ID, as indicated in block 320.

[0057] The method 300 may further comprise one or more of operations described in blocks 330A and 330B: disable, via the respective UI of each of the HMI units 100, in response to a user engaging the locking function via the UI of the first HMI unit, user access to said at least one engine control function associated with the first key ID (block 330A) and/or re-enable, via the respective UI of each of the HMI units 100, in response to a user engaging the unlocking function via the UI of the first HMI unit, user access to those ones of said at least one engine control function associated with the first key ID that are not locked by one or more other key IDs (block 330B).

[0058] The method 300 outlined herein may be varied in a number of ways, e.g. as described in context of the engine control system 100, 100' or the engine control arrangement described with references to Figure 5.

[0059] Components of the engine control system 100, 100' may be provided by using respective hardware means, respective software means, or respective combination of hardware means and software means. In particular, each of the HMI units 110, the SCDB 120 and the LCCU 130 may be provided respective hardware means, respective software means, or respective combination of hardware means and software means.

[0060] As an example of providing a component of the engine control system 100, 100' using a combination of hardware means and software means, Figure 7 schematically illustrates some components of an exemplifying apparatus 400 suited for this purpose. The apparatus 400 comprises a processor 402 and a memory 404 for storing data and computer program code 406. In case of the SCDB 120 the memory 404 may store information that constitutes the SCDB 120. The processor 402 is configured to read from and write to the memory 404. The apparatus 400 further comprises a communication means 408 for communicating with another apparatuses or devices, e.g. with other components of the engine control system 100, 100'. The apparatus 400 further comprise user I/O (input/output) components 410 that may be arranged, together with the processor 402 and a portion of the computer program code 406, to provide a user interface for receiving input from a user and/or providing output to the user. The user I/O components 410 may comprise hardware components such as a display, a touchscreen, a touchpad, a mouse, a keyboard and/or an arrangement of one or more keys or buttons, etc. In particular, at least some of the user I/O components 410 may serve to provide the display means 112 and the user input means 114 of a HMI unit 110 described in the foregoing.

[0061] The processor 402 may be arranged to control operation of the apparatus 400 in accordance with a portion of the computer program code 406 stored in the memory 404 and possibly further in accordance with the user input received via the user I/O components 410 and/or in accordance with information received via the communication means 408. The memory 404 and a portion of the computer program code 406 stored therein may be further arranged, with the processor 402, to provide a control function or control means for controlling operation of the apparatus 400. The processor 402, the memory 404, the communication means 408 and the user I/O components 410 may be interconnected by a bus 412 that enables transfer of data and control information. The apparatus 400 may comprise further components in addition to those shown in the illustration of Figure 7.

[0062] Although the processor 402 is depicted as a single component, the processor 402 may be implemented as one or more separate processing components. Similarly, although the memory 402 is depicted as a single component, the memory 404may be implemented as one or more separate components, some or all of which may be integrated/removable and/or may provide permanent / semi-permanent/ dynamic/cached storage.

[0063] The computer program code 406 stored in the memory 404 may comprise computer-executable instructions that control the operation of the apparatus 400 when loaded into the processor 402. The computer program code 406 may include one or more sequences of one or more instructions. The processor 402 is able to load and execute the computer program code 406 by reading the one or more sequences of one or more instructions included therein from the memory 404. The one or more sequences of one or more instructions may be configured to, when executed by the processor 402, cause the apparatus 400 to carry out operations, procedures and/or functions described in the foregoing in context of the respective component of the engine control system 100, 100', e.g. those described for the HMI unit

110, the SCDB 120 or the LCCU 130.

[0064] The computer program code 406 may be provided e.g. as a computer program product comprising at least one computer-readable non-transitory medium having program code stored thereon, the computer program code 406, when executed by the apparatus 400, arranged to cause the apparatus 400 to carry out operations, procedures and/or functions described in the foregoing in context of the respective component of the engine control system 100, 100', e.g. those described for the HMI unit 110, the SCDB 120 or the LCCU 130. The computer-readable non-transitory medium may comprise a memory device or a record medium such as a CD-ROM, a DVD, a Blu-ray disc or another article of manufacture that tangibly embodies the computer program. As another example, the computer program may be provided as a signal configured to reliably transfer the computer program.

[0065] Reference(s) to a processor should not be understood to encompass only programmable processors, but also dedicated circuits such as field-programmable gate arrays (FPGA), application specific circuits (ASIC), signal processors, etc. Features described in the preceding description may be used in combinations other than the combinations explicitly described.

[0066] Features described in the preceding description may be used in combinations other than the combinations explicitly described. Although functions have been described with reference to certain features, those functions may be performable by other features whether described or not. Although features have been described with reference to certain embodiments, those features may also be present in other embodiments whether described or not.

Claims

1. An engine control system (100) for controlling user access to one or more engine control functions, the engine control system (100) communicatively coupled to an engine (102) via an engine control interface (101) and the engine control system (100) comprising two or more human-machine interface, HMI, units (110), each HMI unit (110) comprising a respective user interface, UI, for providing user access to respective one or more engine control functions, wherein at least two HMI units (110) comprise a respective lock means (116) for receiving a safety key that represents a key identification, ID, of a plurality of key IDs, wherein each key ID has respective at least one engine control function associated therewith,
   wherein the engine control system (100) is arranged to, when the lock means (116) in a first HMI unit is in receipt of the safety key that represents a first key ID of said plurality of key IDs, selectively enable via the UI of said first HMI unit one of the following:

   a user-operable locking function for locking, by the first key ID, said respective at least one engine control function associated with the first key ID to disable user access, via said UIs, to said respective at least one engine control function, or
   a user-operable unlocking function for releasing said respective at least one engine control function from locking by the first key ID to re-enable user access, via said UIs, to those ones of said respective at least one engine control function that are currently not locked by one or more other key IDs of said plurality of key IDs.

2. An engine control system (100) according to claim 1, wherein the engine control system (100) is arranged to
   enable the user-operable locking function via the UI of said first HMI unit when the lock means (116) in said first HMI unit is in receipt of the safety key storing the first key ID, and
   enable, subsequently, the user-operable unlocking function via the UI of a second HMI unit when the lock means (116) in said second HMI unit is in receipt of the safety key storing the first key ID.

3. An engine control system (100) according to claim 1 or 2, wherein said first HMI unit (110) is arranged to enable the user-operable locking function in case the first key ID is not currently applied to lock the respective at least one engine control function associated therewith.

4. An engine control system (100) according to any of claims 1 to 3, wherein said first HMI unit (110) is arranged to enable the user-operable unlocking function in case the first key ID is currently applied to lock the respective at least one engine control function associated therewith.

5. An engine control system (100) according to any of claims 1 to 3, arranged to:

   disable, via the respective UI of each of the HMI units, in response to a user engaging the user-operable locking function via the UI of the first HMI unit, user access to said respective at least one engine control function associated with the first key ID, and

re-enable, via the respective UI of each of the HMI units, in response to a user engaging the user-operable unlocking function via the UI of the first HMI unit, user access to those ones of said respective at least one engine control function associated with the first key ID that are not locked by one or more other key IDs of said plurality of key IDs.

6. An engine control system (100) according to claim 5, arranged to, when the lock means (116) in the first HMI unit is in receipt of the safety key that represents the first key ID, selectively enable one of the user-operable locking function or the user-operable unlocking functions in response to receiving, via the UI of the first HMI unit, a valid personal identification code.

7. An engine control system (100) according to any of claims 1 to 6, further comprising a safety control database, SCDB, (120), for storing at least:

information that defines a mapping between a key ID and the respective at least one engine control function associated therewith for said plurality of key IDs,
information that defines for each engine control function accessible via at least one HMI unit (110) and whose availability is controllable through at least one key ID of said plurality of key IDs whether it is currently accessible by a user.

8. An engine control system (100) according to any of claims 1 to 7, wherein the lock means (116) comprises one of the following:

a universal serial bus, USB; port for receiving a USB device that stores information that defines a respective key ID,
a radio frequency identification, RFID, reader for connecting a RFID tag that stores information that defines a respective key ID,
a near field communication, NFC, device for connecting another NFC device that stores information that defines a respective key ID,
a fingerprint sensor for obtaining a fingerprint of a user for comparison to one or more predefined fingerprint templates that are associated with respective one or more key IDs,
an imaging means for obtaining an image of the face of a user for comparison of facial features extracted from an obtained image to one or more sets of predefined facial features that are associated with respective one or more key IDs,
an imaging means for obtaining an image of an iris of a user for comparison to one or more predefined iris templates that are associated with respective one or more key IDs.

9. An engine control arrangement comprising
one or more engine control systems (100, 100') according to any of claims 1 to 8; and
a local central control unit, LCCU, (130) communicatively coupled to said one or more engine control systems (100, 100'),
wherein the LCCU (130) comprises a UI for providing user access to one or more engine control functions in said one or more engine control systems (100, 100') and further comprises at least one lock means for receiving a safety key that represents a key ID of said plurality of key IDs, which key ID has respective at least one engine control function associated therewith, and
wherein the engine control arrangement is configured to, when the lock means in the LCCU (130) is in receipt of the safety key that represents said first key ID, selectively enable via the UI of the LCCU (130) one of the following:

a user-operable locking function for locking, by the first key ID, the respective at least one engine control function associated with the first key ID to disable user access, via all UIs in the engine control arrangement, to said respective at least one engine control function, or
a user-operable unlocking function for releasing the respective at least engine control function from locking by the first key ID to re-enable user access, via all UIs in the engine control arrangement, to those ones of said respective at least one engine control function that are currently not locked by one or more other key IDs of said plurality of key IDs.

10. An engine control arrangement according to claim 9, wherein the LCCU (130) comprises a single lock means for controlling the selective enablement of the locking or unlocking function in each of said engine control systems (100, 100') coupled to the LCCU (130).

11. An engine control arrangement according to claim 10, wherein the LCCU (130) comprises a dedicated lock means for each of the engine control systems coupled to the LCCU (130) for controlling the selective enablement of the locking or unlocking function in the respective engine control systems (100, 100').

12. A method (300) for controlling user access to one or more engine control functions in an engine control system (100) that is communicatively coupled to an engine (102) via an engine control interface (101), the method comprising operating (310) two or more human-machine interface, HMI, units (110), each HMI unit (110) comprising a respective user interface, UI, for providing user access to respective one or more engine control functions, wherein at least two HMI units (110) comprise a respective lock means (116) for receiving a safety key that represents a key identification, ID, of a plurality of key IDs, wherein each key ID has respective at least one engine control function associated therewith, and
selectively enabling (320), via the UI of a first HMI unit, when the lock means (116) in the first HMI unit is in receipt of the safety key that represents a first key ID of said plurality of key IDs, one of the following:

    a user-operable locking function for locking, by the first key ID, said respective at least one engine control function associated with the first key ID to disable user access, via said UIs, to said respective at least one engine control function, or
    a user-operable unlocking function for releasing said respective at least one engine control function from locking by the first key ID to re-enable user access, via said UIs, to those ones of said respective at least one engine control function that are currently not locked by one or more other key IDs of said plurality of key IDs.

13. A computer program including one or more sequences of one or more instructions which, when executed by one or more processors, cause an arrangement of one or more apparatuses to at least perform the method according to claim 12.

Patentansprüche

1. Motorsteuersystem (100) zum Steuern eines Benutzerzugriffs auf eine oder mehrere Motorsteuerfunktionen, wobei das Motorsteuersystem (100) über eine Motorsteuerschnittstelle (101) kommunikativ mit einem Motor (102) gekoppelt ist und das Motorsteuersystem (100) umfasst
zwei oder mehrere Mensch-Maschine-Schnittstellen-Einheiten, HMI-Einheiten (110), wobei jede HMI-Einheit (110) eine entsprechende Benutzerschnittstelle, UI, umfasst, um einem Benutzer Zugriff auf eine oder mehrere Motorsteuerfunktionen zu gewähren, wobei mindestens zwei HMI-Einheiten (110) ein jeweiliges Sperrmittel (116) zum Empfangen eines Sicherheitsschlüssels umfassen, der eine Schlüsselidentifikation, ID, einer Mehrzahl von Schlüssel-IDs darstellt, wobei jeder Schlüssel-ID jeweils mindestens eine Motorsteuerfunktion zugeordnet ist,
wobei das Motorsteuersystem (100) ausgelegt ist, wenn das Sperrmittel (116) in einer ersten HMI-Einheit den Sicherheitsschlüssel empfängt, der eine erste Schlüssel-ID der Mehrzahl von Schlüssel-IDs darstellt, über die UI der ersten HMI-Einheit eine der folgenden Funktionen selektiv zu aktivieren:

    eine benutzerbedienbare Sperrfunktion zum Sperren, durch die erste Schlüssel-ID, der jeweiligen mindestens einen Motorsteuerfunktion, die der ersten Schlüssel-ID zugeordnet ist, um einen Benutzerzugriff über die UIs auf die jeweilige mindestens eine Motorsteuerfunktion zu deaktivieren, oder
    eine benutzerbedienbare Entsperrfunktion zum Freigeben der jeweiligen mindestens einen Motorsteuerfunktion vom Sperren durch die erste Schlüssel-ID, um einen Benutzerzugriff, über die UIs, für diejenigen der jeweiligen mindestens einen Motorsteuerfunktion erneut zu aktivieren, die derzeit nicht durch eine oder mehrere andere Schlüssel-IDs der Mehrzahl von Schlüssel-IDs gesperrt sind.

2. Motorsteuersystem (100) nach Anspruch 1, wobei das Motorsteuersystem (100) ausgelegt ist zum
Aktivieren der benutzerbedienbaren Sperrfunktion über die UI der ersten HMI-Einheit, wenn das Sperrmittel (116) in der ersten HMI-Einheit den Sicherheitsschlüssel empfängt, der die erste Schlüssel-ID speichert, und
anschließend Aktivieren der benutzerbedienbaren Sperrfunktion über die UI einer zweiten HMI-Einheit, wenn das Sperrmittel (116) in der zweiten HMI-Einheit den Sicherheitsschlüssel empfängt, der die erste Schlüssel-ID speichert.

3. Motorsteuersystem (100) nach Anspruch 1 oder 2, wobei die erste HMI-Einheit (110) ausgelegt ist, die benutzerbedienbare Sperrfunktion zu aktivieren, falls die erste Schlüssel-ID derzeit nicht angewendet wird, um die jeweilige mindestens eine Motorfunktion zu sperren, die dieser zugeordnet ist.

4. Motorsteuersystem (100) nach einem der Ansprüche 1 bis 3, wobei die erste HMI-Einheit (110) ausgelegt ist, die benutzerbedienbare Entsperrfunktion zu aktivieren, falls die erste Schlüssel-ID derzeit angewendet wird, um die jeweilige mindestens eine Motorfunktion zu sperren, die dieser zugeordnet ist.

5. Motorsteuersystem (100) nach einem der Ansprüche 1 bis 3, die ausgelegt ist zum:

Deaktivieren, über die jeweilige UI jeder der HMI-Einheiten, als Reaktion darauf, dass ein Benutzer die benutzerbedienbare Sperrfunktion über die UI der ersten HMI-Einheit aktiviert, eines Benutzerzugriffs auf die jeweilige mindestens eine Motorsteuerfunktion, die der ersten Schlüssel-ID zugeordnet ist, und
erneutes Aktivieren, über die jeweilige UI jeder der HMI-Einheiten, als Reaktion darauf, dass ein Benutzer die benutzerbedienbare Entsperrfunktion über die UI der ersten HMI-Einheit aktiviert, eines Benutzerzugriffs auf diese der jeweiligen mindestens einen Motorsteuerfunktion, die der ersten Schlüssel-ID zugeordnet ist, die nicht durch eine oder mehrere andere Schlüssel-IDs der Mehrzahl von Schlüssel-IDs gesperrt sind.

6. Motorsteuersystem (100) nach Anspruch 5, das ausgelegt ist, wenn das Sperrmittel (116) in der ersten HMI-Einheit den Sicherheitsschlüssel empfängt, der die erste Schlüssel-ID darstellt, eine der benutzerbedienbaren Sperrfunktion oder der benutzerbedienbaren Entsperrfunktionen als Reaktion auf das Empfangen eines gültigen persönlichen Identifikationscodes über die UI der ersten HMI-Einheit selektiv zu aktivieren.

7. Motorsteuersystem (100) nach einem der Ansprüche 1 bis 6, ferner umfassend eine Sicherheitssteuerdatenbank, SCDB, (120) zum Speichern von mindestens:
Informationen, die eine Zuweisung zwischen einer Schlüssel-ID und der jeweiligen mindestens einen Motorsteuerfunktion, die dieser für die Mehrzahl von Schlüssel-IDs zugeordnet ist, definieren, Informationen, die für jede Motorsteuerfunktion definieren, auf die über mindestens eine HMI-Einheit (110) zugegriffen werden kann, und deren Verfügbarkeit über mindestens eine Schlüssel-ID der Mehrzahl von Schlüssel-IDs steuerbar ist, ob ein Benutzer derzeit auf sie zugreifen kann.

8. Motorsteuersystem (100) nach einem der Ansprüche 1 bis 7, wobei das Sperrmittel (116) eines von Folgendem umfasst:

einen universellen seriellen Bus-Anschluss, USB-Anschluss, zum Empfangen einer USB-Vorrichtung, die Informationen speichert, die eine entsprechende Schlüssel-ID definieren.
ein Hochfrequenzidentifikations-Lesegerät, RFID-Lesegerät, zum Verbinden eines RFID-Tags, das Informationen speichert, die eine jeweilige Schlüssel-ID definieren,
eine Nahfeldkommunikations-Vorrichtung, NFC-Vorrichtung, zum Verbinden einer anderen NFC-Vorrichtung, die Informationen speichert, die eine jeweilige Schlüssel-ID definieren,
einen Fingerabdrucksensor zum Erhalten eines Fingerabdrucks eines Benutzers zum Vergleich mit einer oder mehreren vordefinierten Fingerabdruckvorlagen, die jeweils einer oder mehreren Schlüssel-IDs zugeordnet sind,
ein Bildgebungsmittel zum Erhalten eines Bildes des Gesichts eines Benutzers zum Vergleich von aus einem erhaltenen Bild extrahierten Gesichtsmerkmalen mit einem oder mehreren Sätzen vordefinierter Gesichtsmerkmale, die jeweils einer oder mehreren Schlüssel-IDs zugeordnet sind,
ein Bildgebungsmittel zum Erhalten eines Bildes einer Iris eines Benutzers zum Vergleich mit einer oder mehreren vordefinierten Irisvorlagen, die jeweils einer oder mehreren Schlüssel-IDs zugeordnet sind.

9. Motorsteueranordnung, umfassend
ein oder mehrere Motorsteuersysteme (100; 100') nach einem der Ansprüche 1 bis 8; und
eine lokale zentrale Steuereinheit, LCCU, (130), die kommunikativ mit dem einen oder den mehreren Motorsteuersystemen (100, 100') gekoppelt ist,
wobei die LCCU (130) eine UI zum Bereitstellen eines Benutzerzugriffs für eine oder mehrere Motorsteuerfunktionen in dem einen oder den mehreren Motorsteuersystemen (100, 100') umfasst und ferner mindestens ein Sperrmittel zum Empfangen eines Sicherheitsschlüssels umfasst, der eine Schlüssel-ID der Mehrzahl von Schlüssel-IDs darstellt, denen jeweils mindestens eine Motorsteuerfunktion zugeordnet ist, und wobei die Motorsteueranordnung konfiguriert ist, wenn das Sperrmittel in der LCCU (130) den Sicherheitsschlüssel empfängt, der die erste Schlüssel-ID darstellt, über die UI der LCCU (130) eine der folgenden Funktionen selektiv zu aktivieren:

eine benutzerbedienbare Sperrfunktion zum Sperren, durch die erste Schlüssel-ID, der jeweiligen mindestens einen Motorsteuerfunktion, die der ersten Schlüssel-ID zugeordnet ist, um einen Benutzerzugriff über alle UIs

in der Motorsteueranordnung auf die jeweilige mindestens eine Motorsteuerfunktion zu deaktivieren, oder eine benutzerbedienbare Entsperrfunktion zum Freigeben der jeweiligen mindestens einen Motorsteuerfunktion vom Sperren durch die erste Schlüssel-ID, um einen Benutzerzugriff, über alle UIs in der Motorsteueranordnung, für diejenigen der jeweiligen mindestens einen Motorsteuerfunktion erneut zu aktivieren, die derzeit nicht durch eine oder mehrere andere Schlüssel-IDs der Mehrzahl von Schlüssel-IDs gesperrt sind.

10. Motorsteueranordnung nach Anspruch 9, wobei die LCCU (130) ein einziges Sperrmittel zum Steuern der selektiven Aktivierung der Sperr- oder Entsperrfunktion in jedem der mit der LCCU (130) gekoppelten Motorsteuersysteme (100, 100') umfasst.

11. Motorsteueranordnung nach Anspruch 10, wobei die LCCU (130) ein zugehöriges Sperrmittel für jedes der mit der LCCU (130) gekoppelten Motorsteuersysteme zum Steuern der selektiven Aktivierung der Sperr- oder Entsperrfunktion in dem jeweiligen Motorsteuersystem (100, 100') umfasst.

12. Verfahren (300) zum Steuern eines Benutzerzugriffs auf eine oder mehrere Motorsteuerfunktionen in einem Motorsteuersystem (100), das über eine Motorsteuerschnittstelle (101) kommunikativ mit einem Motor (102) gekoppelt ist, wobei das Verfahren umfasst Bedienen (310) von zwei oder mehreren Mensch-Maschine-Schnittstellen-Einheiten, HMI-Einheiten (110), wobei jede HMI-Einheit (110) eine entsprechende Benutzerschnittstelle, UI, umfasst, um einem Benutzer Zugriff auf eine oder mehrere Motorsteuerfunktionen zu gewähren, wobei mindestens zwei HMI-Einheiten (110) ein jeweiliges Sperrmittel (116) zum Empfangen eines Sicherheitsschlüssels umfassen, der eine Schlüsselidentifikation, ID, einer Mehrzahl von Schlüssel-IDs darstellt, wobei jeder Schlüssel-ID jeweils mindestens eine Motorsteuerfunktion zugeordnet ist, und
selektives Aktivieren (320), über die UI einer ersten HMI-Einheit, wenn das Sperrmittel (116) in der ersten HMI-Einheit den Sicherheitsschlüssel empfängt, der eine erste Schlüssel-ID der Mehrzahl von Schlüssel-IDs darstellt, einer der folgenden Funktionen:

einer benutzerbedienbaren Sperrfunktion zum Sperren, durch die erste Schlüssel-ID, der jeweiligen mindestens einen Motorsteuerfunktion, die der ersten Schlüssel-ID zugeordnet ist, um einen Benutzerzugriff über die UIs auf die jeweilige mindestens eine Motorsteuerfunktion zu deaktivieren, oder
einer benutzerbedienbaren Entsperrfunktion zum Freigeben der jeweiligen mindestens einen Motorsteuerfunktion vom Sperren durch die erste Schlüssel-ID, um einen Benutzerzugriff, über die UIs, für diejenigen der jeweiligen mindestens einen Motorsteuerfunktion erneut zu aktivieren, die derzeit nicht durch eine oder mehrere andere Schlüssel-IDs der Mehrzahl von Schlüssel-IDs gesperrt sind.

13. Computerprogramm, das eine oder mehrere Abfolgen einer oder mehrerer Anweisungen aufweist, die, wenn sie von einem oder mehreren Prozessoren ausgeführt werden, eine Anordnung von einer oder mehreren Vorrichtungen veranlassen, mindestens das Verfahren nach Anspruch 12 durchzuführen.

Revendications

1. Système de commande de moteur (100) pour commander l'accès utilisateur à une ou plusieurs fonction(s) de commande de moteur, le système de commande de moteur (100) étant couplé en communication à un moteur (102) par le biais d'une interface de commande de moteur (101) et le système de commande de moteur (100) comprenant deux ou plusieurs unités d'interface homme-machine, HMI, (110), chaque unité HMI (110) comprenant une interface utilisateur, UI, respective pour fournir un accès utilisateur à une ou plusieurs fonction(s) de commande de moteur respective, dans lequel au moins deux unités HMI (110) comprennent un moyen de verrouillage (116) respectif pour recevoir une clé de sécurité qui représente une identification, ID, par clé, d'une pluralité d'ID par clé, dans lequel chaque ID par clé a au moins une fonction de commande de moteur respective associée à celle-ci,
dans lequel le système de commande de moteur (100) est agencé pour, lorsque le moyen de verrouillage (116) dans une première unité HMI est en réception de la clé de sécurité qui représente une première ID par clé de ladite pluralité d'ID par clé, activer de manière sélective, par le biais de l'UI de ladite première unité HMI, une de ce qui suit :

une fonction de verrouillage actionnable par l'utilisateur pour verrouiller, par la première ID par clé, ladite au moins une fonction de commande de moteur respective associée à la première ID par clé pour désactiver l'accès utilisateur, par le biais desdites UI, à ladite au moins une fonction de commande de moteur respective, ou une fonction de déverrouillage actionnable par l'utilisateur pour défaire ladite au moins une fonction de commande de moteur respective du verrouillage par la première ID par clé, pour ré-activer l'accès utilisateur, par

le biais desdites UI, à celles de ladite au moins une fonction de commande de moteur respective qui ne sont actuellement pas verrouillées par une ou plusieurs autres ID par clé de ladite pluralité d'ID par clé.

2. Système de commande de moteur (100) selon la revendication 1, dans lequel le système de commande de moteur (100) est agencé pour activer la fonction de verrouillage actionnable par l'utilisateur par le biais de l'UI de ladite première unité HMI lorsque le moyen de verrouillage (116) dans ladite première unité HMI est en réception de la clé de sécurité stockant la première ID par clé, et
activer, ensuite la fonction de déverrouillage actionnable par l'utilisateur par le biais de l'UI d'une seconde unité HMI lorsque le moyen de verrouillage (116) dans ladite seconde unité HMI est en réception de la clé de sécurité stockant la première clé par ID.

3. Système de commande de moteur (100) selon la revendication 1 ou 2, dans lequel ladite première unité HMI (110) est agencée pour activer la fonction de verrouillage actionnable par l'utilisateur au cas où la première ID par clé n'est pas actuellement appliquée pour verrouiller l'au moins une fonction de commande de moteur respective associée à celle-ci.

4. Système de commande de moteur (100) selon l'une quelconque des revendications 1 à 3, dans lequel ladite première unité HMI (110) est agencée pour activer la fonction de déverrouillage actionnable par l'utilisateur au cas où la première ID par clé est actuellement appliquée pour verrouiller l'au moins une fonction de commande de moteur respective associée à celle-ci.

5. Système de commande de moteur (100) selon l'une quelconque des revendications 1 à 3, agencé pour désactiver, par le biais de l'UI respective de chacune des unités HMI, en réponse à un utilisateur engageant la fonction de verrouillage actionnable par l'utilisateur par le biais de l'UI de la première unité HMI, l'accès utilisateur à ladite au moins une fonction de commande de moteur respective associée à la première ID par clé, et
ré-activer, par le biais de l'UI respective de chacune des unités HMI, en réponse à un utilisateur engageant la fonction de déverrouillage actionnable par l'utilisateur par le biais de l'UI de la première unité HMI, l'accès utilisateur à celles de ladite au moins une fonction de commande de moteur respective associée à la première ID par clé qui ne sont pas verrouillées par une ou plusieurs autres ID par clé de ladite pluralité d'ID par clé.

6. Système de commande de moteur (100) selon la revendication 5, agencé pour, lorsque le moyen de verrouillage (116) dans la première unité HMI est en réception de la clé de sécurité qui représente la première ID par clé, activer de manière sélective une de la fonction de verrouillage actionnable par l'utilisateur ou des fonctions de déverrouillage actionnables par l'utilisateur en réponse à la réception, par le biais de l'UI de la première unité HMI, d'un code d'identification personnel valide.

7. Système de commande de moteur (100) selon l'une quelconque des revendications 1 à 6, comprenant en outre une base de données de contrôle de sécurité, SCBD, (120), pour stocker au moins :

des informations qui définissent un mappage entre une ID par clé et l'au moins une fonction de commande de moteur respective associée à celle-ci pour ladite pluralité d'ID par clé,
des informations qui définissent pour chaque fonction de commande de moteur accessible par le biais d'au moins une unité HMI (110) et dont la disponibilité peut être commandée par au moins une ID par clé de ladite pluralité d'ID par clé, si elle est actuellement accessible par un utilisateur.

8. Système de commande de moteur (100) selon l'une quelconque des revendications 1 à 7, dans lequel le moyen de verrouillage (116) comprend un des suivants :

un port de bus en série universel, USB, pour recevoir un dispositif USB qui stocke des informations qui définissent une ID par clé respective,
un lecteur d'identification par radio-fréquences, RFID, pour relier une balise RFID qui stocke des informations qui définissent une ID par clé respective,
un dispositif de communication en champ proche, NFC, pour connecter un autre dispositif NFC qui stocke des informations qui définissent une ID par clé respective,
un capteur d'empreinte digitale pour obtenir une empreinte digitale d'un utilisateur pour la comparaison à un ou plusieurs modèle(s) d'empreinte prédéfini(s) qui est/sont associé(s) à une ou plusieurs ID par clé respective(s),
un moyen d'imagerie pour obtenir une image du visage d'un utilisateur pour la comparaison de caractéristiques

faciales extraites d'une image obtenue à un ou plusieurs jeu(x) de caractéristiques faciales prédéfinies qui sont associées à une ou plusieurs ID par clé respective(s),
un moyen d'imagerie pour obtenir une image d'un iris d'un utilisateur pour la comparaison à un ou plusieurs modèle(s) d'iris prédéfini(s) qui est/sont associé(s) à une ou plusieurs ID par clé respective(s).

9. Agencement de commande de moteur comprenant
un ou plusieurs système(s) de commande de moteur (100, 100') selon l'une quelconque des revendications 1 à 8 ; et une unité de commande centrale locale, LCCU, (130), couplée en communication avec lesdits un ou plusieurs système(s) de commande de moteur (100, 100'), dans lequel la LCCU (130) comprend une UI pour fournir un accès utilisateur à une ou plusieurs fonction(s) de commande de moteur dans ledit au moins un un ou plusieurs système(s) de commande de moteur (100, 100') et comprend en outre au moins un moyen de verrouillage pour recevoir une clé de sécurité qui représente une ID par clé de ladite pluralité d'ID par clé, laquelle ID par clé a au moins une fonction de commande de moteur respective associée à celle-ci, et
dans lequel l'agencement de commande de moteur est configuré pour, lorsque le moyen de verrouillage dans la LCCU (130) est en réception de la clé de sécurité qui représente ladite première ID par clé, activer de manière sélective, par le biais de l'UI de la LCCU (130), une de ce qui suit :

une fonction de verrouillage actionnable par l'utilisateur pour verrouiller, par la première ID par clé, l'au moins une fonction de commande de moteur respective associée à la première ID par clé pour désactiver l'accès utilisateur, par le biais de toutes les U dans l'agencement de commande de moteur, à ladite au moins une fonction de commande de moteur respective, ou
une fonction de déverrouillage actionnable par l'utilisateur pour défaire l'au moins une fonction de commande de moteur respective du verrouillage par la première ID par clé, pour ré-activer l'accès utilisateur, par le biais de toutes les UI dans l'agencement de commande de moteur, à celles de ladite au moins une fonction de commande de moteur respective qui ne sont actuellement pas verrouillées par une ou plusieurs autres ID par clé de ladite pluralité d'ID par clé.

10. Agencement de commande de moteur selon la revendication 9, dans lequel la LCCU (130) comprend un seul moyen de verrouillage pour commander l'activation sélective de la fonction de verrouillage ou de déverrouillage dans chacun desdits systèmes de commande de moteur (100, 100') couplés à la LCCU (130).

11. Agencement de commande de moteur selon la revendication 10, dans lequel la LCCU (130) comprend un moyen de verrouillage dédié pour chacun des systèmes de commande de moteur couplés à la LCCU (130) pour commander l'activation sélective de la fonction de verrouillage ou de déverrouillage dans les systèmes de commande de moteur (100, 100') respectifs.

12. Procédé (300) de commande de l'accès utilisateur à une ou plusieurs fonction(s) de commande de moteur dans un système de commande de moteur (100) qui est couplé en communication à un moteur (102) par le biais d'une interface de commande de moteur (101), le procédé comprenant
le fonctionnement (310), de deux ou plusieurs unités d'interface homme-machine, HMI, (110), chaque unité HMI (110) comprenant une interface utilisateur, UI, respective pour fournir un accès utilisateur à une ou plusieurs fonction(s) de commande de moteur respective, dans lequel au moins deux unités HMI (110) comprennent un moyen de verrouillage (116) respectif pour recevoir une clé de sécurité qui représente une identification, ID, par clé, d'une pluralité d'ID par clé, dans lequel chaque ID par clé a au moins une fonction de commande de moteur respective associée à celle-ci, et
l'activation sélective (320), par le biais de l'UI d'une première unité HMI, lorsque le moyen de verrouillage (116) dans la première unité HMI est en réception de la clé de sécurité qui représente une première ID par clé de ladite pluralité d'ID par clé, une de ce qui suit :

une fonction de verrouillage actionnable par l'utilisateur pour verrouiller, par la première ID par clé, ladite au moins une fonction de commande de moteur respective associée à la première ID par clé pour désactiver l'accès utilisateur, par le biais desdites UI, à ladite au moins une fonction de commande de moteur respective, ou une fonction de déverrouillage actionnable par l'utilisateur pour défaire ladite au moins une fonction de commande de moteur du verrouillage par la première ID par clé, pour ré-activer l'accès utilisateur, par le biais desdites UI, à celles de ladite au moins une fonction de commande de moteur respective qui ne sont actuellement pas verrouillées par une ou plusieurs autres ID par clé de ladite pluralité d'ID par clé.

13. Programme informatique incluant un ou plusieurs séquence(s) d'une ou plusieurs instruction(s) qui, lorsqu'elles

sont exécutées par un ou plusieurs processeur(s), font qu'un agencement d'un ou plusieurs appareils exécute au moins le procédé selon la revendication 12.

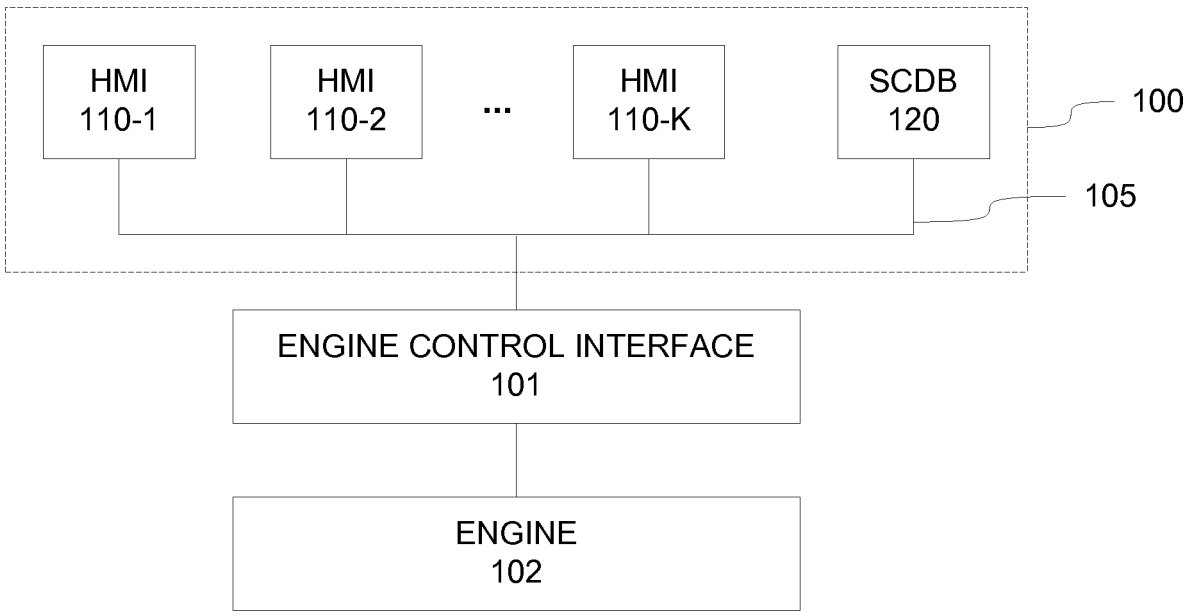

Figure 1

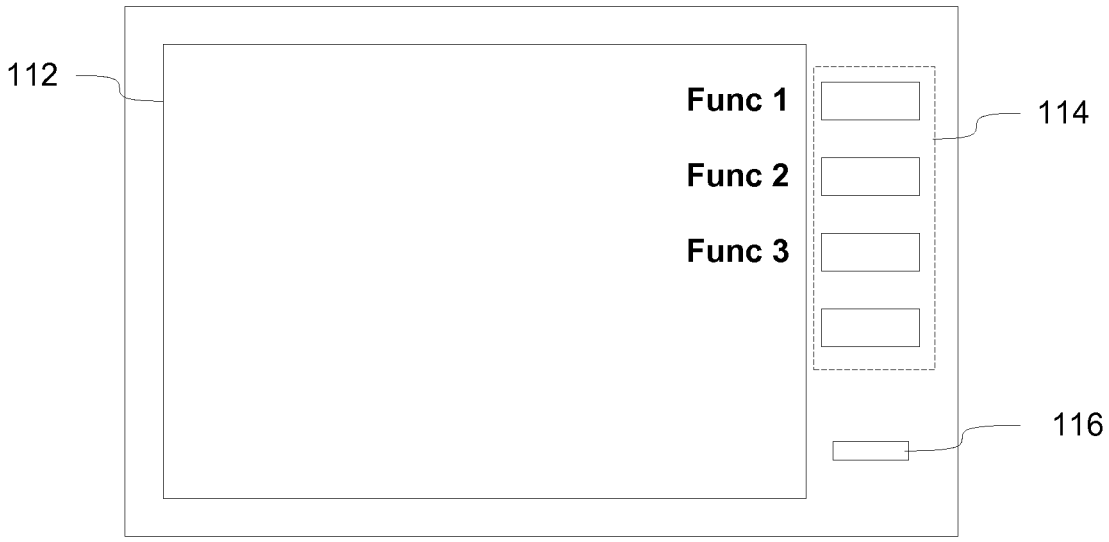

Figure 2

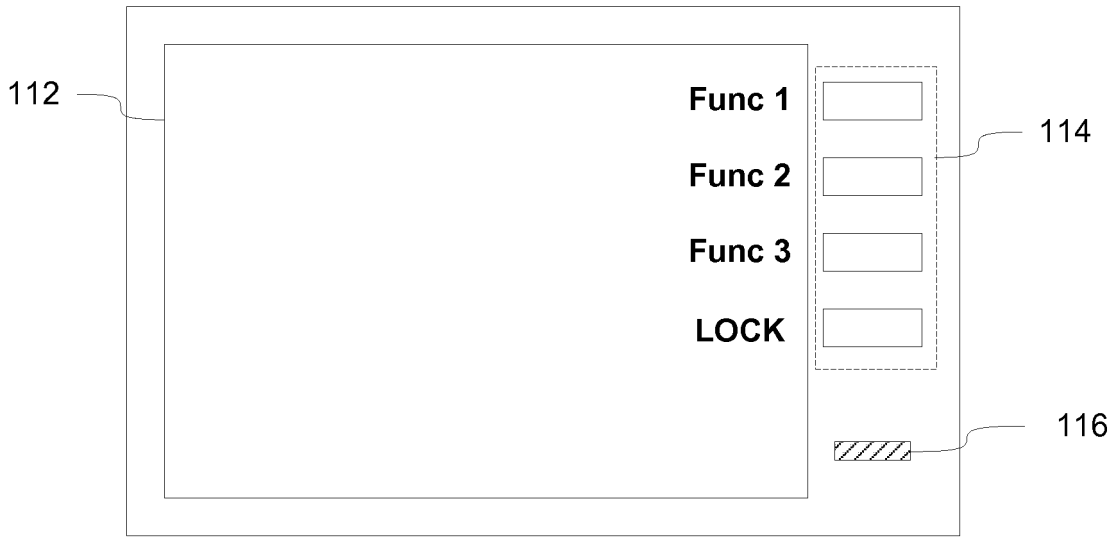

Figure 3A

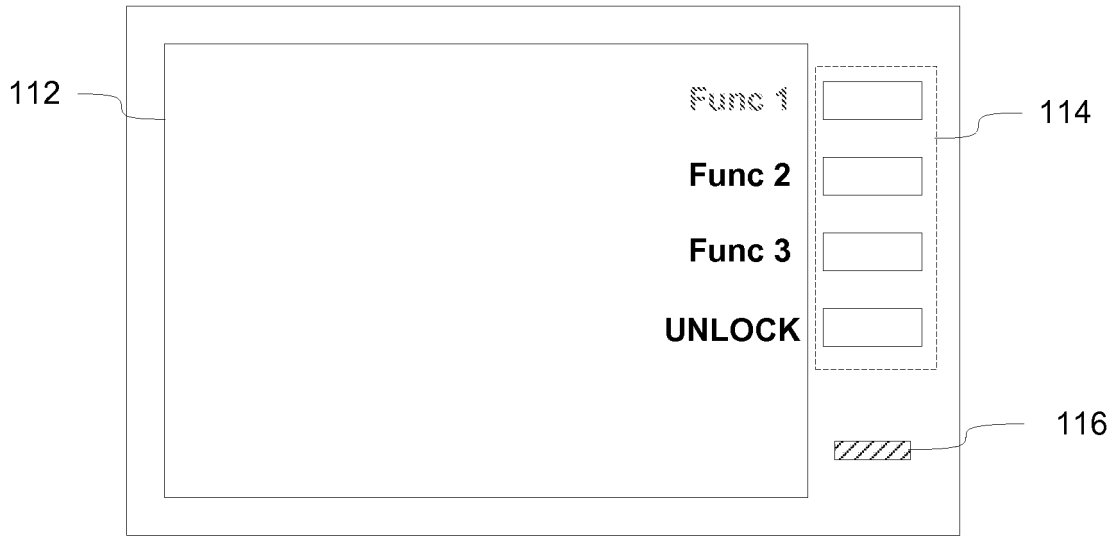

Figure 3B

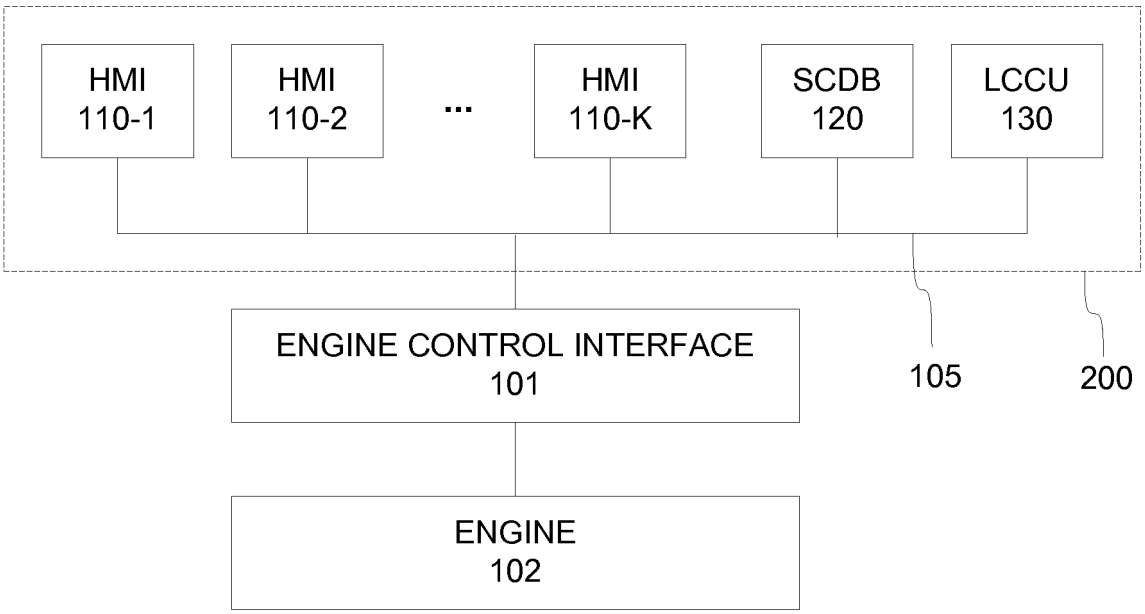

Figure 4

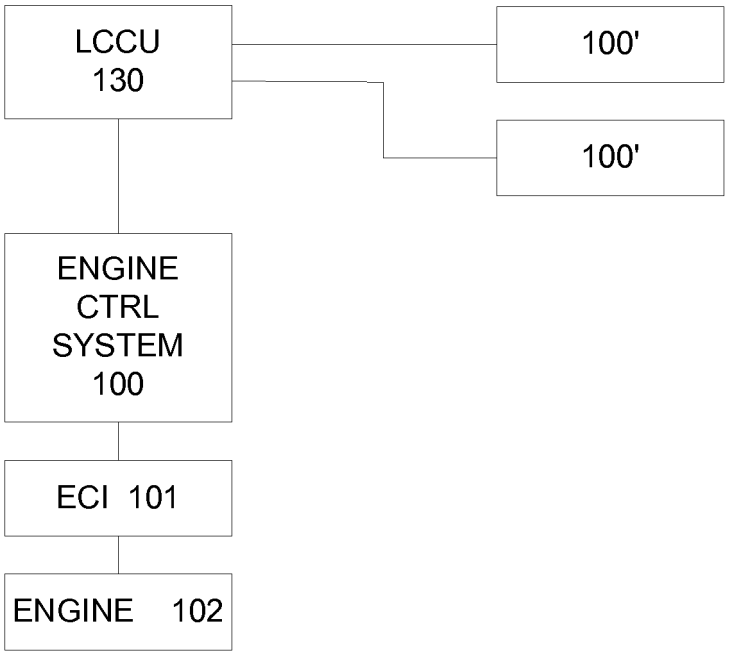

Figure 5

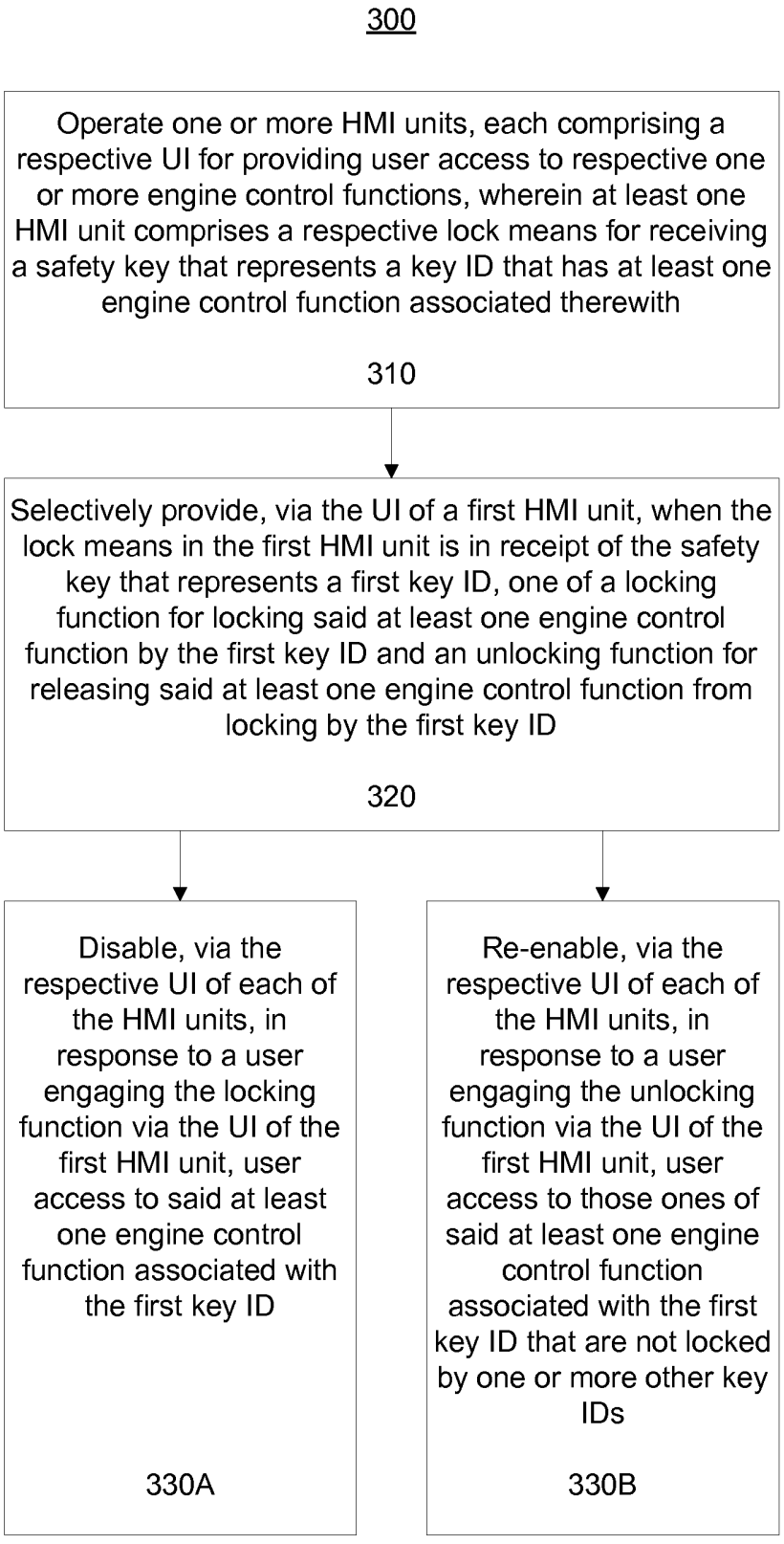
300
Operate one or more HMI units, each comprising a respective UI for providing user access to respective one or more engine control functions, wherein at least one HMI unit comprises a respective lock means for receiving a safety key that represents a key ID that has at least one engine control function associated therewith
310
Selectively provide, via the UI of a first HMI unit, when the lock means in the first HMI unit is in receipt of the safety key that represents a first key ID, one of a locking function for locking said at least one engine control function by the first key ID and an unlocking function for releasing said at least one engine control function from locking by the first key ID
320
Disable, via the respective UI of each of the HMI units, in response to a user engaging the locking function via the UI of the first HMI unit, user access to said at least one engine control function associated with the first key ID
330A
Re-enable, via the respective UI of each of the HMI units, in response to a user engaging the unlocking function via the UI of the first HMI unit, user access to those ones of said at least one engine control function associated with the first key ID that are not locked by one or more other key IDs
330B

Figure 6

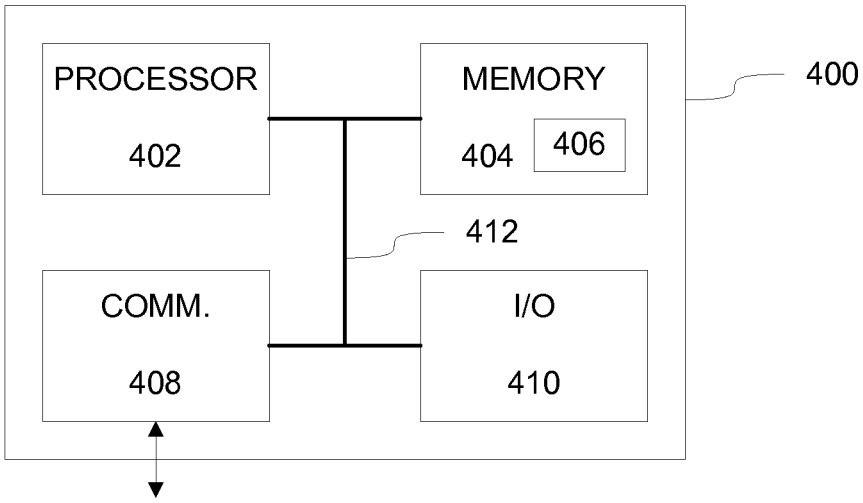

Figure 7

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2007227429 A1 **[0004]**
- US 2005181685 A1 **[0005]**