



(51) International Patent Classification:

F02N 11/08 (2006.01) B60R 25/04 (2013.01)

(21) International Application Number:

PCT/EP2017/084415

(22) International Filing Date:

22 December 2017 (22.12.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

201611215029.7 23 December 2016 (23.12.2016) CN

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: METHOD OF CONTROLLING AN ENGINE OF VEHICLE AND ENGINE CONTROL DEVICE

(57) Abstract: The present disclosure provides a method of controlling the engine of the vehicle without utilization of the SSB and an engine control device for the method. The method includes steps of: detecting whether there is a press on an accelerator pedal of the vehicle (310); receiving and authenticating a credential associated with the vehicle from a smart key (320); and determining to start the engine if a press on the accelerator pedal is detected and the credential is successfully authenticated (360).

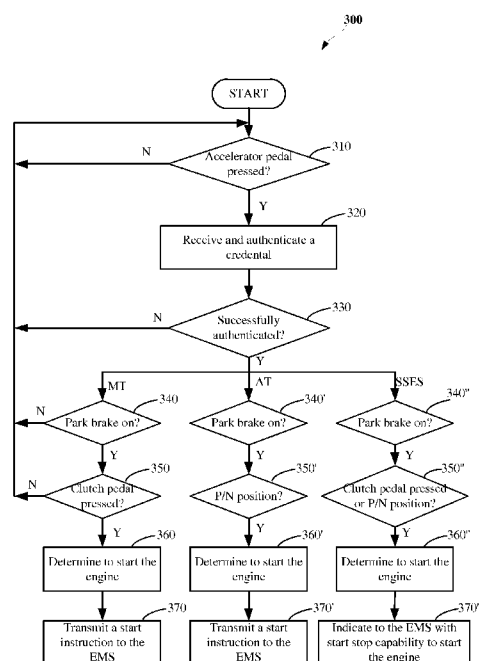


FIG. 3

METHOD OF CONTROLLING AN ENGINE OF VEHICLE AND ENGINE CONTROL DEVICE

FIELD OF THE PRESENT INVENTION

The present disclosure generally relates to the field of vehicle control, and particularly to a method of controlling an engine of a vehicle without utilization of a Start Stop Button (SSB) and an engine control device for implementing the method.

BACKGROUND OF THE PRESENT INVENTION

Currently, many gasoline vehicles are equipped with a Passive Entry Passive Start (PEPS) system to facilitate operation of the vehicle by a driver. In such vehicles, an electrical button is provided to control the Passive Start (PS) function to enable the driver carrying a smart key to start or stop the engine of the vehicle without operating an ignition lock or a mechanical manipulating knob. Such an electrical button is usually called a Start Stop Button (SSB). Fig. 1 illustrates a schematic diagram of a vehicle engine control system 1 equipped with an SSB in the prior art.

As shown in Fig. 1, the vehicle engine control system 1 includes an engine control device 10 and a smart key 30. The engine control device 10 is equipped or connected with, among other things, a SSB 11, at least one Low Frequency (LF) transmitter 12, a Radio Frequency (RF) receiver 13, a gear box switch 14 and a brake pedal switch 15. The SSB 11 usually integrates two light-emitting diodes (LEDs) of Yellow and Green colors. A lighting Green LED indicates that conditions are met to start the engine. In this case, the SSB 11 may be pressed to start the engine. On the other hand, a lighting Yellow LED indicates that at least one condition is missing to start the engine. In this case, pressing the SSB will result in no action. As a usual engine start procedure, the driver of the vehicle may press the SSB 11 first. In response to the press on the SSB 11, the engine control device 10 transmits a LF signal to the smart key 30 through the LF transmitter 12 to authenticate the smart key 30. After receiving the LF signal, a RF signal is transmitted from the smart key 30 to the RF receiver 13 to provide the identifier of the smart key 30 for authentication. The engine control device 10 authenticates the received identifier of the smart key 30 by, for example, comparing it with one or more identifiers stored in the engine control device 10 in advance. After the identifier of the smart key 30 is successfully authenticated, the engine control device 10 determines whether the gear box switch 14 has detected the gear box of the vehicle to be in a Park or Neutral (P/N) position and whether the brake pedal switch 15 has detected a press on the brake pedal of the vehicle. If the gear box is determined to be in a P/N position and the brake pedal has

been pressed, the engine control device 10 will send a start instruction to the Engine Management System (EMS, not shown) of the vehicle to start the engine.

SUMMARY OF THE PRESENT INVENTION

In the above conventional gasoline vehicles, to enable the Passive Start function, the SSB has necessarily to be installed in the vehicles, which will increase the cost for each vehicle.

To avoid the costs involved with the prior art, the present disclosure proposes a method of controlling the engine of the vehicle without utilization of the SSB and an engine control device for the method.

According to a first aspect of the present disclosure, a method of controlling an engine of a vehicle without utilization of a SSB is provided. The method includes steps of: detecting whether there is a press on an accelerator pedal of the vehicle; receiving and authenticating a credential associated with the vehicle from a smart key; and determining to start the engine if a press on the accelerator pedal is detected and the credential is successfully authenticated.

According to a second aspect of the present disclosure, an engine control device of a vehicle without utilization of a SSB is provided. The engine control device includes a processor that is configured to: detect whether there is a press on an accelerator pedal of the vehicle; receive and authenticate a credential associated with the vehicle from a user terminal; and determine to start the engine if a press on the accelerator pedal is detected and the credential is successfully authenticated.

According to a third aspect of the present disclosure, a method of controlling an engine of a vehicle without utilization of a SSB is provided. The method includes steps of: detecting whether at least one action to stop the vehicle is received from a user of the vehicle; detecting whether a speed of the vehicle is substantially zero; and determining to stop the engine if at least one action to stop the vehicle is received from the user and the speed of the vehicle is detected to be substantially zero.

According to a fourth aspect of the present disclosure, an engine control device of a vehicle without utilization of a SSB is provided. The engine control device includes a processor configured to: detect whether at least one action to stop the vehicle is received from a user of the vehicle; detect whether a speed of the vehicle is substantially zero; and determine to stop the engine if at least one action to stop the vehicle is received from the user and the speed of the vehicle is detected to be substantially zero.

With the solution of the present disclosure, the engine start and stop button is not needed in the vehicle, and thus a cost reduction is achieved. Furthermore, a user

experience like electric vehicles may be obtained.

BRIEF DESCRIPTION OF THE DRAWINGS

The present disclosure will be understood better and other objectives, details, features and advantages of the present disclosure will become more evident from the description of specific embodiments of the disclosure given in conjunction with the following figures, wherein:

Fig. 1 illustrates a schematic diagram of a vehicle engine control system equipped with an SSB in the prior art;

Fig. 2 illustrates a schematic diagram of a vehicle engine control system according to the present disclosure;

Fig. 3 illustrates a flowchart of a method of controlling the engine of the vehicle without utilization of the SSB according to the present disclosure;

Fig. 4 illustrates a flowchart of a method of controlling the engine of the vehicle without utilization of the SSB according to the present disclosure; and

Fig. 5 illustrated a schematic diagram of the engine control device according to the present disclosure.

Throughout the figures, the same or like reference numbers indicate same or like elements.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Preferred embodiments of the present disclosure will now be described in more details in conjunction with accompanying figures. Although preferred embodiments of the present disclosure are shown in the accompanying figures, it should be understood that the present disclosure can be embodied in various ways but not be limited to the embodiments depicted herein. Instead, the embodiments are provided herein to make the disclosure more throughout and complete and convey the scope of the present disclosure to those skilled in this art.

Fig. 2 illustrates a schematic diagram of a vehicle engine control system 2 according to the present disclosure. As shown in Fig. 2, the vehicle engine control system 2 according to the present disclosure includes an engine control device 20 according to the present disclosure and a smart key 30 as used in the prior art and shown in Fig. 1. The engine control device 20 according to the present disclosure may be embodied in the PEPS Electronic Control Unit (ECU) of the vehicle or may be an independent component of the vehicle from the PEPS ECU.

The engine control device 20 of Fig. 2 is different from the engine control device 10 of

Fig. 1 in that the engine control device 20 of Fig. 2 is not equipped or connected with any SSB. Instead, the engine control device 20 is further equipped or connected with an accelerator pedal switch 26 and a park brake switch 27. The accelerator pedal switch 26 is configured to detect the state of the accelerator pedal of the vehicle. For example, the accelerator pedal switch 26 is configured to detect whether the accelerator pedal has been pressed or pushed. The park brake switch 27 is configured to detect the state of the park brake of the vehicle. In some instances, the park brake of the vehicle includes an Electric Park Brake (EPB). For example, the park brake switch 27 is configured to detect whether the park brake is on. It is to be noted that the accelerator pedal switch 26 and the park brake switch 27 may also be present in the engine control device 10 of Fig. 1, but they are not involved in the engine start procedure as described above with reference to Fig. 1 and thus are omitted.

Similar to the engine control device 10 of Fig. 1, the engine control device 20 of Fig. 2 is also equipped or connected with at least one LF transmitter 22, a RF receiver 23, and a gear box switch 24. The gear box switch 24 is configured to detect the position of the gear box of the vehicle. For example, the position of the gear box may include one of a Reverse position, a Park position, a Neutral position, a Drive position, a Second position and a Low position. Here, in the description of the present disclosure, only the Park (P) position and the Neutral (N) position are involved, and thus other positions will not be described in detail.

Furthermore, if the vehicle is equipped with a manual transmission, the engine control device 20 is further equipped or connected with a clutch pedal switch 28. The clutch pedal switch 28 is configured to detect the state of the clutch pedal of the vehicle. For example, the clutch pedal switch 28 is configured to detect whether the clutch pedal has been pressed or pushed.

Fig. 3 illustrates a flowchart of a method 300 of controlling the engine of the vehicle without utilization of the SSB according to the present disclosure. The method 300 focuses on the engine start procedure of the vehicle. Hereinafter, the flowchart of the method 300 will be described in connection with the schematic diagram of the vehicle engine control system 2, especially the engine control device 20, as shown in Fig. 2.

As shown in Fig. 3, at step 310, the engine control device 20 determines whether there is a press on the accelerator pedal of the vehicle. In one implementation, the accelerator pedal switch 26 detects the state of the accelerator pedal and upon detection of a press on the accelerator pedal, the accelerator pedal switch 26 transmits a signal to the engine control device 20 indicating that the accelerator pedal has been pressed. In the present disclosure, the Passive Start procedure is initiated by the press on the accelerator pedal

rather than the press on an SSB.

Then, at step 320, in responding to detecting the press on the accelerator pedal, the engine control device 20 receives and authenticates a credential associated with the vehicle from the smart key 30. The process for authenticating the credential is similar to that described with reference to Fig. 1. First, in response to the press on the accelerator pedal, the engine control device 20 transmits a LF signal to the smart key 30 through the LF transmitter 22 to authenticate the smart key 30. After receiving the LF signal, a RF signal is transmitted from the smart key 30 to the RF receiver 23 to provide the credential such as an identifier of the smart key 30 for authentication. The engine control device 20 authenticates the received credential of the smart key 30 by, for example, comparing it with one or more credentials stored in the engine control device 20 in advance.

At step 330, the engine control device 20 determines whether the credential received from the smart key 30 is successfully authenticated.

If the credential received from the smart key 30 is successfully authenticated, depending on the configuration of the vehicle per se, the rest of the Passive Start procedure may be slightly different. Herein, the configuration of the vehicle per se refers to whether the vehicle is equipped with a manual transmission, an automatic transmission or a Start-Stop Engine System (SSES).

In a first embodiment, in case that the vehicle is equipped with a manual transmission (the left branch of Fig. 3), the method 300 further includes steps 340 and 350, where the engine control device 20 determines whether the park brake (especially the EPB) of the vehicle is on and whether the clutch pedal is pressed, respectively. In one implementation, the park brake switch 27 detects the state of the park brake and upon detection that the park brake is on, the park brake switch 27 transmits a signal to the engine control device 20 indicating that the park brake is on. The clutch pedal switch 28 detects the state of the clutch pedal and upon detection of a press on the clutch pedal, the clutch pedal switch 28 transmits a signal to the engine control device 20 indicating that the clutch pedal has been pressed.

At step 360, the engine control device 20 determines to start the engine if both the determination results in step 340 and 350 are YES, i.e. if the park brake is on and the clutch pedal is pressed.

And then at step 370, the engine control device 20 transmits a start instruction to the EMS and the EMS actually starts and runs the engine. In some cases, the cranking may be controlled by the engine control device 20 itself.

In a second embodiment, in case that the vehicle is equipped with an automatic transmission (the middle branch of Fig. 3), the method 300 further includes steps 340' and

350', where the engine control device 20 determines whether the park brake (especially the EPB) of the vehicle is on and whether the gear box is in a Park or Neutral position, respectively. In one implementation, the park brake switch 27 detects the state of the park brake and upon detection of the park brake being on, the park brake switch 27 transmits a signal to the engine control device 20 indicating that the park brake is on. The gear box switch 24 detects the position of the gear box and transmits a signal to the engine control device 20 indicating the position of the gear box.

At step 360', the engine control device 20 determines to start the engine if both the determination results in step 340' and 350' are YES, i.e. if the park brake is on and the gear box is in a Park or Neutral position.

And then at step 370', the engine control device 20 transmits a start instruction to the EMS and the EMS actually starts and runs the engine, similarly to the step 370 for the manual transmission. In some cases, the cranking may be controlled by the engine control device 20 itself.

In a third embodiment, in case that the vehicle is equipped with a Start-Stop Engine System (SSES) (the right branch of Fig. 3), the method 300 further includes steps 340'' and 350'', where the engine control device 20 determines whether the park brake (especially the EPB) of the vehicle is on and whether the clutch pedal is pressed (for a manual transmission vehicle) or whether the gear box is in a Park or Neutral position (for an automatic transmission vehicle), respectively. In one implementation, the park brake switch 27 detects the state of the park brake and upon detection of the park brake being on, the park brake switch 27 transmits a signal to the engine control device 20 indicating that the park brake is on. The gear box switch 24 detects the position of the gear box and transmits a signal to the engine control device 20 indicating the position of the gear box. The clutch pedal switch 28 detects the state of the clutch pedal and upon detection of a press on the clutch pedal, the clutch pedal switch 28 transmits a signal to the engine control device 20 indicating that the clutch pedal has been pressed.

At step 360'', the engine control device 20 determines to start the engine if both the determination results in step 340'' and 350'' are YES, i.e. if the park brake is on and if the clutch pedal is pressed (for a manual transmission vehicle) or the gear box is in a Park or Neutral position (for an automatic transmission vehicle).

And then at step 370'', the engine control device 20 indicates to the EMS with a Start-Stop capability (not shown) to start the engine. In this case, the EMS with Start-Stop capability will take over the engine control activities instead of the engine control device 20.

Throughout the description of the method 300, if the determination result of a step

(any of steps 310, 330, 340 (340', 340'') or 350 (350', 350'')) is NO, the Passive Start procedure will be terminated, and thus its detailed description is omitted.

It is to be noted that in Fig. 3, to make the drawing concise, only lines for the negative determination result of steps 340 and 350 are shown and those for steps 340', 340'', 350' and 350'' are omitted.

In Fig. 3, all of the three branches are illustrated to describe three possible configurations of the vehicle. However, it will be appreciated by those skilled in the art that each vehicle will have only one of the three configurations at a time. For a vehicle with determined engine start configuration, only one branch of the three branches as illustrated in Fig. 3 will be performed to achieve the Passive Start function.

Without the SSB installed in the vehicle, the engine stop procedure of the vehicle should also be redesigned. Fig. 4 illustrates a flowchart of a method 400 of controlling the engine of the vehicle without utilization of the SSB according to the present disclosure. The method 400 focuses on the engine stop procedure of the vehicle. Hereinafter, the flowchart of the method 400 will be described in connection with the schematic diagram of the vehicle engine control system 2, especially the engine control device 20, as shown in Fig. 2.

As shown in Fig. 4, at step 410, the engine control device 20 determines whether at least one action to stop the vehicle is received from the user of the vehicle.

In one embodiment, in case that the vehicle is equipped with the manual transmission, the at least one action to stop the vehicle includes an operation on the park brake. The park brake switch 27 is configured to detect the state of the park brake of the vehicle and upon detection of the park brake being on, the park brake switch 27 transmits a signal to the engine control device 20 indicating that the park brake is on.

Then, at step 420, the engine control device 20 may determine whether the speed of the vehicle is substantially zero. In one implementation, a speed sensor (not shown) equipped on or connected with the engine control device 20 may be used to sense the speed of the vehicle and indicates the sensed speed to the engine control device 20. In practice, a speed below 4km/h will usually be regarded as a substantial zero speed.

After receiving the signal indicating that the park brake is on and determining that the speed of the vehicle is substantially zero, the engine control device 20 may determine that the user wishes to stop the vehicle at step 430. Thereafter, at step 440, the engine control device 20 may transmit a stop instruction to the EMS of the vehicle to stop the engine.

In another embodiment, in case that the vehicle is equipped with the automatic transmission, the at least one action to stop the vehicle includes both an operation on the park brake of the vehicle and an action to set the gear box to the Park or Neutral position.

In one implementation, the park brake switch 27 detects the state of the park brake and upon detection of the park brake being on, the park brake switch 27 transmits a signal to the engine control device 20 indicating that the park brake is on. The gear box switch 24 detects the position of the gear box and transmits a signal to the engine control device 20 indicating the position of the gear box.

Then, at step 420, the engine control device 20 may determine whether the speed of the vehicle is substantially zero. In one implementation, a speed sensor (not shown) equipped on or connected with the engine control device 20 may be used to sense the speed of the vehicle and indicates the sensed speed to the engine control device 20. In practice, a speed below 4km/h will usually be regarded as a substantial zero speed.

After receiving both the signal indicating that the park brake is on from the park brake switch 27 and the signal indicating that the gear box is in a Park or Neutral position from the gear box switch 24 and determining that the speed of the vehicle is substantially zero, the engine control device 20 may determine that the user wishes to stop the vehicle at step 430. Thereafter, at step 440, the engine control device 20 may transmit a stop instruction to the EMS of the vehicle to stop the engine.

In still another embodiment, in case that the vehicle is equipped with the SSES, the engine control device 20 indicates to the SSES to stop the engine by the SSES at step 440. In this case, the SSES will take over the manipulation of the engine instead of the engine control device 20.

Fig. 5 illustrated a schematic diagram of the engine control device 20 according to the present disclosure. As described above, the engine control device 20 may be embodied in the PEPS ECU of the vehicle or may be an independent component of the vehicle from the PEPS ECU. The engine control device 20 may be used to implement the method 300 described with reference to Fig. 3 and/or the method 400 described with reference to Fig. 4.

As shown in Fig. 5, the engine control device 20 includes a processor 210 that controls the operations and functions of the engine control device 20. For example, in some implementations, the processor 210 may implement various operations by using the computer program codes or instructions 230 stored in the memory 220 coupled to the processor 210. The memory 220 may be of any type that is suitable for the implementation of the present disclosure and may be implemented by any suitable data storage technologies, including but not limited to semiconductor based storage devices, magnetic storage devices, or optical storage devices. Although only one memory 220 is illustrated in Fig. 5, a plurality of different memories 220 may be present in the engine control device 20.

The processor 210 may be of any type that is suitable for the implementation of the present disclosure, including but not limited to general purpose processor, dedicated processor, microprocessor, digital signal processor or any multi-core processor. Although only one processor 210 is illustrated in Fig. 5, a plurality of different processors 210 may be present in the engine control device 20.

Those skilled in the art would further appreciate that the various illustrative logical blocks, units, and method steps described in connection with the embodiments of the present disclosure may be implemented as electronic hardware or computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, units, and method steps have been described generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present disclosure.

The above depiction of the present disclosure is to enable any of those skilled in the art to implement or use the present disclosure. For those skilled in the art, various modifications of the present disclosure are obvious, and the general principle defined herein may also be applied to other transformations without departing from the spirit and protection scope of the present disclosure. Thus, the present disclosure is not limited to the examples and designs as described herein, but should be consistent with the broadest scope of the principle and novel characteristics of the present disclosure.

What is claimed is:

1. A method of controlling an engine of a vehicle without utilization of a Start Stop Button (SSB), the method comprising steps of:

detecting whether there is a press on an accelerator pedal of the vehicle;
receiving and authenticating a credential associated with the vehicle from a smart key;
and

determining to start the engine if a press on the accelerator pedal is detected and the credential is successfully authenticated.

2. The method of claim 1, wherein the vehicle has a Passive Start capability.

3. The method of claim 1, wherein the vehicle is equipped with a manual transmission, the method further comprising:

detecting whether a park brake of the vehicle is on and a clutch pedal of the vehicle is pressed;

wherein determining to start the engine further comprises:

determining to start the engine if the park brake is detected to be on and the clutch pedal is detected to be pressed; and

wherein the method further comprises a step of:

transmitting a start instruction to an Engine Management System (EMS) of the vehicle to start the engine if it is determined to start the engine.

4. The method of claim 1, wherein the vehicle is equipped with an automatic transmission, the method further comprising:

detecting whether a park brake of the vehicle is on and a gear box of the vehicle is in a neutral or park position;

wherein determining to start the engine further comprises:

determining to start the engine if the park brake is detected to be on and the gear box is detected to be in a neutral or park position; and

wherein the method further comprises a step of

transmitting a start instruction to an Engine Management System (EMS) of the vehicle to start the engine after it is determined to start the engine.

5. The method of claim 3 or 4, wherein the park brake is an Electrical Park Brake (EPB).

6. The method of claim 1, wherein the vehicle is equipped with a Start-Stop Engine System, the method further comprising:

indicating to an Engine Management System (EMS) with a Start-Stop capability of the vehicle to start the engine by the EMS if it is determined to start the engine.

7. An engine control device of a vehicle without utilization of a Start Stop Button (SSB), comprising:

a processor that is configured to:

detect whether there is a press on an accelerator pedal of the vehicle;

receive and authenticate a credential associated with the vehicle from a user terminal; and

determine to start the engine if a press on the accelerator pedal is detected and the credential is successfully authenticated.

8. The engine control device of claim 7, wherein the vehicle has a Passive Start capability.

9. The engine control device of claim 7, wherein the vehicle is equipped with a manual transmission, and

the processor is further configured to:

detect whether a park brake of the vehicle is on and a clutch pedal of the vehicle is pressed;

determine to start the engine if a press on the accelerator pedal is detected and the credential is successfully authenticated and further if the park brake is detected to be on and the clutch pedal is detected to be pressed; and

transmit a start instruction to an Engine Management System (EMS) of the vehicle to start the engine if it is determined to start the engine.

10. The engine control device of claim 7, wherein the vehicle is equipped with an automatic transmission, and

the processor is further configured to:

detect whether a park brake of the vehicle is on and a gear box of the vehicle is in a neutral or park position;

determine to start the engine if a press on the accelerator pedal is detected and the credential is successfully authenticated and further if the park brake is detected to be on and the gear box is detected to be in a neutral or park position; and

transmit a start instruction to an Engine Management System (EMS) of the vehicle to start the engine after it is determined to start the engine.

11. The engine control device of claim 9 or 10, wherein the park brake is an Electrical Park Brake.

12. The engine control device of claim 7, wherein the vehicle is equipped with a Start-Stop Engine System, and the processor is further configured to:

indicating to an Engine Management System (EMS) with a Start-Stop capability of the vehicle to start the engine by the EMS if it is determined to start the engine.

13. A method of controlling an engine of a vehicle without utilization of a Start Stop Button (SSB), the method comprising steps of:

detecting whether at least one action to stop the vehicle is received from a user of the vehicle;

detecting whether a speed of the vehicle is substantially zero; and

determining to stop the engine if at least one action to stop the vehicle is received from the user and the speed of the vehicle is detected to be substantially zero.

14. The method of claim 13, wherein detecting whether a speed of the vehicle is substantially zero includes detecting whether a speed of the vehicle is below 4km/h.

15. The method of claim 13, wherein the vehicle is equipped with a manual transmission and the at least one action to stop the vehicle includes an operation on a park brake of the vehicle by the user, the method further comprising a step of:

transmitting a stop instruction to an Engine Management System (EMS) of the vehicle to stop the engine after it is determined to stop the engine.

16. The method of claim 13, wherein the vehicle is equipped with an automatic transmission, and the at least one action to stop the vehicle includes an operation on a park brake of the vehicle by the user and an action to set a gear box of the vehicle to a neutral or park position, the method further comprising a step of:

transmitting a stop instruction to an Engine Management System (EMS) of the vehicle to stop the engine after it is determined to stop the engine.

17. The method of claim 15 or 16, wherein the park brake is an Electrical Park Brake.

18. The method of claim 13, wherein the vehicle is equipped with a Start-Stop Engine System, the method further comprising a step of:

transmitting a stop instruction to the Start-Stop Engine System to stop the engine by the Start-Stop Engine System after it is determined to stop the engine.

19. An engine control device of a vehicle without utilization of a Start Stop Button (SSB), comprising:

a processor configured to:

detect whether at least one action to stop the vehicle is received from a user of the vehicle;

detect whether a speed of the vehicle is substantially zero; and

determine to stop the engine if at least one action to stop the vehicle is received from the user and the speed of the vehicle is detected to be substantially zero.

20. The engine control device of claim 19, wherein the processor is further configured to detect whether a speed of the vehicle is below 4km/h so as to detect whether a speed of the vehicle is substantially zero.

21. The engine control device of claim 19, wherein the vehicle is equipped with a manual transmission and the at least one action to stop the vehicle includes an operation on a park brake of the vehicle by the user, and

the processor is further configured to:

transmit a stop instruction to an Engine Management System (EMS) of the vehicle to stop the engine automatically after it is determined to stop the engine.

22. The engine control device of claim 19, wherein the vehicle is equipped with an automatic transmission, and the at least one action to stop the vehicle includes an operation on a park brake of the vehicle by the user and an action to set a gear box of the vehicle to a neutral or park position, and

the processor is further configured to:

transmit a stop instruction to an Engine Management System (EMS) of the vehicle to stop the engine automatically after it is determined to stop the engine.

23. The engine control device of claim 21 or 22, wherein the park brake is an Electrical Park Brake.

24. The engine control device of claim 19, wherein the vehicle is equipped with a Start-Stop Engine System, and the processor is further configured to:

transmit a stop instruction to the Start-Stop Engine System to stop the engine by the Start-Stop Engine System after it is determined to stop the engine.

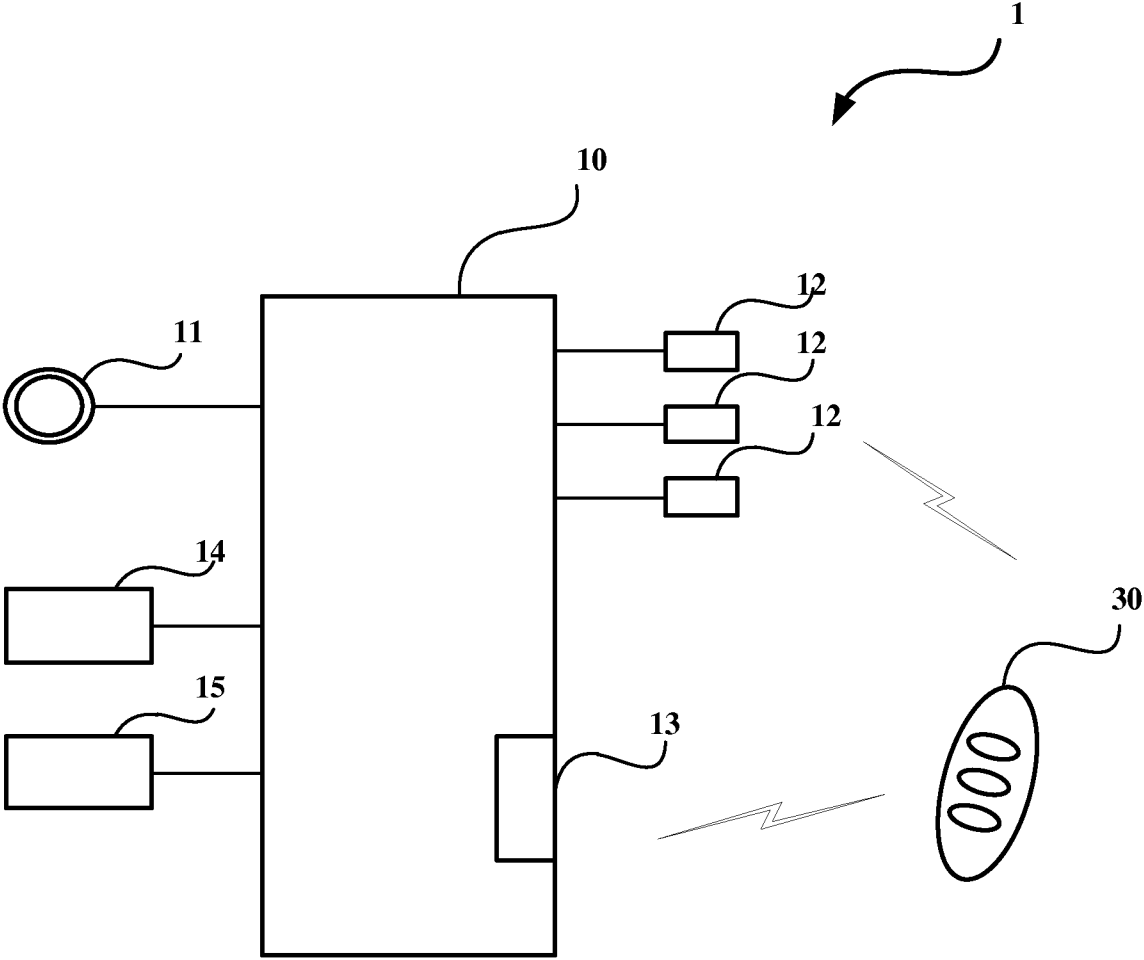


FIG. 1

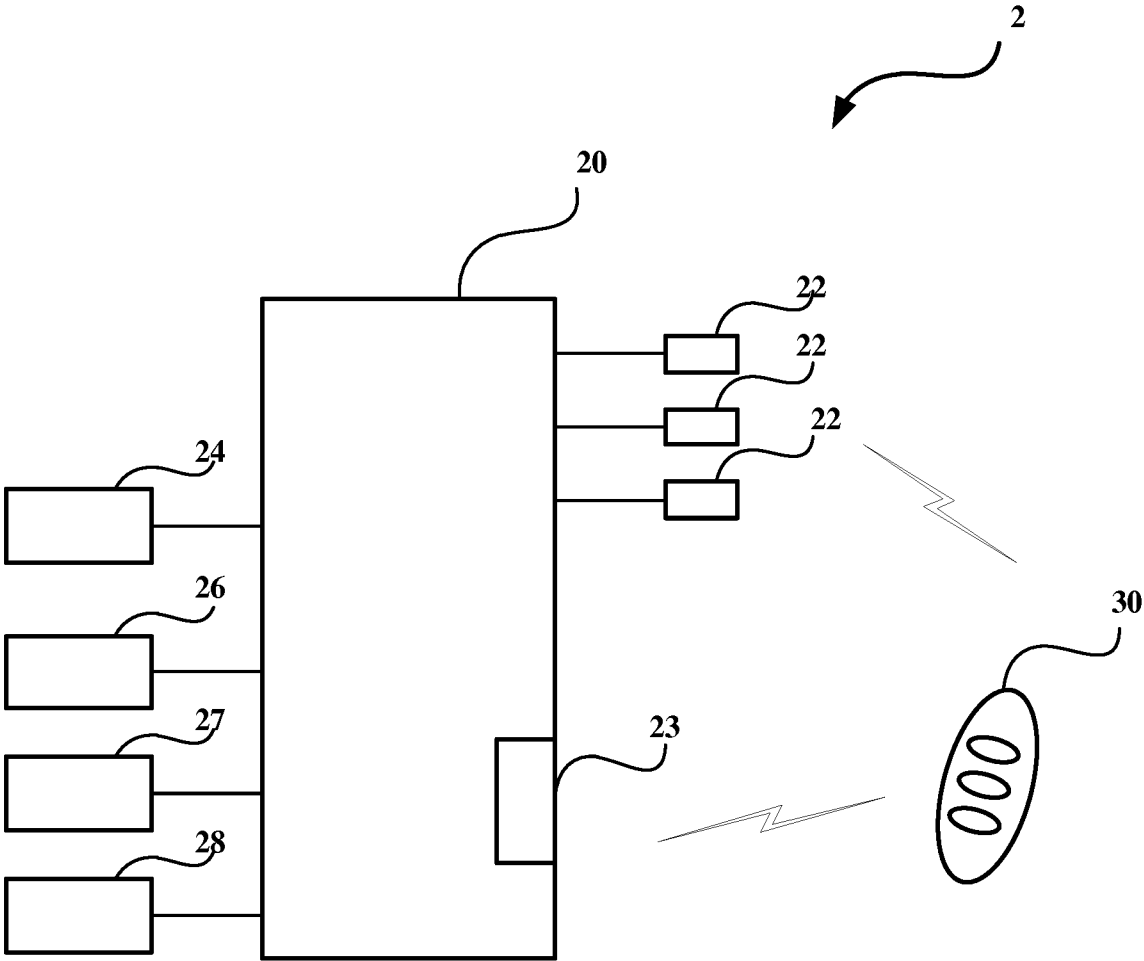


FIG. 2

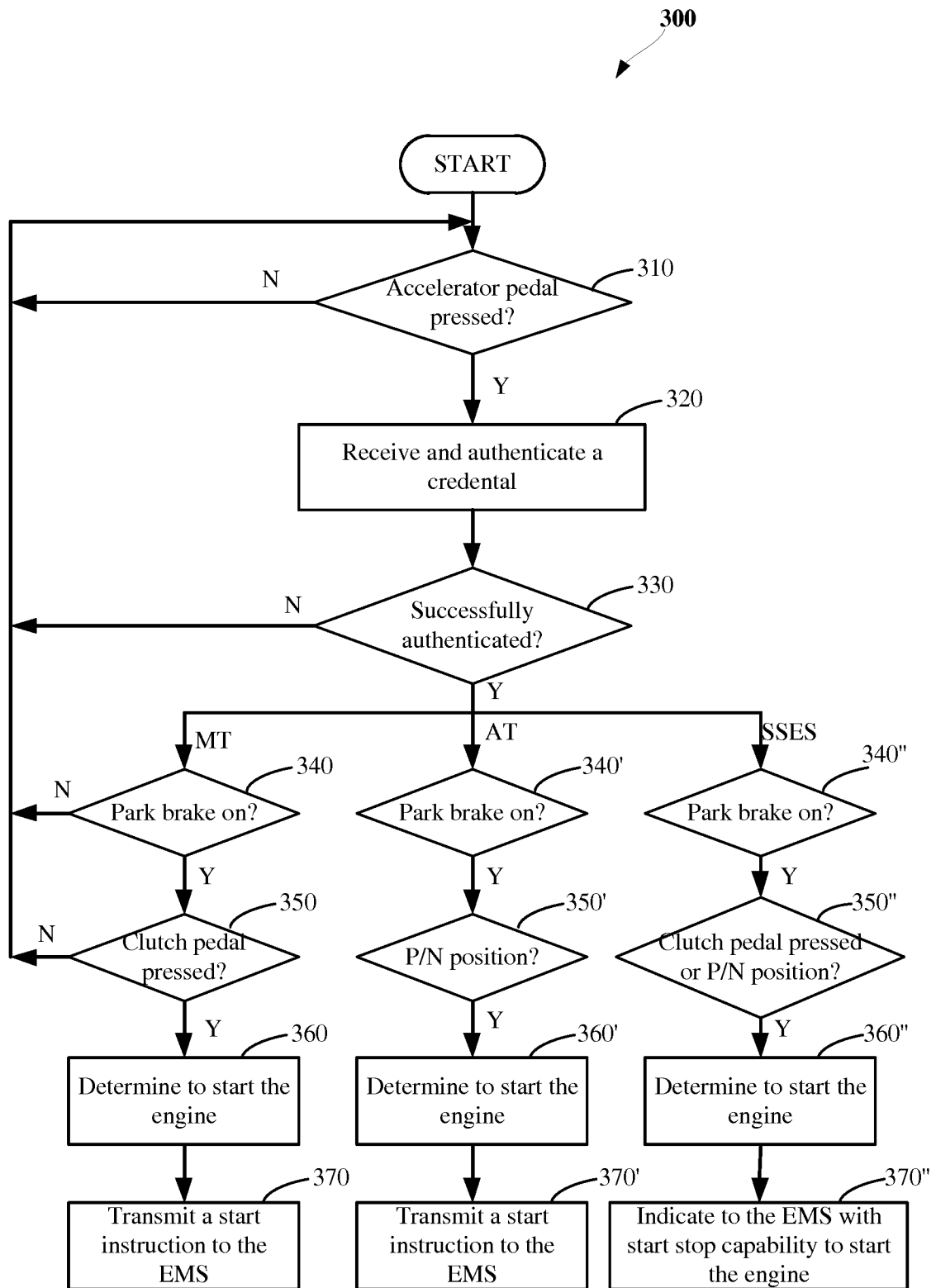
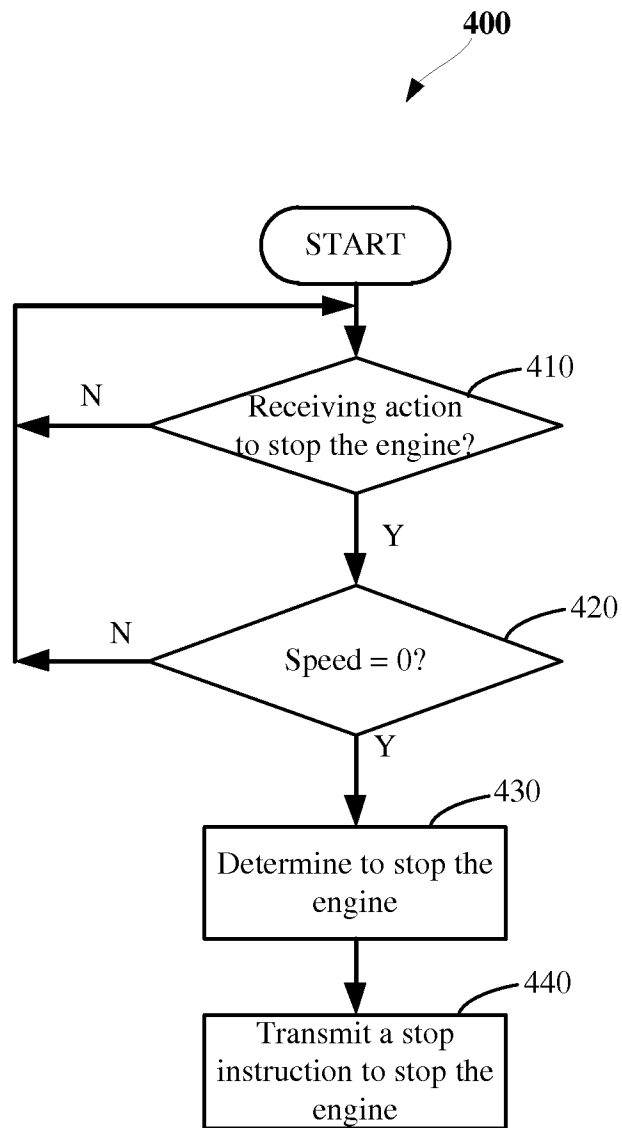


FIG. 3

**FIG. 4**

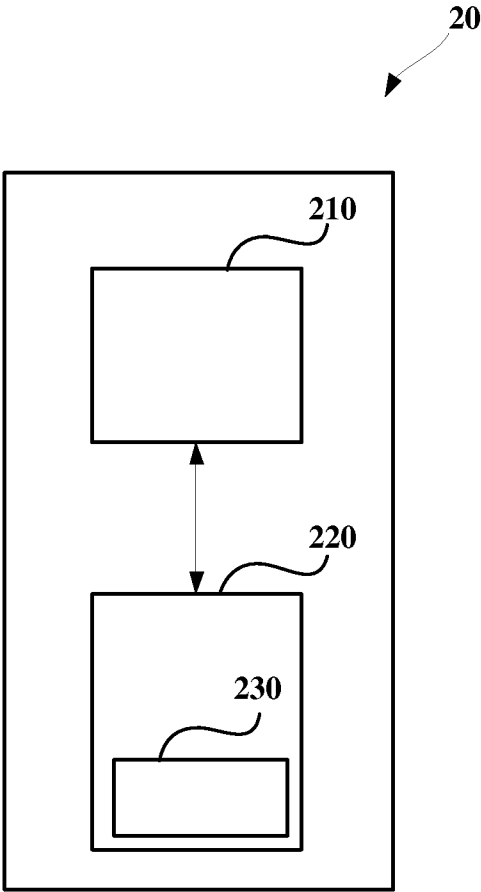


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/084415

A. CLASSIFICATION OF SUBJECT MATTER
INV. F02N11/08 B60R25/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F02N B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	paragraphs [0010], [0011] -----	3,9
X	DE 10 2008 013409 A1 (FORD GLOBAL TECH LLC [US]) 17 September 2009 (2009-09-17)	13,14, 19,20
A	paragraph [0028] -----	15,21
A	JP 2011 025713 A (TOKAI RIKA CO LTD) 10 February 2011 (2011-02-10) the whole document -----	1-24
A	US 2014/257637 A1 (SANGAMESWARAN SANGEETHA [US] ET AL) 11 September 2014 (2014-09-11) the whole document -----	1-24
	-/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

23 March 2018

Date of mailing of the international search report

11/04/2018

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/084415

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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