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

(11) **EP 4 279 727 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
22.11.2023 Bulletin 2023/47

(21) Application number: **22174008.7**

(22) Date of filing: **18.05.2022**

(51) International Patent Classification (IPC):
F02D 19/06 *(2006.01)* ***G06Q 20/20*** *(2012.01)*

(52) Cooperative Patent Classification (CPC):
F02D 19/06; E02F 9/2033; E02F 9/267; G06Q 20/20; E02F 3/435; F02D 19/0652; F02D 2200/0625; F02D 2250/26

(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
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **METHOD FOR CONTROLLING FUEL USAGE OF A MACHINE**

(57) A computer-implemented method for controlling fuel usage of a machine (1), said method comprising: obtaining (2) access information (3) comprising information defining a first amount of fuel, obtaining (4) fuel usage information (5) of the machine (1) during operation of the machine (1), the fuel usage information (5) defining at least an amount of fuel used by the machine (1), and switching (6) the machine (1) to a restricted operation mode (R) in response to the amount of fuel used by the machine (1) exceeding the first amount of fuel.

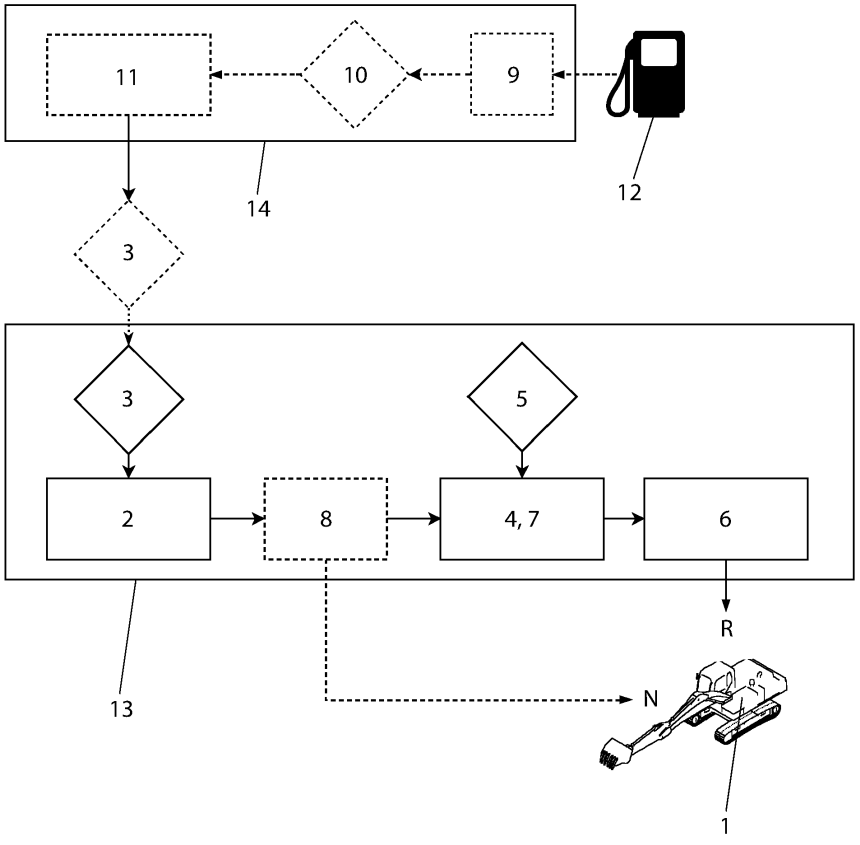

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to control of fuel usage in combustion engine powered machine, such as a vehicle, a stone crusher, a diesel power generator, or a diesel pump, for example control relating to amount of fuel used and fuel type used.

BACKGROUND OF THE INVENTION

[0002] Some machines, such as work machine vehicles, are shared between several operators, each operator operating the machine for a limited period of time. Although the machine may be capable of operating on various fuel type, such as diesel and Hydrotreated Vegetable Oil (HVO), there may be legal or environmental reasons for using HVO instead of diesel. Price and availability often differ for various fuel types and the machines are thus sometimes fueled with another fuel type than the fuel type an operator is supposed to operate the machine on. When different operators use a machine and when the machine is used on varying locations, the risk of operators adding fuel of a fuel type not intended increases. Further, some operators tend to use more fuel than they add when they fuel the machine, thereby leading to cost for others.

[0003] Accordingly, an object of the present disclosure is to promote use of a correct type of fuel.. A further object is to promote fair use of fuel of a shared machine

SUMMARY OF THE INVENTION

[0004] According to a first aspect, these and other objects are achieved by a computer-implemented method for controlling fuel usage of a machine, said method comprising: obtaining access information comprising information defining a first amount of fuel, obtaining fuel usage information of the machine during operation of the machine, the fuel usage information defining at least an amount of fuel used by the machine, and switching the machine to a restricted operation mode in response to the amount of fuel used by the machine exceeding the first amount of fuel.

[0005] Once the machine has been switched to the restricted operation mode, it can no longer be normally operated and therefore a hurdle for the operator of the machine to further use of the machine is introduced once the first amount of fuel has been consumed. Thus, even if there is plenty of fuel left in the machine, normal operation cannot continue once switched to the restricted operation mode. When the machine is operated, consumables are used, such as fuel, and tires. The amount of fuel used by the machine is a good indicator of how much the machine is used, and thus an indicator of use of a consumable, such as fuel or tire wear. The use of such access information gives an incentive for an operator to obtain access information corresponding to a consumable associated with the intended period of use of the machine.

[0006] The computer-implemented method may further comprise comparing information comprised in the access information to a predetermined fuel criterion/criteria and switching the machine to a normal operation mode if information comprised in the access information matches the predetermined fuel criterion/criteria.

[0007] When an operator is to use the machine, the machine obtains the access information and subsequently checks the access information against a fuel criterion before enabling the machine for use by switching the machine to the normal operation mode. This mitigates any unauthorized use of the machine if the fuel criterion is not met and thus gives the operator an incentive to purchase only such fuel as required by the fuel criterion.

[0008] The predetermined fuel criterion may comprise a predetermined minimum amount of fuel, wherein the machine is switched to the normal operation mode only if the first amount of fuel exceeds the predetermined minimum amount of fuel.

[0009] By checking that the amount of fuel exceeds a predetermined minimum amount of fuel, it is possible to allow use of the machine only if enough fuel is allocated based on the access information. The minimum amount of fuel could be set to zero but it is typically at least a few liters of fuel, such as five or ten liters of fuel. If the minimum amount is set to zero, any amount of fuel purchased, as defined by the access information, is sufficient and the check basically amounts to a check that access information is provided at all, i.e. the operator is at least someone with access to such access information and not just any person. The access information may be provided with user information tied to a specific person, or legal entity. For example a legal entity could purchase a lot of fuel of a specific type and then allocate access information to a specific person or machine according to a predicted daily use of the machine. This check also mitigates too short uses of the machine, reducing the risk of an operator having to drive home in a restricted operation mode which would lead to unnecessary unavailability of the machine for normal operation by others.

[0010] The access information may further comprise information defining a fuel type, wherein the predetermined fuel criterion further comprises a predetermined fuel type, and wherein the machine is switched to the normal operation mode

only if the fuel type defined by the access information corresponds to the predetermined fuel type.

[0011] By checking that the fuel type corresponds to the predetermined fuel type, it is possible to allow operation of the machine only if a correct type of fuel has been purchased, as defined by the access information. This check thus promotes fueling of a specific type of fuel, as defined by the predetermined fuel type. The predetermined fuel type may for example be a biofuel, such as hydrotreated vegetable oil HVO.

[0012] The restricted operation mode may comprise restriction of a maximum driving speed limit of the machine .

[0013] By restricting a maximum speed limit, the operator of the machine will not be able to travel above the maximum speed limit, effectively disabling any efficient use of the machine, yet allowing limping home with the machine. Hence, the operator has an incentive to purchase more fuel or stop using the machine before the restriction sets in.

[0014] The restricted operation mode may alternatively comprise restriction of a maximum power limit, a maximum speed limit or a maximum torque limit of a motor of the machine , wherein the motor of the machine is a motor for propulsion of the machine and/or a motor for powering of auxiliary devices attached to the machine.

[0015] Many working machines are driven by a diesel engine powering a hydraulic system which in turn controls drive motors for wheels of the machine as well as auxiliary devices attached to the machine. Limiting the performance of the motor thus affects the machine such that it cannot be used as normal, yet allowing limp home.

[0016] The restricted operation mode may alternatively comprise disabling normal operation of an auxiliary device, such as an excavator arm or bucket, attached to the machine , for example by limiting maximum allowed movement speed of the auxiliary device or by disabling one or more degrees of freedom of movement of the auxiliary device. Limiting the operation of the auxiliary device thus affects the machine such that it cannot be used as normal, yet allowing the machine to be driven at normal speeds for safer travel at public roads.

[0017] The computer-implemented method may further comprise initial steps of

obtaining fueling information provided by a fuel pump , said fueling information comprising at least information defining an amount of fuel dispensed by the fuel pump, and

generating access information based on the fueling information such that the amount of fuel defined by the information comprised in the access information corresponds to the amount of fuel dispensed by the fuel pump .

[0018] The initial steps of the method are steps performed to create the access information and are thus performed before the access information is obtained. By providing the access information with information of how much fuel has been dispensed, subsequent control of the machine may be based on that fuel amount information such that an operator can only consume as much fuel as he has previously dispensed.

[0019] The fueling information may further comprise information defining the type of fuel dispensed by the fuel pump . Also, the generated access information may further comprise information defining a type of fuel corresponding to the type of fuel dispensed by the fuel pump .

[0020] By providing the access information with information about what type of fuel has been dispensed, subsequent control of the machine may be based on the fuel type information comprised in the access information, such that an operator can only consume fuel from a specific machine if he has also dispensed fuel of the same type.

[0021] The fueling information from the fuel pump may be provided by the fuel pump in the form of digital information provided by the fuel pump by a wired or wireless means of communication. Alternatively, or additionally, the fueling information may be provided by the fuel pump in the form of a printed receipt comprising a graphical representation of said fueling information, such as text and/or a barcode such as a QR-code.

[0022] If it is possible to integrate with the hardware/software of the fuel pump, it may be possible to enable wired or wireless exchange of fueling information from the fuel pump. If cases where such integration is not possible, it is still possible to obtain the information in the form of information printed on the receipt from the fuel pump, or information shown on the display of the fuel pump. Printed or displayed information may subsequently be scanned by a handheld device comprising a scanner or a camera, such as a mobile phone, which the processes the information further for generation for direct or indirect generation of access information in the handheld unit or elsewhere.

[0023] The computer-implemented method may further comprise transmitting the generated access information to the machine , or storing the generated access information in a storage means, such as a digital memory or a printed information carrier comprising a graphical representation of said access information , such as text and/or a barcode such as a QR-code.

[0024] Once the access information has been generated, it is either transmitted directly to the machine, or stored in a storage means for subsequent use at another time.

[0025] According to a second aspect, these and other objects are achieved by a system for controlling fuel usage, said system comprising an electronic control unit for use in a machine or with a machine . The electronic control unit is configured to obtain access information comprising information defining an amount of fuel. The electronic control unit is further configured to obtain fuel usage of the machine during operation of the machine, and to switch the machine to a restricted operation mode in response to said fuel usage exceeding said amount of fuel.

[0026] The associated function and effects of the various embodiment of the system correspond to the ones mentioned above for the corresponding method steps.

[0027] The electronic control unit may further be configured to compare the amount of fuel defined by the access information to a predetermined fuel criterion and to switch the machine to a normal operation mode if the information defined by the access information matches the predetermined fuel criterion.

[0028] The predetermined fuel criterion used by the electronic control unit may comprise a predetermined minimum amount of fuel, wherein the electronic control unit is configured to only switch the machine to the normal operation mode if the amount of fuel defined by the access information exceeds the minimum amount of fuel.

[0029] The access information may further comprise information defining a fuel type of the amount of fuel, wherein the predetermined fuel criterion further comprises a predetermined fuel type. The electronic control unit may be configured to only switch the machine to the normal operation mode if the fuel type defined by the access information corresponds to the predetermined fuel type.

[0030] The restricted operation mode may include restriction of a maximum driving speed limit of the machine .

[0031] The restricted operation mode may alternatively include restriction of a maximum power limit, a maximum speed limit or a maximum torque limit of a motor of the machine , wherein the motor of the machine is a motor for propulsion of the machine and/or a motor for powering of auxiliary devices attached to the machine.

[0032] Further, the restricted operation mode may include disabling of normal operation of an auxiliary device, such as an excavator arm or bucket, attached to the machine , for example by limiting maximum allowed movement speed of the auxiliary device or by altogether disabling movement of the auxiliary device.

[0033] The system may further comprise a computing node configured to obtain fueling information provided by a fuel pump . The fueling information may comprise at least information defining an amount of fuel dispensed by the fuel pump , wherein the computing node is configured to generate the access information based on the fueling information such that the amount of fuel defined by the information comprised in the access information corresponds to the amount of fuel dispensed by the fuel pump .

[0034] *The computing node may be located anywhere. For example, the computing node may be an electronic control unit, a server* of a *handheld device, such* as a *mobile phone. The computing node may be integrated with the fuel pump of may be in communication with the fuel pump.*

[0035] The computing node is thus responsible for obtaining data from the fuel pump and generating access information based on the obtained data.

[0036] The system may comprise a transmitter configured to provide said generated access information to the electronic control unit.

[0037] The transmitter thus enables direct transfer of data to the machine, such that no printed information or separate information carrier is needed to store the access information between generation of the access information and subsequent use of the access information for control of the machine. The transmitter may transmit the access information as it is generated, or the access information may be transmitted on-demand.

[0038] According to a third aspect, these and other objects are achieved by a machine comprising the above-described system. The machine may be a working machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] Fig. 1 shows a schematic view of a computer-implemented method for controlling fuel usage of a machine.

DETAILED DESCRIPTION

[0040] A first embodiment of the computer-implemented method of the present disclosure will be described with reference to fig. 1.

[0041] The computer-implemented method is for controlling fuel usage of a machine 1. The method comprises:

obtaining 2 access information 3 comprising information defining a first amount of fuel, obtaining 4 fuel usage information 5 of the machine 1 during operation of the machine 1, the fuel usage information 5 defining at least an amount of fuel used by the machine 1, and

switching 6 the machine 1 to a restricted operation mode R in response to the amount of fuel used by the machine 1 exceeding the first amount of fuel.

[0042] Once the machine 1 has been switched to the restricted operation mode R, it can no longer be normally operated and therefore a hurdle to further use is introduced once the first amount of fuel has been consumed. Thus, even if there is plenty of fuel left in the machine 1, normal operation cannot continue once switched to the restricted operation mode R. When the machine 1 is operated, consumables are used, such as fuel, and tires. The amount of fuel used by the

machine 1 is a good indicator of how much the machine 1 is used, and thus an indicator of use of a consumable, such as fuel or tire wear. The fuel use is typically easy to determine and often readily available as data from an onboard control system of the machine 1. The use of such access information 3 gives an incentive for an operator to obtain access information corresponding to a purchased consumable, such as fuel, associated with the intended period of use of the machine 1.

[0043] The method further comprises comparing 7 information comprised in the access information 3 to a predetermined fuel criterion/criteria and switching 8 the machine 1 to a normal operation mode N if information comprised in the access information 3 matches the predetermined fuel criterion/criteria. Hence, this is normally made before the machine 1 is used by an operator.

[0044] When an operator is to use the machine 1, the machine 1 obtains the access information 3 and subsequently checks the access information 3 against a fuel criterion before enabling the machine 1 for use by switching the machine 1 to the normal operation mode. This mitigates any unauthorized use of the machine 1 if the fuel criterion is not met.

[0045] In other embodiments, the method may omit switching the machine 1 to the normal operation mode. For example, the machine 1 may switch itself to normal mode N at restarting of the machine 1. If the machine 1 would be restarted and brought to normal mode N, the above-mentioned method of disabling normal operation will still put the machine 1 back to a restricted operation mode R as described herein.

[0046] The predetermined fuel criterion comprises a predetermined minimum amount of fuel, wherein the machine 1 is switched to the normal operation mode N if the first amount of fuel exceeds the predetermined minimum amount of fuel.

[0047] By checking that the amount of fuel exceeds a predetermined minimum amount of fuel, it is possible to allow use of the machine 1 only if enough fuel is allocated based on the access information 3. The minimum amount of fuel could be set to zero but it is typically at least a few liters of fuel, such as five or ten liters of fuel. If the minimum amount is set to zero, any amount of fuel purchased, as defined by the access information 3, is sufficient and the check basically amounts to an identity check. This check also mitigates too short uses of the machine 1.

[0048] The access information 3 further comprises information defining a fuel type, wherein the predetermined fuel criterion further comprises a predetermined fuel type, and wherein the machine 1 is switched to the normal operation mode N only if the fuel type defined by the access information 3 corresponds to the predetermined fuel type.

[0049] By checking that the fuel type corresponds to the predetermined fuel type, it is possible to allow operation of the machine 1 only if a correct type of fuel has been purchased, as defined by the access information. This check thus promotes fueling of a specific type of fuel, as defined by the predetermined fuel type. The predetermined fuel type may for example be a biofuel, such as hydrotreated vegetable oil HVO.

[0050] Hence, in the present embodiment, both minimum amount of fuel and fuel type must match the respective information of the predetermined fuel criterion. In other embodiments, the fuel criterion could comprise other information or either one of the predetermined fuel type or the predetermined minimum amount of fuel.

[0051] The restricted operation mode R comprises restriction of a maximum power limit, a maximum speed limit or a maximum torque limit of a motor of the machine 1. The motor of the machine 1 is a motor for propulsion of the machine 1 and is also used to power auxiliary devices attached to the machine 1. In the present embodiment, the maximum speed of the motor is set to ten percent of the maximum speed of the motor, but in other embodiments, any other suitable reduction of the speed of the motor could be used instead, as long as the restriction in speed makes the machine 1 unusable for its intended purpose, or example unusable for construction work or transportation. Alternatively, the motor may be otherwise restricted, such as by limiting maximum torque or maximum throttle/fuel supply rate of the motor.

[0052] An operator set out to using the machine 1 must make sure the machine 1 is able obtain the required access information 3. Typically, this is achieved by fueling a specific type of fuel into the machine 1 using a fuel pump, wherein access information 3 is subsequently generated based on fueling information from the fuel pump.

[0053] Accordingly, the computer-implemented method further comprises initial steps of obtaining 9 fueling information 10 provided by a fuel pump 12, said fueling information comprising at least information defining an amount of fuel dispensed by the fuel pump. The method also comprises generating 11 access information 3 based on the fueling information such that the amount of fuel defined by the information comprised in the access information 3 corresponds to the amount of fuel dispensed by the fuel pump 12.

[0054] In this embodiment of the system, the fueling information also comprises information defining the type of fuel dispensed by the fuel pump 12. The generated access information 3 comprises information defining a type of fuel corresponding to the type of fuel dispensed by the fuel pump 12. Alternatively, the information relating to type of fuel may in other embodiments be omitted from the fueling information.

[0055] In this embodiment, the fueling information is provided by the fuel pump 12 in the form of a printed receipt comprising a graphical representation of said fueling information, such as text and/or a barcode such as a QR-code.

[0056] The operator uses a handheld device, such as a mobile phone, to scan the graphical representation of the fueling information. Alternatively, the handheld device may in other embodiments receive the fueling information via a wireless network connection, directly or indirectly via intermediate node(s), from the fuel pump.

[0057] The handheld device may forward the fueling information to a computing node which generates access infor-

mation 3, or the handheld device may generate the access information 3 based on the fueling information. After generation of the access information 3, the access information 3 is either stored or transmitted directly to the machine 1. The operator uses his handheld device to control this process and choose when the access information 3 should be transmitted to the machine 1. Also, the handheld device can present the operator with alternatives for what machine 1 to send the access information 3 to.

[0058] Accordingly, the computer-implemented method further comprises transmitting the generated access information 3 to the machine 1, or storing the generated access information 3 in a storage means, such as a digital memory or a printed information carrier comprising a graphical representation of said access information 3, such as text and/or a barcode such as a QR-code.

[0059] The present disclosure also discloses a system for controlling fuel usage. The system comprises an electronic control unit 13 for use in a machine 1 or with a machine 1. The system also comprises a computing node 14 configured to generate access information 3 based on fueling data, as described below.

[0060] The electronic control unit 13 is configured to obtain access information 3 comprising information defining an amount of fuel. The electronic control unit is further configured to obtain fuel usage of the machine 1 during operation of the machine 1, and to switch the machine 1 to a restricted operation mode R in response to said fuel usage exceeding said amount of fuel.

[0061] The electronic control unit 13 is also configured to compare the amount of fuel defined by the access information 3 to a predetermined fuel criterion and to switch 8 the machine 1 to a normal operation mode N if the information defined by the access information 3 matches the predetermined fuel criterion.

[0062] The access information 3 further comprises information defining a fuel type of the amount of fuel, wherein the predetermined fuel criterion further comprises a predetermined fuel type. The electronic control unit 13 may be configured to only switch the machine 1 to the normal operation mode N if the fuel type defined by the access information 3 corresponds to the predetermined fuel type. In this embodiment, the predetermined fuel type is Hydrotreated Vegetable Oil, but in other embodiments, any other fuel type compatible with the machine 1 could be used instead. In some embodiments, the predetermined fuel type may be omitted from the predetermined fuel criterion.

[0063] The restricted operation mode R may include restriction of a maximum driving speed limit of the machine 1.

[0064] The restricted operation mode R may alternatively include restriction of a maximum power limit, a maximum speed limit or a maximum torque limit of a motor of the machine 1, wherein the motor of the machine 1 is a motor for propulsion of the machine 1 and/or a motor for powering of auxiliary devices attached to the machine 1.

[0065] Further, the restricted operation mode R may include disabling of normal operation of an auxiliary device, such as an excavator arm or bucket, attached to the machine 1, for example by limiting maximum allowed movement speed of the auxiliary device or by altogether disabling movement of the auxiliary device.

[0066] The computing node 14 is configured to obtain fueling information provided by a fuel pump 12. The fueling information may comprise at least information defining an amount of fuel dispensed by the fuel pump 12, wherein the computing node 14 is configured to generate the access information 3 based on the fueling information such that the amount of fuel defined by the information comprised in the access information 3 corresponds to the amount of fuel dispensed by the fuel pump 12.

[0067] *The computing node may be located anywhere. For example, the computing node may be an electronic control unit, a server* of a *handheld device, such* as a *mobile phone. The computing node may be integrated with the fuel pump of may be in communication with the fuel pump.*

[0068] The system further comprises a transmitter (device capable of wirelessly transmitting information), wherein the transmitter is configured to provide said generated access information 3 to the electronic control unit 13. The transmitter may be a handheld unit using a mobile network, such as a public land mobile network, or using a short-range wireless technology for establishing a direct connection with the machine 1, for example a Bluetooth connection.

[0069] Portions of the system, such as the electronic control unit 13, may be integrated with a machine 1. The mvachine 1 may be a vehicle, such as a working machine.

[0070] The information comprised in the access information may be encrypted as the access information is generated, wherein the obtaining of access infromation comprises decrypting the access information.

Table of reference numerals

1	machine
2	obtaining access information (method step)
3	access information
4	obtaining fuel usage information (method step)
5	fuel usage information

(continued)

6	switching machine to restricted operation mode (method step)
7	comparing information of access information (method step)
8	switching machine to normal operation mode (method step)
9	obtaining fueling information (method step)
10	fueling information
11	generating access information (method step)
12	fuel pump
13	electronic control unit
14	computing node
R	restricted operation mode of machine
N	normal operation mode of machine

Claims

1. A computer-implemented method for controlling fuel usage of a machine (1), said method comprising:

obtaining (2) access information (3) comprising information defining a first amount of fuel,
obtaining (4) fuel usage information (5) of the machine (1) during operation of the machine (1), the fuel usage information (5) defining at least an amount of fuel used by the machine (1), and
switching (6) the machine (1) to a restricted operation mode (R) in response to the amount of fuel used by the machine (1) exceeding the first amount of fuel.

2. The computer-implemented method according to claim 1, further comprising comparing (7) information comprised in the access information (3) to a predetermined fuel criterion/criteria and switching (8) the machine (1) to a normal operation mode (N) if information comprised in the access information (3) matches the predetermined fuel criterion/criteria.

3. The computer-implemented method according to claim 2, wherein the predetermined fuel criterion comprises a predetermined minimum amount of fuel, and wherein the machine (1) is switched to the normal operation mode (N) only if the first amount of fuel exceeds the predetermined minimum amount of fuel.

4. The computer-implemented method according to any one of claims 2 or 3, wherein the access information (3) further comprises information defining a fuel type and wherein the predetermined fuel criterion further comprises a predetermined fuel type, and wherein the machine (1) is switched to the normal operation mode (N) only if the fuel type defined by the access information (3) corresponds to the predetermined fuel type.

5. The computer-implemented method according to any one of claims 1-4, wherein said restricted operation mode (R) comprises:

restriction of a maximum driving speed limit of the machine (1),
restriction of a maximum power limit, a maximum speed limit or a maximum torque limit of a motor of the machine (1), said motor of the machine (1) being a motor for propulsion of the machine (1) and/or a motor for powering of auxiliary devices attached to the machine (1), and/or
disabling of normal operation of an auxiliary device, such as an excavator arm or bucket, attached to the machine (1), for example by limiting maximum allowed movement speed of the auxiliary device or by disabling one or more degrees of freedom of movement of the auxiliary device.

6. The computer-implemented method according to any one of claims 1-5, further comprising initial steps of

obtaining (9) fueling information (10) provided by a fuel pump (12), said fueling information comprising at least

information defining an amount of fuel dispensed by the fuel pump,
and
generating (11) access information (3) based on the fueling information such that the amount of fuel defined by the information comprised in the access information (3) corresponds to the amount of fuel dispensed by the fuel pump (12).

7. The computer-implemented method according to claim 6,

wherein said fueling information further comprises information defining the type of fuel dispensed by the fuel pump (12), and
wherein the generated access information (3) further comprises information defining a type of fuel corresponding to the type of fuel dispensed by the fuel pump (12).

8. The computer-implemented method according to any one of claims 6-7,
wherein the fueling information from the fuel pump (12) is provided by the fuel pump (12) in the form of digital information provided by the fuel pump (12) by a wired or wireless means of communication, or is provided by the fuel pump (12) in the form of a printed receipt comprising a graphical representation of said fueling information, such as text and/or a barcode such as a QR-code.

9. The computer-implemented method according to any one of claims 6-8, further comprising:

transmitting the generated access information (3) to the machine (1), or
storing the generated access information (3) in a storage means, such as a digital memory or a printed information carrier comprising a graphical representation of said access information (3), such as text and/or a barcode such as a QR-code.

10. A system for controlling fuel usage, said system comprising an electronic control unit (13) for use in a machine (1) or with a machine (1), wherein the electronic control unit (13) is configured to:

obtain access information (3) comprising information defining an amount of fuel,
obtain fuel usage of the machine (1) during operation of the machine (1), and
switch the machine (1) to a restricted operation mode (R) in response to said fuel usage exceeding said amount of fuel.

11. A system according to claim 10, wherein the electronic control unit (13) is further configured to compare the amount of fuel defined by the access information (3) to a predetermined fuel criterion and to switch (8) the machine (1) to a normal operation mode (N) if the information defined by the access information (3) matches the predetermined fuel criterion.

12. A system according to claim 11, wherein the predetermined fuel criterion comprises a predetermined minimum amount of fuel, and wherein the electronic control unit (13) is configured to only switch the machine (1) to the normal operation mode (N) if the amount of fuel defined by the access information (3) exceeds the minimum amount of fuel.

13. A system according to claim 11 or 12, wherein the access information (3) further comprises information defining a fuel type of the amount of fuel and wherein the predetermined fuel criterion further comprises a predetermined fuel type, and wherein the electronic control unit (13) is configured to only switch the machine (1) to the normal operation mode (N) if the fuel type defined by the access information (3) corresponds to the predetermined fuel type.

14. A system according to any one of claims 11-13, wherein said restricted operation mode (R) includes:

restriction of a maximum driving speed limit of the machine (1),
and/or
disabling of normal operation of an auxiliary device, such as an excavator arm or bucket, attached to the machine (1), for example by limiting maximum allowed movement speed of the auxiliary device or by altogether disabling movement of the auxiliary device.

15. A system according to any one of claims 11-14, further comprising a computing node (14) configured to obtain fueling information provided by a fuel pump (12), said fueling information comprising at least information defining

an amount of fuel dispensed by the fuel pump (12),
wherein the computing node (14) is configured to generate the access information (3) based on the fueling information such that the amount of fuel defined by the information comprised in the access information (3) corresponds to the amount of fuel dispensed by the fuel pump (12).

16. A system according to any one of claims 11-15, wherein the system comprises a transmitter configured to provide said generated access information (3) to the electronic control unit (13).

17. A machine (1) comprising a system according to any one of claims 11-16, wherein the machine (1) may be a vehicle, for example a working machine.

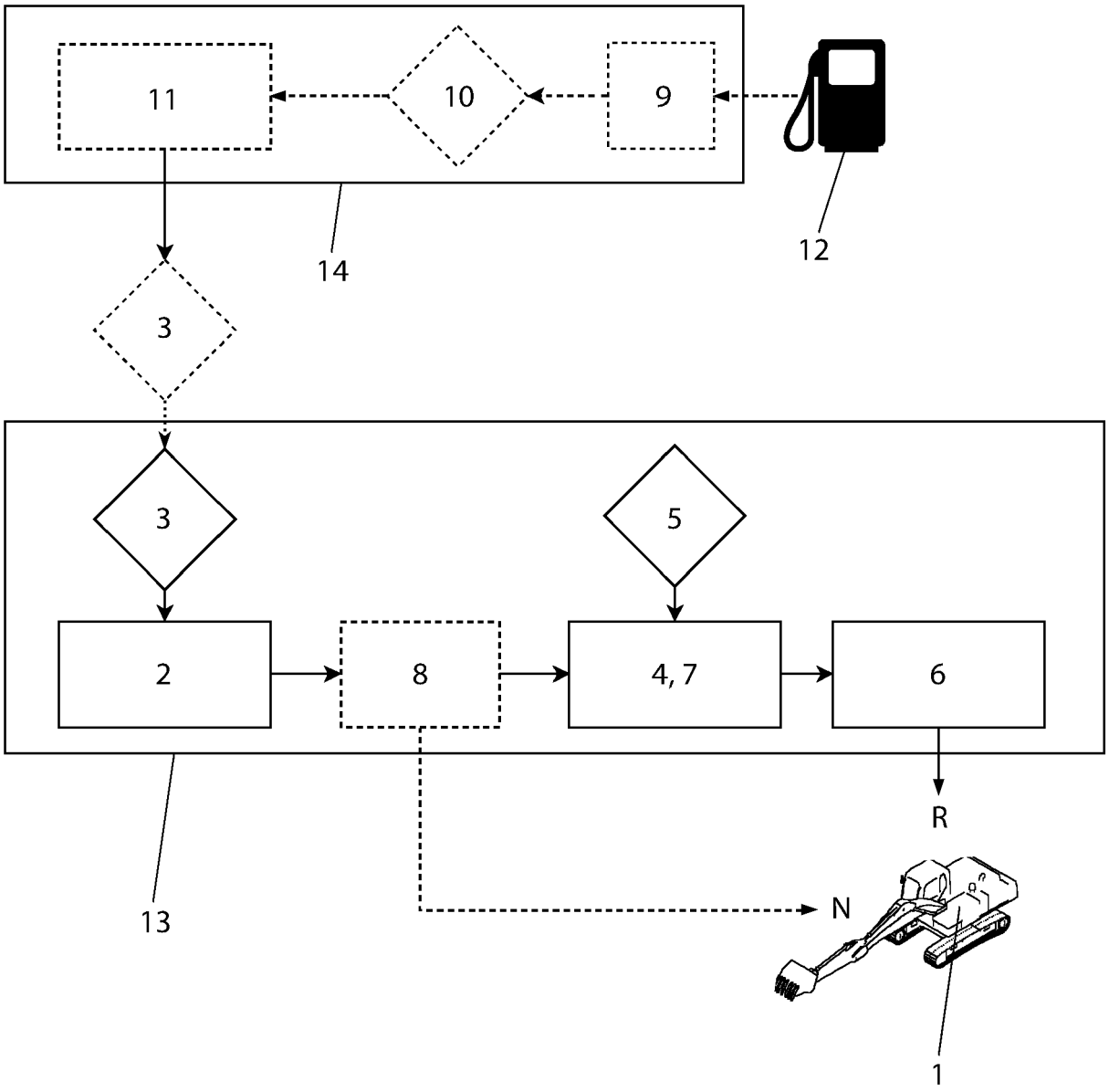

Fig. 1

Europäisches Patentamt
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PARTIAL EUROPEAN SEARCH REPORT

under Rule 62a and/or 63 of the European Patent Convention. This report shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number
EP 22 17 4008

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2021 080847 A (MAZDA MOTOR) 27 May 2021 (2021-05-27)	1-17	INV. F02D19/06 G06Q20/20
Y	* abstract * * claims 1, 5, 6 *	6-9,15, 16	
X	WO 2018/204258 A1 (CUMMINS INC [US]; AGILITY FUEL SYSTEMS INC [US] ET AL.) 8 November 2018 (2018-11-08)	1-3, 5-12, 14-17	
Y	* abstract * * claims 1-8, 13-20 * * paragraph [0006] - paragraph [0007] * * paragraph [0010] - paragraph [0011] *	6-9,15, 16	
X	GB 2 530 633 A (DAIMLER AG [DE]) 30 March 2016 (2016-03-30)	1-3,5-9, 11,12, 14-17	
Y	* abstract * * claims 1, 5 * * figures 1, 2 *	6-9,15, 16	

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TECHNICAL FIELDS SEARCHED (IPC)

F02D
G07G
G06Q

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
The Hague	19 December 2022	Kämper, Fabian

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

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

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04E07)

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PARTIAL EUROPEAN SEARCH REPORT

Application Number
EP 22 17 4008

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	US 10 163 141 B2 (FANSLER THOMAS S [US]; KONEZNY RONALD EDWARD [US] ET AL.) 25 December 2018 (2018-12-25) * abstract * * the whole document * * claims 1, 2, 7, 13, 14 * * figure 1 * * column 8, line 16 - line 34 * -----	6-9,15, 16	
			TECHNICAL FIELDS SEARCHED (IPC)

EPO FORM 1503 03.82 (P04C10) 2

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INCOMPLETE SEARCH
SHEET C

Application Number
EP 22 17 4008

Claim(s) completely searchable:
–

Claim(s) searched incompletely:
1-17

Reason for the limitation of the search:

1 Introduction
In the present case, the claims are unduly broad and not clear to an extend that a meaningful complete search cannot be carried out on the current claims. Therefore a clarification request had been sent to the applicant. The response dated 07/12/22 to this request is used in the following to interpret the claims such that a search can be carried out. However, since the objections still remain the search cannot be complete and the objections remain.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 17 4008

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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19-12-2022

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82