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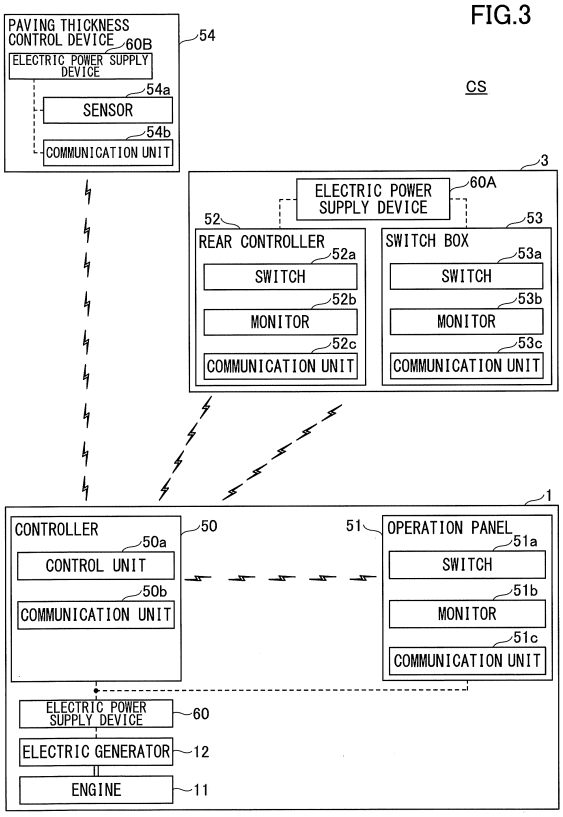
(54) ASPHALT FINISHER

(57) An asphalt finisher (100) according to the embodiment of the present invention includes a tractor (1), a screed (3), and a wireless communication system configured to perform wireless communication between at least two of a plurality of devices installed in at least one of the tractor (1) and the screed (3). One or more devices installed in the tractor (1) include at least one of a controller (50) and an operation panel (51), and one or more devices installed in the screed (3) include at least one of a rear controller (52), a switch box (53), a sensor, a screed controller, and a vibration power generator as an electric power supply device (60A).

FIG.3



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to an asphalt finisher.

BACKGROUND ART

[0002] An asphalt finisher with switch boxes (i.e., screed control boxes) attached at both ends of a screed has been known (see Patent Document 1 and Patent Document 2). Generally, switch boxes are connected to a battery installed in a tractor through a power cable, and are connected to a control device installed in a tractor through a communication cable.

PRIOR ART DOCUMENT

PATENT DOCUMENT

[0003]

Patent Document 1: Japanese Unexamined Patent Publication No. 2014-47568
Patent Document 2: Japanese Unexamined Patent Publication No. 2016-79570

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0004] However, there is a possibility that a power cable and a communication cable might be damaged when a screed extends or retracts as a screed is configured to be able to extend or retract in a vehicle width direction.

[0005] In addition, there is a possibility that a power cable and a communication cable might be damaged by heat of paving material between a tractor and a screed. There is a possibility that interoperation between a device in a tractor and a device in a screed might be terminated when a power cable or a communication cable is damaged.

[0006] In view of the description above, it is desirable to provide an asphalt finisher that causes a device in a tractor and a device in a screed to interoperate more stably.

MEANS FOR SOLVING THE PROBLEMS

[0007] An asphalt finisher according to an embodiment of the present invention includes a tractor, a screed, and a wireless communication system configured to perform wireless communication between at least two of a plurality of devices that are installed in at least one of the tractor and the screed.

EFFECTS OF THE INVENTION

[0008] By the means described above, an asphalt finisher that causes a device in a tractor and a device in a screed to interoperate more stably is provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a side view of an asphalt finisher according to an embodiment of the present invention;
Fig. 2 is a top view of an asphalt finisher of Fig. 1;
Fig. 3 is a block diagram illustrating an example of a configuration of an interoperation system;
Fig. 4 is a block diagram illustrating another example of a configuration of an interoperation system; and
Fig. 5 is a block diagram illustrating further another example of a configuration of an interoperation system.

EMBODIMENT OF THE INVENTION

[0010] Fig. 1 is a side view of an asphalt finisher 100 that is an example of a road machine according to an embodiment of the present invention. Fig. 2 is a top view of the asphalt finisher 100. The asphalt finisher 100 mainly includes a tractor 1, a hopper 2, and a screed 3. In the following, a direction toward the hopper 2 viewed from the tractor 1 (i.e., a +X direction) is the front, and a direction toward the screed 3 viewed from the tractor 1 (i.e., a -X direction) is the back. In the tractor 1 of Fig. 2, a side in which a driver's cab including a driver's seat 1S is located (i.e., a -Y side) is the right, and the opposite direction (i.e., a +Y side) is the left.

[0011] The tractor 1 is a mechanism for causing the asphalt finisher 100 to travel. In the present embodiment, the tractor 1 moves the asphalt finisher 100 by rotating a rear wheel 5 using a rear wheel driving hydraulic motor, and by rotating a front wheel 6 using a front wheel driving hydraulic motor. A rear wheel driving hydraulic motor and a front wheel driving hydraulic motor are rotated by being provided with operating oil by a hydraulic pump. The rear wheel 5 and the front wheel 6 may be replaced by crawlers. The tractor 1 includes an engine 11, an electric generator 12, a controller 50, an operation panel 51, and an electric power supply device 60, for example.

[0012] The hopper 2 is a mechanism to receive paving material. In the present embodiment, the hopper 2 is disposed in front of the tractor 1 and is configured such that the hopper 2 can be opened and closed in a Y axis direction (i.e., the vehicle width direction) by a hopper cylinder. The asphalt finisher 100 generally receives paving material (e.g., asphalt mix) from a dump truck bed with the hopper 2 fully opened. Fig. 1 and Fig. 2 illustrate a state in which the hopper 2 is fully opened. When paving material in the hopper 2 is decreased, the hopper 2 is closed, and paving material located in the proximity of

inner walls of the hopper 2 is gathered in the center of the hopper 2. This enables a conveyor CV provided in the center of the hopper 2 to feed paving material to the rear of the tractor 1. The paving material fed to the rear of the tractor 1 are laid and spread in the rear of the tractor 1 and in front of the screed 3 by a screw SC in the vehicle width direction. In the present embodiment, the screw SC is in a state in which extension screws are coupled on each side of the screw SC. Fig. 1 and Fig. 2 illustrate the paving material PV laid and spread by the screw SC with a coarse dot pattern.

[0013] The screed 3 is a mechanism for laying and leveling the paving material PV. In the embodiment, the screed 3 includes a front screed 30 and a rear screed 31. The rear screed 31 is configured to be extendable and retractable in the vehicle width direction (i.e., the Y axis direction) as illustrated by a bidirectional arrow AR1. Specifically, the rear screed 31 includes a left rear screed 31L and a right rear screed 31R that are extendable and retractable in the vehicle width direction. The left rear screed 31L and the right rear screed 31R are disposed in positions offset to each other in a traveling direction (an X axis direction). Thus, the left rear screed 31L and the right rear screed 31R can have a longer width (i.e., length in the vehicle width direction (the Y axis direction)) than the left rear screed 31L and the right rear screed 31R not being offset, and can extend longer in the vehicle width direction, and can construct a wider new pavement body.

[0014] The screed 3 is a floating screed towed by the tractor 1, and is coupled to the tractor 1 through leveling arms 3A. The screed 3 includes a rear controller 52, a switch box 53, a paving thickness control device 54, and an electric power supply device 60A, for example. Fig. 1 and Fig. 2 illustrate a new pavement body NP laid and leveled by the screed 3 with a fine dot pattern.

[0015] Next, with reference to Fig. 3, an interoperation system CS as a wireless communication system provided in the asphalt finisher 100 will be described. Fig. 3 is a block diagram illustrating an example of a configuration of the interoperation system CS. The interoperation system CS is a system that causes a device installed in the tractor 1 and a device installed in the screed 3 to interoperate, and mainly includes the controller 50 and the operation panel 51 installed in the tractor 1, and the rear controller 52, the switch box 53, and the paving thickness control device 54 installed in the screed 3.

[0016] In the embodiment, the controller 50 and the operation panel 51 receive an electric power supply from the electric power supply device 60 installed in the tractor 1. The electric power supply device 60 converts alternating-current power generated by the electric generator 12 driven by the engine 11 into direct-current power. The electric power supply device 60 may include an electric storage device. A thick dotted line in Fig. 3 indicates an electric power line and a double line indicates that the engine 11 and the electric generator 12 are mechanically coupled.

[0017] The rear controller 52 and the switch box 53 receives an electric power supply from the electric power supply device 60A installed in the screed 3. The electric power supply device 60A is a device independent of the electric power supply device 60, and is, for example, a vibration power generator, a solar power generator, a temperature difference power generator, and an electric storage device. The electric power supply device 60A may be removable, and may be non-removable. The electric power supply device 60A may be a self power generator that generates electric power by using operation power (i.e., kinetic energy) of an operator who operates a switch. The self power generator may be provided for each switch. In this case, a switch can transmit information about the switch wirelessly using electric power generated by operation power of an operator who operates the switch. It is not necessary to provide an electric storage device.

[0018] The paving thickness control device 54 controls thickness of the paving material paved by the asphalt finisher 100. In the embodiment, the paving thickness control device 54 receives an electric power supply from a built-in electric power supply device 60B. The electric power supply device 60B is a device independent of the electric power supply device 60 and the electric power supply device 60A, and is, for example, a vibration power generator, a solar power generator, a temperature difference power generator, a self power generator, and an electric storage device. However, the paving thickness control device 54 may receive an electric power supply from the electric power supply device 60 or the electric power supply device 60A.

[0019] The controller 50 is a control device that controls the asphalt finisher 100. In the embodiment, the controller 50 includes a microcomputer including, for example, a CPU, a volatile storage device, and a non-volatile storage device. Various functions of the controller 50 are achieved by the CPU executing a program stored in the non-volatile storage device, for example.

[0020] The controller 50 includes a control unit 50a and a communication unit 50b as functional elements. The control unit 50a and the communication unit 50b are achieved by software, hardware, or any combination of software and hardware.

[0021] The control unit 50a controls various devices installed in the asphalt finisher 100. The control unit 50a controls a control valve in accordance with a control instruction from the operation panel 51, the rear controller 52, the switch box 53, and the paving thickness control device 54, for example. The control valve controls a flow of the operating oil between the hydraulic pump and a hydraulic actuator driven by the engine 11. The hydraulic actuator includes, for example, the front wheel driving hydraulic motor, the rear wheel driving hydraulic motor, a screw driving hydraulic motor, a conveyor driving hydraulic motor, a screed extendable cylinder, a leveling cylinder, a screed lift cylinder, a hopper cylinder, a damper driving hydraulic motor, and a vibrator driving hydraulic

motor. A vibrator is a device that vibrates the screed 3.

[0022] The communication unit 50b controls wireless communication between the controller 50 and a device installed in each of the tractor 1 and the screed 3. In the embodiment, the communication unit 50b uses a wireless communication standard such as Bluetooth (registered trademark) and Wi-Fi (registered trademark), and controls wireless communication between the controller 50 and the operation panel 51 installed in the tractor 1. In addition, the communication unit 50b controls wireless communication between the controller 50 and each of the rear controller 52, the switch box 53, and the paving thickness control device 54 installed in the screed 3.

[0023] The operation panel 51 generates a control instruction in accordance with an input from an operator, and outputs the control instruction to the controller 50. The operation panel 51 includes a switch 51a, a monitor 51b, and a communication unit 51c. In the embodiment, the operation panel 51 is attached in front of the driver's seat 1S in the driver's cab.

[0024] The switch 51a is an example of an operation device that an operator operates in order to control the asphalt finisher 100. The switch 51a includes, for example, a switch for switching between on and off of the conveyor CV, a switch for switching between on and off of the screw SC, a switch for switching between extension, retraction, and off of the rear screed 31, and a switch for switching between open, close, and off of the hopper 2. The switch includes, for example, a toggle switch, a rocker switch, a rotary switch, a push switch, a slide switch, and a lever switch. The operation panel 51 may include another operation device such as a dial and a joystick.

[0025] The monitor 51b displays various information. In the embodiment, the monitor 51b is a color liquid crystal display. The monitor 51b may include a touch panel.

[0026] The communication unit 51c controls wireless communication between the operation panel 51 and the controller 50. However, the operation panel 51 may be connected to the controller 50 through a communication cable. In this case, the communication unit 51c controls wired communication between the controller 50 and the operation panel 51, with the communication unit 50b in the controller 50.

[0027] The rear controller 52 generates a control instruction in accordance with an input from an operator, and outputs the control instruction to the controller 50. In the embodiment, as in the operation panel 51, the rear controller 52 includes a switch 52a, a monitor 52b, and a communication unit 52c, and is attached to a central part of the screed 3. However, the rear controller 52 may be omitted.

[0028] The communication unit 52c controls wireless communication between the rear controller 52 and the controller 50. However, the rear controller 52 may be connected to the controller 50 through a communication cable. In this case, the communication unit 52c controls wired communication between the controller 50 and the rear controller 52, with the communication unit 50b in the controller 50.

[0029] The switch box 53 generates a control instruction in accordance with an input from an operator, and outputs the control instruction to the controller 50. In the embodiment, as in the rear controller 52, the switch box 53 includes a switch 53a, a monitor 53b, and a communication unit 53c, and the switch boxes 53 are attached to a right end of the right rear screed 31R and a left end of the left rear screed 31L.

[0030] An operator can switch between on and off of the conveyor CV, switch between on and off of the screw SC, adjust conveying speed of the conveyor CV, adjust rotation speed of the screw SC, adjust rotation speed of the vibrator driving hydraulic motor, and adjust temperature of the screed, for example, by operating the switch 53a and so on.

[0031] The monitor 53b can display the conveying speed of the conveyor CV, the rotation speed of the screw SC, the rotation speed of the vibrator driving hydraulic motor, and the temperature of the screed, for example.

[0032] The communication unit 53c controls wireless communication between the switch box 53 and the controller 50. However, the switch box 53 may be connected to the controller 50 or the rear controller 52 through a communication cable. In this case, the communication unit 53c controls wired communication between the switch box 53 and the controller 50 or the rear controller 52, with the communication unit 50b in the controller 50 or the communication unit 52c in the rear controller 52.

[0033] The paving thickness control device 54 controls thickness of the paving material paved by the asphalt finisher 100, by outputting a control instruction to extend or retract the leveling cylinder. The paving thickness control device 54 includes a sensor 54a and a communication unit 54b, for example. The sensor 54a, for example, is attached to a front end of the rear screed 31, and is an ultrasonic sensor that measures a vertical distance to a roadbed RB (see Fig. 1 and Fig. 2) in front of the rear screed 31.

[0034] The communication unit 54b controls wireless communication between the paving thickness control device 54 and the controller 50. However, the paving thickness control device 54 may be connected to the controller 50, the rear controller 52, or the switch box 53 through a communication cable. In this case, the communication unit 54b controls wired communication between the paving thickness control device 54 and one of the controller 50, the rear controller 52, and the switch box 53, with one of the communication unit 50b in the controller 50, the communication unit 52c in the rear controller 52, and the communication unit 53c in the switch box 53.

[0035] The paving thickness control device 54, for example, generates a control instruction with respect to an extension or retraction amount of the leveling cylinder based on the vertical distance detected by the sensor 54a, and outputs the control instruction to the controller 50. The controller 50 extends or retracts the leveling cylinder by moving the control valve disposed in a pipe line

connecting the hydraulic pump to the leveling cylinder based on the control instruction. The leveling cylinder adjusts thickness of the paving material to be laid and leveled by controlling a position and orientation of the screed 3 with moving a front end part of a leveling arm 3A up and down. The vertical distance detected by the sensor 54a or related information may be displayed on the monitor 53b of the switch box 53, for example.

[0036] Each of the operation panel 51, the rear controller 52, the switch box 53, and the paving thickness control device 54 may be configured to be removable from the asphalt finisher 100. In this case, for example, when the operation panel 51 is removed from the tractor 1, the operation panel 51 functions as a remote controller by receiving an electric power supply from an internal battery. That is, an operator can remotely operate the asphalt finisher 100 away from the asphalt finisher 100. When the operation panel 51 is attached to the tractor 1, the operation panel 51 operates by receiving an electric power supply from the electric power supply device 60 and charges the internal battery by electric power of the electric power supply device 60. Charging may be contact charging or non-contact charging. This is similar to the rear controller 52, the switch box 53, and the paving thickness control device 54. Each of the operation panel 51, the rear controller 52, the switch box 53, and the paving thickness control device 54 may be composed of a mobile terminal such as a smartphone, a tablet PC, and a notebook PC.

[0037] The interoperation system CS may include a holding amount control device. The holding amount control device controls a holding amount of the paving material in front of the rear screed 31. The holding amount control device includes, for example, a holding amount sensor and a communication unit. As in the paving thickness control device 54, the holding amount control device receives an electric power supply from a built-in electric power supply device, for example. The holding amount sensor is, for example, an ultrasonic sensor attached to a side plate of the rear screed 31. In this case, the holding amount sensor measures a distance to the paving material laid and spread by the screw SC in front of the rear screed 31.

[0038] The communication unit controls wireless communication between the holding amount control device and the controller 50. However, the holding amount control device may be connected to the controller 50, the rear controller 52, the switch box 53, or the paving thickness control device 54 through a communication cable. In this case, the communication unit controls wired communication between the holding amount control device and one of the controller 50, the rear controller 52, the switch box 53, and the paving thickness control device 54, with one of the communication unit 50b in the controller 50, the communication unit 52c in the rear controller 52, the communication unit 53c in the switch box 53, and the communication unit 54b in the paving thickness control device 54.

[0039] The holding amount control device determines whether a holding amount is greater than a predetermined amount based on a distance detected by the holding amount sensor for example. Based on the determined result, the holding amount control device generates a control instruction with respect to the rotation speed of the screw SC, and outputs the control instruction to the controller 50. The controller 50 adjusts the rotation speed of the screw driving hydraulic motor by moving the control valve disposed in a pipe line connecting the hydraulic pump to the screw driving hydraulic motor based on the control instruction. The screw driving hydraulic motor increases or decreases a holding amount by increasing or decreasing the rotation speed of the screw SC. The distance detected by the holding amount sensor or related information may be displayed on the monitor 53b of the switch box 53, for example.

[0040] As described above, the interoperation system CS is configured to perform wireless communication between a device installed in the tractor 1 and a device installed in the screed 3. The interoperation system CS is configured such that a device installed in the tractor 1 receives an electric power supply from the electric power supply device 60 installed in the tractor 1, and a device installed in the screed 3 receives an electric power from the electric power supply device 60A installed in the screed 3. Thus, there is no power cable and no communication cable leading from the tractor 1 to the screed 3. Therefore, there is no possibility that a power cable and a communication cable are damaged by, for example, heat of paving material between the tractor 1 and the screed 3.

[0041] The interoperation system CS is configured to perform wireless communication between the controller 50 installed in the tractor 1 and the switch box 53 installed in the screed 3. Thus, there is no communication cable leading from a central part of the screed 3 to the switch box 53 attached to each side of the rear screed 31. Therefore, there is no possibility that a communication cable is damaged such as stripping and disconnection when the rear screed 31 is extended or retracted.

[0042] As described above, the interoperation system CS can reduce or solve a problem about a cable damage related to a device installed in the screed 3. Thus, the interoperation system CS can cause a device installed in the tractor 1 and a device installed in the screed 3 to interoperate more stably. As a result, it can improve, for example, convenience, stability, workability, and productivity of the asphalt finisher 100.

[0043] Next, with reference to Fig. 4, another example of a configuration of the interoperation system CS will be described. Fig. 4 is a block diagram illustrating another example of a configuration of the interoperation system CS. The interoperation system CS in Fig. 4 is different from the interoperation system CS in Fig. 3 in that the rear controller 52 and the switch box 53 receive an electric power supply from the electric power supply device 60 installed in the tractor 1. In addition, the interoperation

system CS in Fig. 4 is different from the interoperation system CS in Fig. 3 in that wireless communication is performed between the rear controller 52 and each of the switch box 53 and the paving thickness control device 54; that is, wireless communication is not performed between the controller 50 and each of the switch box 53 and the paving thickness control device 54. The interoperation system CS in Fig. 4 has other points in common with the interoperation system CS in Fig. 3.

[0044] By this configuration, as in the interoperation system CS in Fig. 3, the interoperation system CS in Fig. 4 can cause a device installed in the tractor 1 and a device installed in the screed 3 to interoperate more stably. In addition, the interoperation system CS in Fig. 4 can supply electric power to a device installed in the screed 3 stably, compared with the interoperation system CS in Fig. 3. This is because a device installed in the screed 3 receives an electric supply from the electric power supply device 60 installed in the tractor 1. In addition, as a communication cable connecting between devices is omitted, a possibility that a communication cable is damaged can be removed. In the interoperation system CS in Fig. 4, power line communication may be used.

[0045] Next, with reference to Fig. 5, further another example of a configuration of the interoperation system CS will be described. Fig. 5 is a block diagram illustrating further another example of a configuration of the interoperation system CS. The interoperation system CS in Fig. 5 is different from the interoperation system CS in Fig. 3 in that the interoperation system CS in Fig. 5 is configured to perform wireless communication between the rear controller 52 and each of the switch box 53 and the paving thickness control device 54. That is, the interoperation system CS in Fig. 5 is different from the interoperation system CS in Fig. 3 in that the interoperation system CS in Fig. 5 is configured not to perform wireless communication between the controller 50 and each of the switch box 53 and the paving thickness control device 54. The interoperation system CS in Fig. 5 has other points in common with the interoperation system CS in Fig. 3.

[0046] The interoperation system CS in Fig. 5 may be configured to perform wireless communication between the switch box 53 and the paving thickness control device 54, and not to perform wireless communication between the paving thickness control device 54 and each of the controller 50 and the rear controller 52.

[0047] By this configuration, as in the interoperation system CS in Fig. 3, the interoperation system CS in Fig. 5 can cause a device installed in the tractor 1 and a device installed in the screed 3 to interoperate more stably. In addition, the interoperation system CS in Fig. 5 can achieve wireless communication related to the switch box 53 and the paving thickness control device 54 with low electric power, compared with the interoperation system CS in Fig. 3. This is because the interoperation system CS in Fig. 5 is configured so that wireless communication is performed in a relatively short distance.

[0048] As described above, the asphalt finisher 100 according to the embodiment of the present invention includes the tractor 1, the screed 3, and the interoperation system CS as a wireless communication system configured to perform wireless communication between at least two of a plurality of devices installed in at least one of the tractor 1 and the screed 3. This can cause a device installed in the tractor 1 and a device installed in the screed 3 to interoperate more stably.

[0049] One or more devices installed in the tractor 1 include, for example, at least one of the controller 50 and the operation panel 51, and one or more devices installed in the screed 3 include at least one of the rear controller 52, the switch box 53, the sensor 54a, a screed controller, and the electric power supply device 60A. The sensor 54a may be a height difference sensor. The screed controller is a device attached to the screed 3 so that an operator can configure various settings of the screed 3, and, for example, has a similar configuration of the switch box 53. The electric power supply device 60A is, for example, a vibration power generator.

[0050] As illustrated in Fig. 3 to Fig. 5, the interoperation system CS may be configured to perform wireless communication between the controller 50 and the rear controller 52, and may be configured to perform wireless communication between the controller 50 and the operation panel 51. The interoperation system CS may be configured to perform wireless communication between at least one of the switch box 53, the sensor 54a, and the screed controller, and the rear controller 52.

[0051] The interoperation system CS may be configured to perform wired communication between the controller 50 and the rear controller 52, and perform wireless communication between the controller 50 and the operation panel 51. The interoperation system CS may be configured to perform wired communication between the controller 50 and the rear controller 52, and perform wireless communication between at least one of the switch box 53, the sensor 54a, and the screed controller, and the rear controller 52.

[0052] The asphalt finisher 100 may include, for example, the electric power supply device 60 as a first electric power supply device installed in the tractor 1, and the electric power supply device 60A as a second electric power supply device independent of the electric power supply device 60. At least one of a plurality of devices installed in at least one of the tractor 1 and the screed 3 may be configured to receive an electric power supply from the electric power supply device 60A.

[0053] In the embodiment, the left rear screed 31L and the right rear screed 31R are disposed in positions offset to each other in a traveling direction (i.e., the X axis direction). Thus, the left rear screed 31L and the right rear screed 31R can be extended longer in the vehicle width direction. However, when the rear screed 31 is extended, the switch box 53 is disposed at a position far away from the tractor 1. Thus, when the switch box 53 performs wired communication, an asphalt finisher needs to pro-

vide a long cable related to the switch box 53. Additionally, when the rear screed 31 is retracted, an asphalt finisher needs to provide a space for placing an extra part of a long cable related to the switch box 53. In the embodiment, the asphalt finisher 100 can omit a space for placing a cable that is necessary for performing wired communication, by the switch box 53 performing wireless communication.

[0054] A preferred embodiment of the present invention is described above. The present invention, however, is not limited to the embodiment described above. Various variations, replacements, etc., may be applied to the embodiment described above without departing from the scope of the present invention. Furthermore, the features described with reference to the embodiment described above may be appropriately combined as long as causing no technical contradiction.

[0055] The present application is based upon and claims priority to Japanese Patent Application No. 2017-149062, filed on August 1, 2017, the entire contents of which are incorporated herein by reference.

DESCRIPTION OF THE REFERENCE NUMERALS

[0056] 1 ... tractor 1S ... driver's seat 2 ... hopper 3 ... screed 3A ... leveling arm 5 ... rear wheel 6 ... front wheel 11 ... engine 12 ... electric generator 30 ... front screed 31 ... rear screed 31L ... left rear screed 31R ... right rear screed 50 ... controller 50a ... control unit 50b ... communication unit 51 ... operation panel 51a ... switch 51b ... monitor 51c ... communication unit 52 ... rear controller 52a ... switch 52b ... monitor 52c ... communication unit 53 ... switch box 53a ... switch 53b ... monitor 53c ... communication unit 54 ... paving thickness control device 54a ... sensor 54b ... communication unit 60, 60A, 60B ... electric power supply device 100 ... asphalt finisher CV ... conveyor NP ... new pavement body PV ... paving material RB ... roadbed SC ... screw

Claims

1. An asphalt finisher comprising:

   a tractor;
   a screed; and
   a wireless communication system configured to perform wireless communication between at least two of a plurality of devices installed in at least one of the tractor and the screed.

2. The asphalt finisher as claimed in claim 1, wherein one or more devices installed in the tractor includes at least one of a controller and an operation panel, and one or more devices installed in the screed includes at least one of a rear controller, a switch box, a sensor, a screed controller, and a vibration power generator.

3. The asphalt finisher as claimed in claim 2, wherein the wireless communication system is configured to perform the wireless communication between the controller and the rear controller.

4. The asphalt finisher as claimed in claim 2, wherein the wireless communication system is configured to perform the wireless communication between the controller and the operation panel.

5. The asphalt finisher as claimed in claim 2, wherein the wireless communication system is configured to perform the wireless communication between at least one of the switch box, the sensor, and the screed controller, and the rear controller.

6. The asphalt finisher as claimed in claim 2, wherein the wireless communication system is configured to perform wired communication between the controller and the rear controller, and perform the wireless communication between the controller and the operation panel.

7. The asphalt finisher as claimed in claim 2, wherein the wireless communication system is configured to perform wired communication between the controller and the rear controller, and perform the wireless communication between at least one of the switch box, the sensor, and the screed controller, and the rear controller.

8. The asphalt finisher as claimed in claim 1, comprising:

   a first electric power supply device installed in the tractor; and
   a second electric power supply device that is independent of the first electric power supply device, wherein at least one of the plurality of devices installed in at least one of the tractor and the screed receives an electric power supply from the second electric power supply device.

9. The asphalt finisher as claimed in claim 1, wherein the screed includes a left rear screed and a right rear screed that are extendable and retractable in a vehicle width direction, and the left rear screed and the right rear screed are disposed in positions offset to each other in a traveling direction.

FIG.1

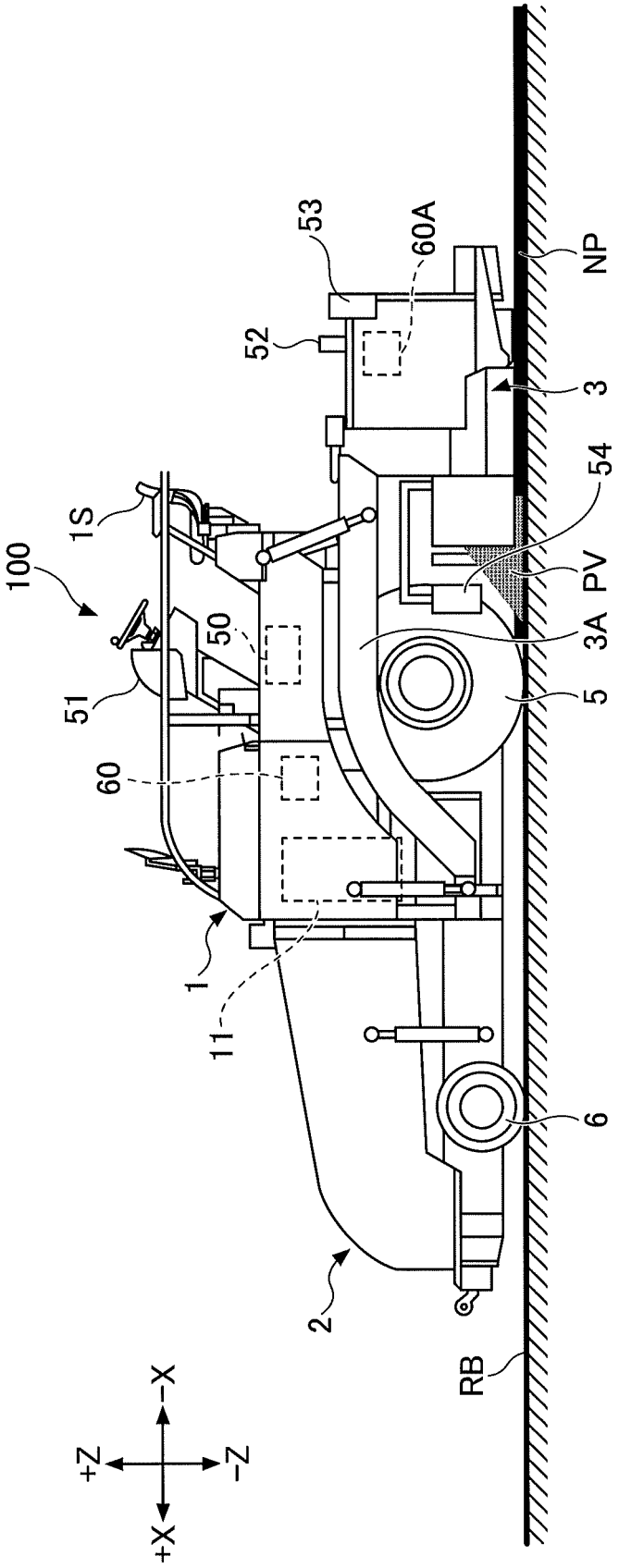
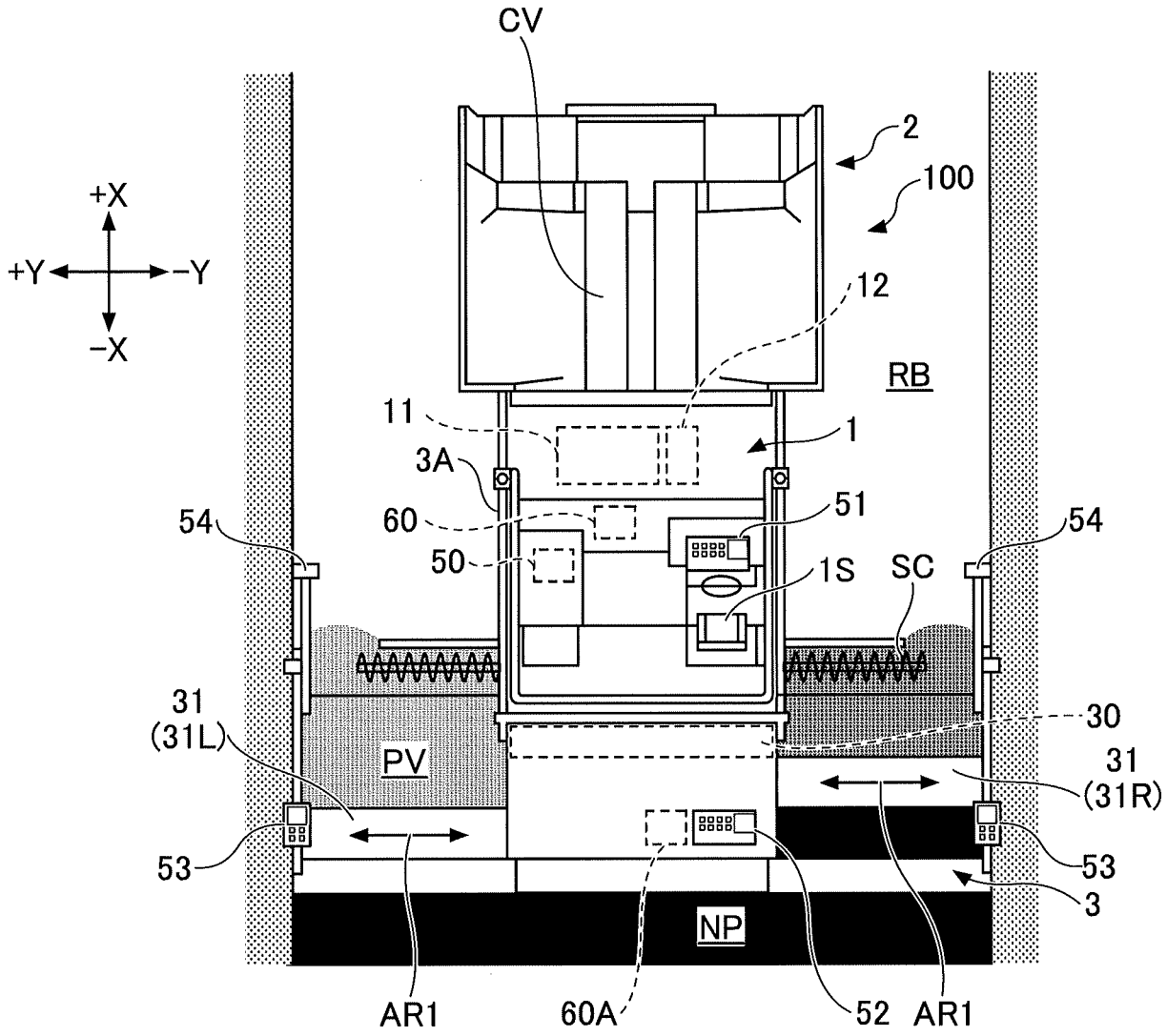


FIG.2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100
+X
+Y
-Y
-X
12
RB
11
1
3A
60
51
54
50
1S
SC
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31
(31L)
30
PV
31
(31R)
53
53
3
NP
AR1
60A
52
AR1

FIG.3

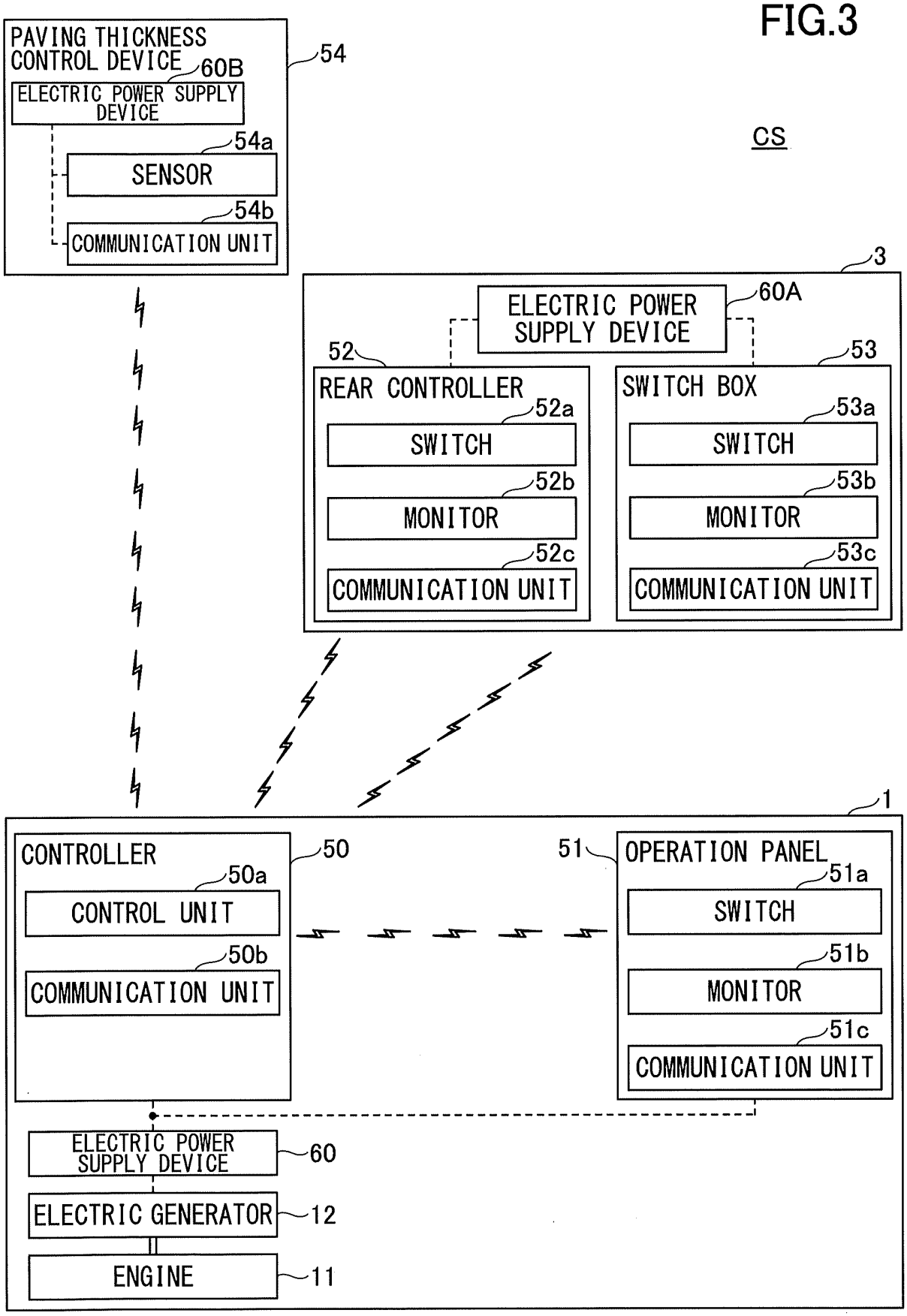
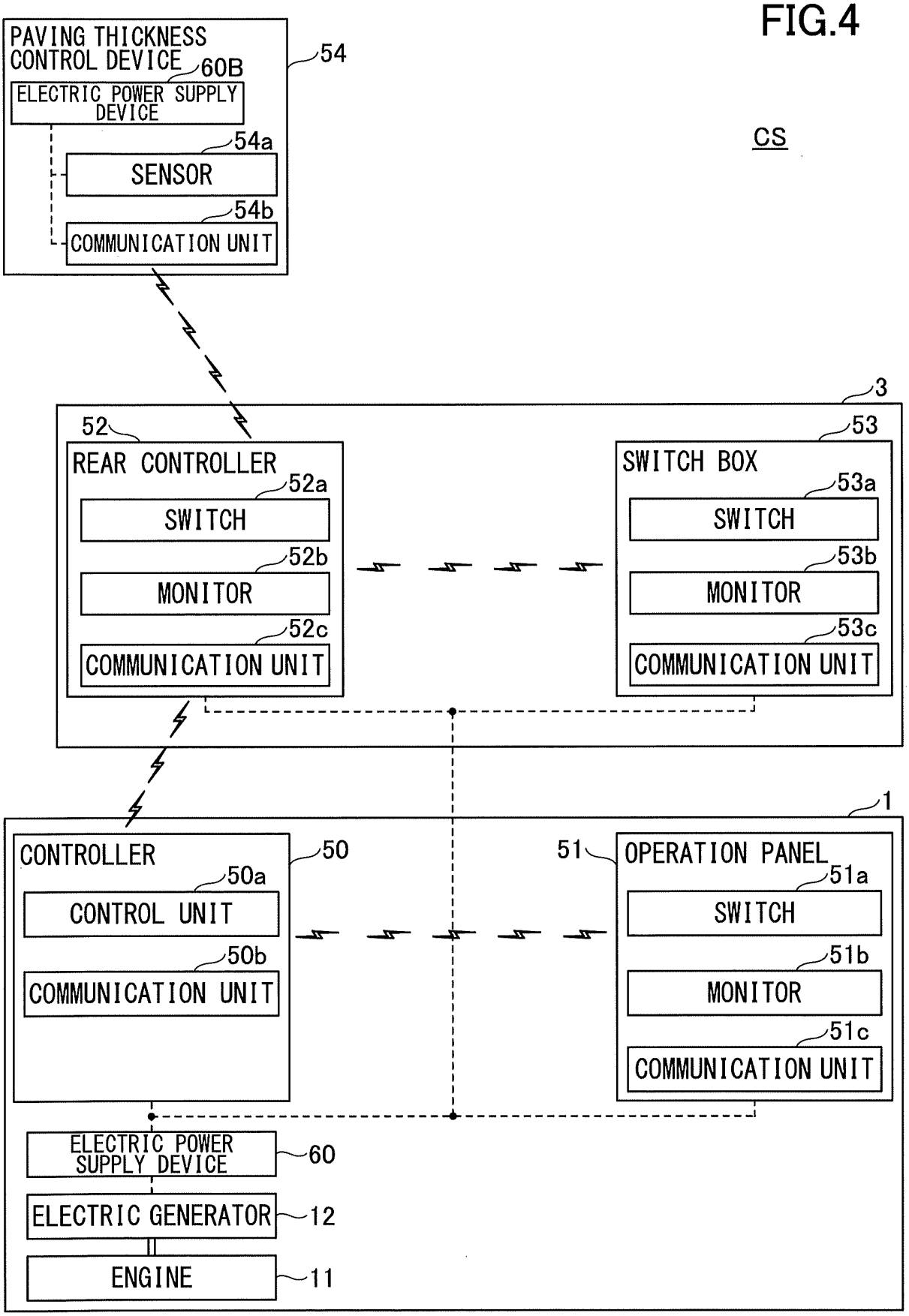

PAVING THICKNESS CONTROL DEVICE
60B
54
ELECTRIC POWER SUPPLY DEVICE
54a
SENSOR
54b
COMMUNICATION UNIT
CS
3
ELECTRIC POWER SUPPLY DEVICE
60A
52
REAR CONTROLLER
52a
SWITCH
52b
MONITOR
52c
COMMUNICATION UNIT
53
SWITCH BOX
53a
SWITCH
53b
MONITOR
53c
COMMUNICATION UNIT
1
CONTROLLER
50
50a
CONTROL UNIT
50b
COMMUNICATION UNIT
51
OPERATION PANEL
51a
SWITCH
51b
MONITOR
51c
COMMUNICATION UNIT
ELECTRIC POWER SUPPLY DEVICE
60
ELECTRIC GENERATOR
12
ENGINE
11

FIG.4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60B
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ELECTRIC POWER SUPPLY DEVICE
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SENSOR
54b
COMMUNICATION UNIT
3
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52a
SWITCH
52b
MONITOR
52c
COMMUNICATION UNIT
53
SWITCH BOX
53a
SWITCH
53b
MONITOR
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COMMUNICATION UNIT
1
CONTROLLER
50
50a
CONTROL UNIT
50b
COMMUNICATION UNIT
51
OPERATION PANEL
51a
SWITCH
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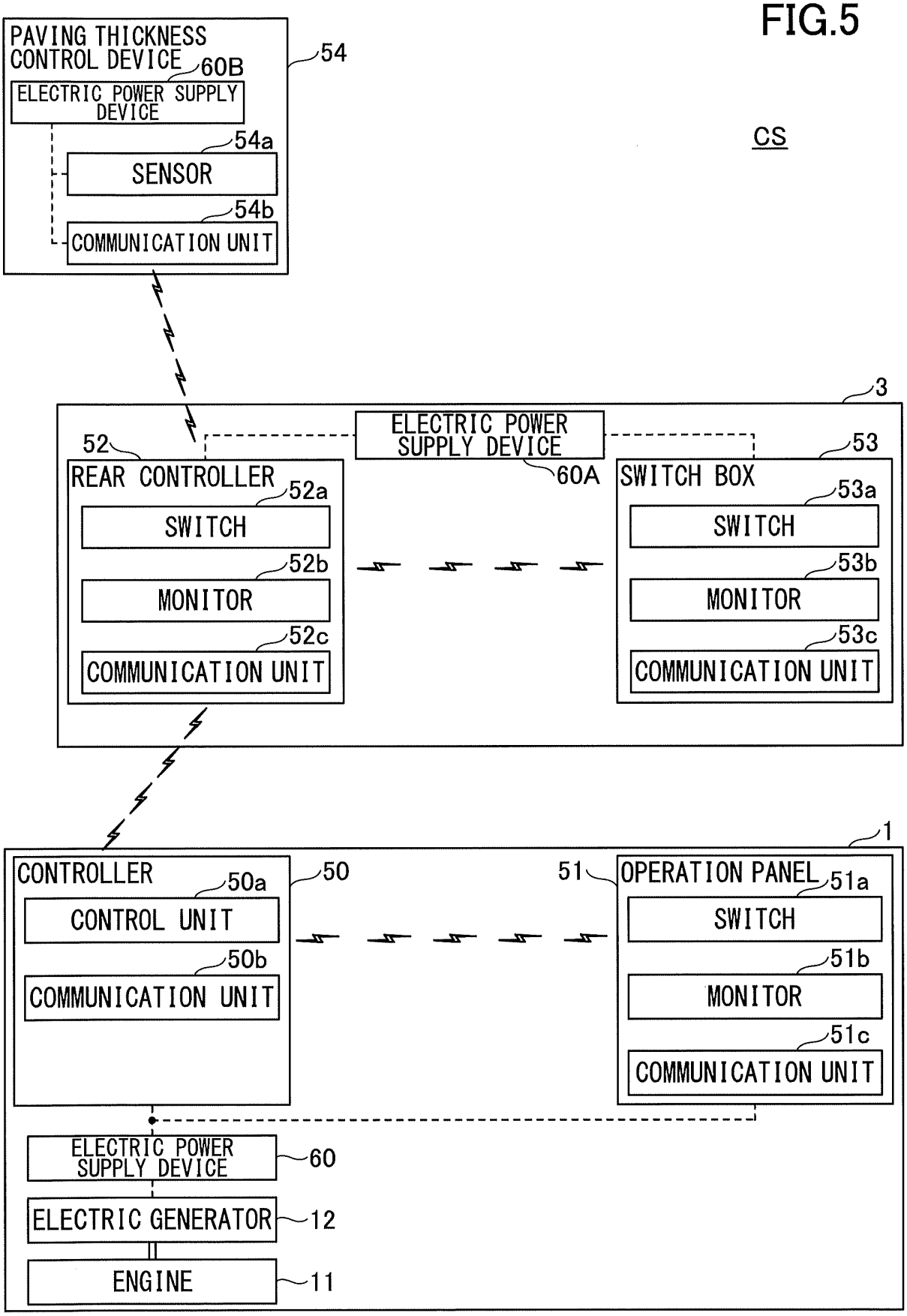
MONITOR
51c
COMMUNICATION UNIT
ELECTRIC POWER SUPPLY DEVICE
60
ELECTRIC GENERATOR
12
ENGINE
11

FIG.5


CS
PAVING THICKNESS CONTROL DEVICE
60B
54
ELECTRIC POWER SUPPLY DEVICE
54a
SENSOR
54b
COMMUNICATION UNIT
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ELECTRIC POWER SUPPLY DEVICE
60A
52
REAR CONTROLLER
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SWITCH
52b
MONITOR
52c
COMMUNICATION UNIT
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SWITCH BOX
53a
SWITCH
53b
MONITOR
53c
COMMUNICATION UNIT
1
CONTROLLER
50a
50
CONTROL UNIT
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COMMUNICATION UNIT
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OPERATION PANEL
51a
SWITCH
51b
MONITOR
51c
COMMUNICATION UNIT
ELECTRIC POWER SUPPLY DEVICE
60
ELECTRIC GENERATOR
12
ENGINE
11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/028413

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. E01C19/48(2006.01)i

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)
Int.Cl. E01C19/48, E02F9/00-9/26

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2016-180300 A (JOSEPH VOEGELE AG) 13 October 2016, paragraphs [0001], [0037]-[0050], fig. 2-8 & US 2016/0266610 A1, paragraphs [0001], [0051]-[0065], fig. 2-8	1-2, 4, 8 2-3, 5-7, 9
Y	JP 2016-191299 A (JOSEPH VOEGELE AG) 10 November 2016, paragraphs [0005], [0044]-[0058], fig. 1-3 & US 2016/0289902 A1, paragraphs [0005]-[0006], [0047]-[0062], fig. 1-3	2-3, 5-7

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2018 (31.08.2018)	11 September 2018 (11.09.2018)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/028413

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 9-53253 A (HITACHI CONSTRUCTION MACHINERY CO., LTD.) 25 February 1997, paragraph [0031], fig. 1, 3 & US 5960378 A, column 9, lines 7-16, fig. 1, 3	5, 7
Y	JP 2011-6858 A (CATERPILLAR JAPAN LTD.) 13 January 2011, paragraph [0003] (Family: none)	5, 7
Y	JP 2013-253468 A (JOSEPH VOEGELE AG) 19 December 2013, paragraph [0027], fig. 1 & US 2013/0322964 A1, paragraph [0028], fig. 1	5, 7
Y	JP 2016-79570 A (SUMITOMO (S.H.I.) CONSTRUCTION MACHINERY COMPANY, LIMITED) 16 May 2016, paragraph [0017], fig. 1 (Family: none)	9

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2014047568 A **[0003]**
- JP 2016079570 A **[0003]**
- JP 2017149062 A **[0055]**