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(54) **WORK VEHICLE LOAD CONTROL SYSTEM AND METHOD**

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CPC ***E02F 9/2029*** (2013.01); ***E02F 3/844*** (2013.01); ***E02F 9/2041*** (2013.01); ***E02F 9/2066*** (2013.01); *E02F 3/7609* (2013.01)

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See application file for complete search history.

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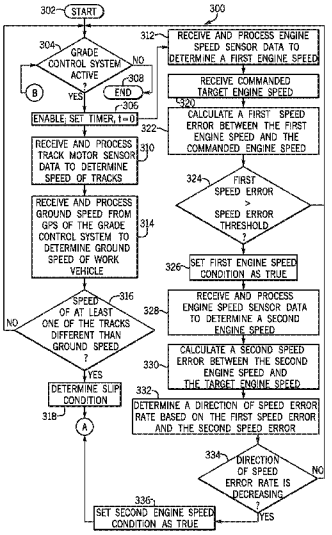
(57) **ABSTRACT**

Systems and methods are provided for adjusting a position of an implement of a work vehicle to control a load on the work vehicle. The implement is movable by a hydraulic circuit controlled by a Grade Control System. The method includes: determining, by a processor of the work vehicle, a slip condition associated with the work vehicle; determining, by the processor, an engine speed condition associated with the work vehicle; determining, by the processor, an offset to adjust the position of the implement based on at least one of the slip condition and the engine speed condition; and outputting the offset to the Grade Control System to adjust the position of the implement based on the offset to control the load on the work vehicle.

13 Claims, 5 Drawing Sheets



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wires, a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, a portable compact disc read-only memory (CD-ROM), an optical storage device. In the context of this document, a computer-usable, or computer-readable, storage medium may be any tangible medium that may contain, or store a program for use by or in connection with the instruction execution system, apparatus, or device.

A computer readable signal medium may include a propagated data signal with computer readable program code embodied therein, for example, in baseband or as part of a carrier wave. Such a propagated signal may take any of a variety of forms, including, but not limited to, electromagnetic, optical, or any suitable combination thereof. A computer readable signal medium may be non-transitory and may be any computer readable medium that is not a computer readable storage medium and that may communicate, propagate, or transport a program for use by or in connection with an instruction execution system, apparatus, or device.

Aspects of certain embodiments are described herein may be described with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that each block of any such flowchart illustrations and/or block diagrams, and combinations of blocks in such flowchart illustrations and/or block diagrams, may be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer-readable memory that may direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instructions which implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

Any flowchart and block diagrams in the figures, or similar discussion above, may illustrate the architecture, functionality, and operation of possible implementations of systems, methods and computer program products according to various embodiments of the present disclosure. In this regard, each block in the flowchart or block diagrams may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It should also be noted that, in some alternative implementations, the functions noted in the block (or otherwise described herein) may occur out of the order noted in the figures. For example, two blocks shown in succession (or two operations described in succession) may, in fact, be executed substantially concurrently, or the blocks (or operations) may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of any block diagram and/or flowchart illustration, and combinations of blocks in any block diagrams and/or flowchart illustrations, may be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and computer instructions.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the disclosure. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

The description of the present disclosure has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the disclosure in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the disclosure. Explicitly referenced embodiments herein were chosen and described in order to best explain the principles of the disclosure and their practical application, and to enable others of ordinary skill in the art to understand the disclosure and recognize many alternatives, modifications, and variations on the described example(s). Accordingly, various embodiments and implementations other than those explicitly described are within the scope of the following claims.

What is claimed is:

1. A method for adjusting a position of an implement of a work vehicle to control a load on the work vehicle, the implement movable by a hydraulic circuit controlled by a Grade Control System, the method comprising:

determining, by a processor of the work vehicle, a slip condition associated with the work vehicle;

determining, by the processor, an engine speed condition associated with the work vehicle by;

receiving a speed of the engine and a target speed of the engine from one or more sources associated with the work vehicle;

calculating, by the processor, a first speed error between the speed of the engine and the target speed;

determining, by the processor, whether the first speed error is greater than a threshold; and

setting a first engine speed condition as true or false based on the determining;

determining, by the processor, an offset to adjust the position of the implement based on at least one of the slip condition and the engine speed condition;

outputting the offset to the Grade Control System to adjust the position of the implement based on the offset to control the load on the work vehicle;

based on the first engine speed condition as true, receiving a second speed of the engine from the one or more sources;

calculating, by the processor, a second speed error between the second speed of the engine and the target speed;

determining, by the processor, a direction of speed error of the engine based on the first speed error and the second speed error;

setting a second engine speed condition as true based on the determined direction; and

determining the offset based on the second speed condition as true.

2. The method of claim **1**, wherein the work vehicle has one or more wheels or tracks that are driven to move the work vehicle, and the determining, by the processor, the slip condition further comprises:

receiving speed data from a source that indicates a speed of a motor associated with at least one of the one or more wheels or tracks; and

determining, by the processor, the slip condition based on the speed of the motor.

3. The method of claim **2**, further comprising:

receiving ground speed data of the work vehicle from a source; and

determining, by the processor, the slip condition based on a difference between the ground speed data and the speed of the motor.

4. The method of claim **1**, further comprising:

receiving an operating state of the work vehicle;

determining, by the processor, a gain based on one or more predefined rates associated with the operating state of the work vehicle; and

determining the offset based on the gain.

5. The method of claim **4**, wherein the one or more predefined rates are user-defined via at least one input device associated with the work vehicle.

6. A system for adjusting a position of an implement of a work vehicle to control a load on the work vehicle, the implement movable by a hydraulic circuit controlled by a Grade Control System, the system comprising:

a controller associated with the work vehicle and having a processor that:

determines a slip condition associated with the work vehicle;

determines an engine speed condition associated with the work vehicle;

determines an offset to adjust the position of the implement based on the slip condition or the engine speed condition; and

outputs the offset to the Grade Control System associated with the work vehicle to adjust the position of the implement to control the load on the work vehicle;

wherein the processor determines the engine speed condition based on a first speed error between a speed of the engine of the work vehicle and a target speed for the engine of the work vehicle;

wherein the processor sets a first engine speed condition as true or false based on whether the first speed error is greater than a threshold; and

wherein based on the first engine speed condition as true, the processor calculates a second speed error between a second speed of the engine and the target speed for the engine, and the processor determines a direction of speed error of the engine based on the first speed error and the second speed error.

7. The system of claim **6**, wherein the work vehicle has one or more tracks that are driven to move the work vehicle, and the processor determines the slip condition based on a speed of a motor associated with at least one of the tracks.

8. The system of claim **7**, wherein the processor determines the slip condition based on a difference between a ground speed of the work vehicle and the speed of the motor.

9. The system of claim **6**, wherein the processor sets a second engine speed condition as true based on the determined direction, and determines the offset based on the second engine speed condition as true.

10. The system of claim **6**, wherein the processor receives an operating state of the work vehicle, determines a gain based on one or more predefined rates associated with the operating state of the work vehicle and determines the offset based on the gain.

11. A system for adjusting a position of an implement of a work vehicle to control a load on the work vehicle, the implement movable by a hydraulic circuit controlled by a Grade Control System, the work vehicle having one or more tracks that are driven to move the work vehicle, and the system comprising:

a controller associated with the work vehicle and having a processor that:

determines a slip condition associated with the work vehicle based on a difference between a ground speed of the work vehicle and a speed of a motor associated with at least one of the tracks;

determines an engine speed condition associated with the work vehicle;

determines an offset to adjust the position of the implement based on the slip condition or the engine speed condition; and

outputs the offset to the Grade Control System to adjust the position of the implement to control the load on the work vehicle;

wherein the processor sets a first engine speed condition as true or false based on a difference between a speed of the engine of the work vehicle and a target speed for the engine of the work vehicle, and the first engine speed condition is true when the first speed error is greater than a threshold; and

wherein based on the first engine speed condition as true, the processor calculates a second speed error between a second speed of the engine and the target speed for the engine, determines a direction of speed error of the engine based on the first speed error and the second speed error, and based on the determined direction, the processor sets a second engine speed condition as true and determines the offset based on the second engine speed condition as true.

12. The system of claim **11**, wherein the processor receives an operating state of the work vehicle, determines a gain based on one or more predefined rates associated with the operating state of the work vehicle and calculates the offset based on the gain.

13. The system of claim **12**, wherein the one or more predefined rates are user-defined via at least one input device associated with the work vehicle.

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