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(54) LEG CONTROL SYSTEM AND ENGINEERING MACHINE

(57) The invention provides a leg control system, comprising a command transmitting unit, a leg controller and electromagnetic valves for controlling actions of legs, wherein the command transmitting unit is used for transmitting a leg control command; the leg controller simultaneously transmits an action instruction to the electromagnetic valves corresponding to a plurality of legs according to the received leg control command from the command transmitting unit; and the electromagnetic valves are reversed according to the control instruction so as to control the actions of the plurality of legs. Correspondingly, the invention further provides an engineering machine. According to the technical solutions of the invention, the plurality of legs can be controlled simultaneously, and problems of uneven stress and the like when a single leg is controlled are solved.

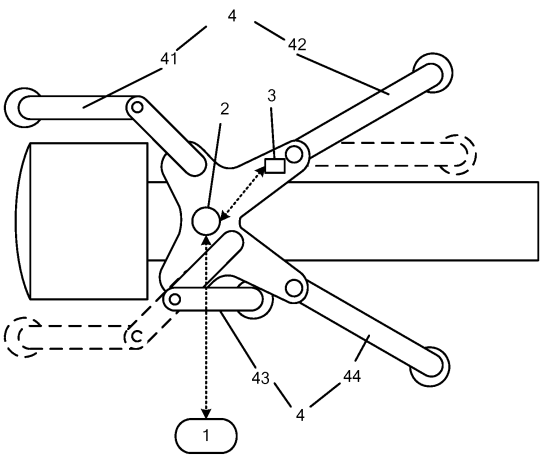

Fig. 1

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Description

[0001] This application claims the priority to Chinese Patent Application No. 201210370775.9, filed September 28, 2012, entitled "LEG CONTROL SYSTEM AND ENGINEERING MACHINE", the disclosures for which are hereby incorporated herein in their entireties by reference.

FIELD OF THE INVENTION

[0002] The invention relates to the field of leg control technology, and particularly to a leg control system and an engineering machine provided with the leg control system.

BACKGROUND OF THE INVENTION

[0003] At present, legs of an engineering machine mostly adopt the following several structural forms: rear swing legs, X legs, front swing legs, folding legs, arc-shaped legs and the like. When the legs are unfolded, multi-way valve rockers of the legs need to be manually operated, to control a plurality of legs to be unfolded and landed, so as to form a square or a trapezoid for supporting the weight of the engineering machine to prevent overturning. However, when the legs are unfolded by adopting a relevant technology, each leg only can be controlled individually, so that when the actions of the legs are operated, two sides of the engineering machine can not be simultaneously supported, which easily causes incline of the engineering machine and uneven stress on the legs, and even results in overturning of the engineering machine.

[0004] Therefore, a new leg control technology is needed for solving the problems that uneven stress possibly appears when a single leg is controlled and the like.

SUMMARY OF THE INVENTION

[0005] Aiming at the above-mentioned problems, the invention provides a novel leg control system and an engineering machine, which can realize synchronous control of a plurality of legs and solve the problems of uneven stress and the like when legs are controlled individually.

[0006] In view of this, the invention provides a leg control system, comprising a command transmitting unit, a leg controller and electromagnetic valves for controlling the actions of legs, wherein the command transmitting unit is used for transmitting a leg control command; the leg controller simultaneously transmits an action instruction to the electromagnetic valves corresponding to a plurality of legs according to the received leg control command from the command transmitting unit; and the electromagnetic valves are reversed according to the action instruction to control the actions of the legs.

[0007] In this technical solution, the plurality of legs are simultaneously controlled, so that on the one hand, the working efficiency can be improved, and on the other hand, the plurality of legs can be simultaneously in contact with the ground to support an engineering machine, the stress is more even, and inclination and even overturn of the engineering machine after a single leg lands are avoided.

[0008] In the above-mentioned technical solution, preferably, the electromagnetic valves comprise unfolding and folding electromagnetic valves arranged on unfolding and folding loops of the legs and/or ascending and descending electromagnetic valves arranged on ascending and descending loops of the legs; the leg control command comprises an unfolding and folding control command and/or an ascending and descending control command, and the leg controller transmits a corresponding unfolding and folding instruction to the unfolding and folding electromagnetic valves when receiving the unfolding and folding control command and transmits a corresponding ascending and descending instruction to the ascending and descending electromagnetic valves when receiving the ascending and descending control command.

[0009] In this technical solution, the operation of each leg comprises two parts, namely as for one part, the leg extends from an initial position such as the back of the engineering machine and is laid down right above a target position, and as for the other part, the other section extends downwards from the end of each leg and is in contact with the ground to realize supporting. The actions of the two parts may be controlled respectively or simultaneously, so that the construction time is reduced.

[0010] In any of the above-mentioned technical solutions, preferably, the electromagnetic valves are proportional electromagnetic valves; the leg control command includes a leg moving speed for adjusting the displacement of the valve core of each proportional electromagnetic valve; and the leg controller adjusts the displacement of the valve core of each proportional electromagnetic valve according to the leg moving speed to control the moving speed of each leg.

[0011] In this technical solution, the proportional electromagnetic valves are adopted, so that the positions of the valve cores may be controlled, and then the moving speeds of the legs can be controlled to adapt to different working conditions.

[0012] In any of the above-mentioned technical solutions, preferably, the command transmitting unit is a remote control device, which is connected with the leg controller in a wired or wireless manner.

[0013] In this technical solution, the wired connection manner adopted is favorable for improving the stability of signal transmission; and the wireless connection manner adopted is favorable for further getting away from the engineering machine and avoiding the limitation of lengths of cables and the like, so that operators are prevented from being hit in the moving process of the legs, and the operational safety is improved.

[0014] In any of the above-mentioned technical solu-

tions, preferably, the remote control device is provided with a command receiving device, which generates the leg control command after sensing a preset operation action.

[0015] In this technical solution, the command receiving device herein may be one or more of multiple forms such as a physical key, an operating rod, a voice receiving and identification device, an image acquisition and identification device, a touch screen and a keyboard, for facilitating inputting the command of a user.

[0016] In any of the above-mentioned technical solutions, preferably, the command receiving device comprises a plurality of buttons, and each button corresponds to a plurality of legs; when the operation action specific to a specified button is sensed, a corresponding leg control command is generated; and the leg control command includes leg information, the leg controller determines the corresponding electromagnetic valve according to the leg information, so as to control the plurality of legs corresponding to the specified button.

[0017] In this technical solution, a plurality of buttons are arranged on the remote control device, a corresponding function is preset for each button, e.g. a certain button corresponds to unfolding of the two left legs of the engineering machine, and after the user presses down the button, the two left legs would be unfolded. By identifying the transmitted leg control command, different functional buttons are distinguished, and accurate control of the corresponding legs is guaranteed.

[0018] In any of the above-mentioned technical solutions, preferably, the command receiving device comprises two buttons, each of which corresponds to a plurality of legs on the same side.

[0019] In this technical solution, according to different positions of the installed legs, the legs are divided into two groups, so as to adapt to different working conditions.

[0020] In any of the above-mentioned technical solutions, preferably, when a plurality of buttons simultaneously sense an operation action, a leg control command for all of the legs is generated.

[0021] In this technical solution, each button may respectively control a plurality of legs, e.g. the legs on a certain side, and when a plurality of buttons simultaneously performs operation, all of the legs can be controlled, so that synchronous operation is realized.

[0022] According to another aspect of the invention, an engineering machine is further provided, comprising the leg control system in any of the above-mentioned technical solutions.

[0023] In the above-mentioned technical solution, preferably, the engineering machine comprises a boom device and a plurality of legs, wherein the command transmitting unit is a boom remote controller, and the boom remote controller is provided with a switching device; when the switching device is at a first state position, the boom remote controller transmits a boom control command to the boom device according to the sensed operation action; and when the switching device is at a second state position, the boom remote controller transmits a leg control command to a plurality of corresponding legs according to the sensed operation action.

[0024] In this technical solution, a boom or the legs can be controlled on the same remote control device, so that a plurality of functions can be integrated, multiple functions can be multiplexed on the basis of no change of the existing device, and the design and development cost is saved.

[0025] Through the above technical solutions, the plurality of legs may be simultaneously controlled, so that situations of possible uneven stress and the like when a single leg is controlled are avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026]

Fig. 1 shows a structural schematic diagram of a leg control system according to an embodiment of the invention.

Fig. 2 is a side schematic diagram of the embodiment shown in Fig. 1.

Fig. 3 shows a schematic diagram of a remote control device according to an embodiment of the invention.

Fig. 4 shows a schematic diagram of signal transmission according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0027] To understand the above-mentioned objects, features and advantages of the invention more clearly, the invention will be further described in detail below in conjunction with the accompanying drawings and preferred embodiments. It should be noted that, the embodiments of this application and features in the embodiments can be combined with each other without conflicts.

[0028] Each embodiment of the invention will be illustrated below in conjunction with the accompanying drawings.

[0029] Refer to Fig. 1, which shows a leg control system according to an embodiment of the invention. The leg control system comprises a command transmitting unit, a leg controller and electromagnetic valves for controlling the actions of legs, wherein the command transmitting unit is connected with the leg controller and configured to transmit a leg control command to the leg controller; the leg controller is connected with the electromagnetic valves and configured to transmit an action instruction according to the received leg control command; and the electromagnetic valves are connected with the controlled legs and are configured to be reversed according to the action instruction to synchronously control the actions of the legs.

[0030] For example, as shown in Fig. 1, the leg control system according to the embodiment of the invention comprises a command transmitting unit 1, a leg controller

2 and electromagnetic valves 3 for controlling the actions of legs 4, wherein the command transmitting unit 1 is used for transmitting a leg control command; the leg controller 2 simultaneously transmits an action instruction to the electromagnetic valves 3 corresponding to a plurality of legs 4 according to the received leg control command from the command transmitting unit 1; and the electromagnetic valves 3 are reversed according to the action instruction to control synchronous actions of the plurality of legs 4.

[0031] In this technical solution, the plurality of legs 4 are simultaneously controlled, so that on the one hand, the working efficiency can be improved, and on the other hand, the plurality of legs 4 can be simultaneously in contact with the ground to support an engineering machine, the stress is more even, and inclination and even overturn of the engineering machine after a single leg 4 lands are avoided.

[0032] It should be noted that, in each above-mentioned embodiment, the leg control command comprises an unfolding and folding control command and/or an ascending and descending control command; and in correspondence to the leg control command, the action instruction comprises an unfolding and folding instruction and/or an ascending and descending instruction.

[0033] For example, in the above-mentioned technical solution, the electromagnetic valves 3 comprise unfolding and folding electromagnetic valves arranged on unfolding and folding loops of the legs 4 and/or ascending and descending electromagnetic valves arranged on ascending and descending loops of the legs; the leg control command comprises an unfolding and folding control command and/or an ascending and descending control command, and the leg controller 2 transmits the corresponding unfolding and folding instruction to the unfolding and folding electromagnetic valves when receiving the unfolding and folding control command and transmits the corresponding ascending and descending instruction to the ascending and descending electromagnetic valves when receiving the ascending and descending control command.

[0034] In this technical solution, the operation of each leg 4 comprises two parts, namely as for one part, the leg 4 extends from an initial position such as the back of the engineering machine and is laid down right above a target position, and as for the other part, the other section extends downwards from the end of each leg 4 and is in contact with the ground to realize supporting. In this embodiment, the actions of the two parts may be controlled respectively or simultaneously, so that the construction time is reduced.

[0035] The action process of the legs 4 will be illustrated below in conjunction with Fig. 1 and Fig. 2.

[0036] Fig. 1 is an overlook schematic diagram of a structure of an engineering machine, and the legs 4 in the figure comprise a first leg 41, a second leg 42, a third leg 43 and a fourth leg 44. In a relevant technology, only the action of each leg can be controlled individually. Further, each leg 4 corresponds to at least two control handles, e.g. the two control handles comprise an unfolding and folding handle and an ascending and descending handle for the leg 4.

[0037] If the control manner in the relevant technology is adopted, then each leg can not simultaneously complete the indicated action. For example, by taking the four legs in Fig. 1 as an example herein, the first leg 41, the second leg 42 and the fourth leg have completed the unfolding action, whereas the third leg 43 is still in an initial retracted state; as shown in Fig. 2, each leg 4 comprises a horizontal part 4a and a vertical part 4b, wherein on the one hand, the horizontal part 4a needs to move in the horizontal direction to complete the unfolding action, and on the other hand, the vertical part 4b which is originally retracted in the horizontal part 4a extends in the vertical direction till landing is realized.

[0038] In any of the above-mentioned technical solutions, the electromagnetic valves 3 are proportional electromagnetic valves, wherein the leg control command includes a leg moving speed for adjusting the displacement of a valve core of each proportional electromagnetic valve. For example, the leg controller 2 adjusts the displacement of the valve core of each proportional electromagnetic valve according to the leg moving speed to control the moving speed of each leg 4.

[0039] In this technical solution, the proportional electromagnetic valves are adopted, so that the positions of the valve cores can be controlled, and then the moving speeds of the legs 4 can be controlled to adapt to different working conditions.

[0040] In any of the above-mentioned technical solutions, the command transmitting unit 1 may comprise a command receiving device and a command transmitting device, wherein the command receiving device receives an action indication input from the outside and generates the leg control command according to the action indication, and the command transmitting device transmits the generated leg control command to a control target, e.g. the leg controller. In this embodiment, the action indication may be generated under the trigger of a preset operation action.

[0041] Preferably, in the above-mentioned embodiment, the command transmitting unit 1 may be a remote control device, and the remote control device is connected with the leg controller 2 in a wired or wireless manner. For example, the command transmitting unit comprises a remote control device and a remote control receiver, wherein the remote control device may be connected with the remote control receiver in a wired or wireless manner, and the remote control receiver may be connected with the leg controller in a wired or wireless manner.

[0042] It should be noted that, in this technical solution, the wired connection manner adopted is favorable for improving the stability of signal transmission; and the wireless connection manner adopted is favorable for further getting away from the engineering machine and avoiding the limitation of lengths of cables and the like,

so that operators are prevented from being hit in the moving process of the legs 4, and the operational safety is improved.

[0043] Further, the remote control device 10 shown in Fig. 3 is provided with a command receiving device, and the command receiving device is configured to generate the leg control command according to the received action indication. For example, the command receiving device senses the action indication, and generates the leg control command according to the action indication. In this embodiment, the action indication may be a preset operation action.

[0044] For example, in this technical solution, the command receiving device herein may be one or more of multiple forms such as a physical key, an operating rod, a voice receiving and identification device, an image acquisition and identification device, a touch screen and a keyboard, for facilitating command input of a user.

[0045] In the above-mentioned embodiment, the command receiving device comprises action indication input devices, and each action indication input device corresponds to at least two legs and is configured to generate the corresponding leg control command according to the input action indication, wherein the leg control command includes leg information for determining the electromagnetic valves corresponding to the controlled legs.

[0046] For example, buttons arranged on the command receiving device may be used as the action indication input devices herein. In any of the above-mentioned technical solutions, the command receiving device comprises a plurality of buttons 102, and each button 102 corresponds to a plurality of legs; when the operation action specific to a specified button 102 is sensed, a corresponding leg control command is generated; and the leg control command includes leg information, the leg controller 2 determines the corresponding electromagnetic valves 3 according to the leg information, to control the plurality of legs 4 corresponding to the specified button 102.

[0047] In this technical solution, a plurality of buttons 102 are arranged on the remote control device 10, a corresponding function is preset for each button 102, e.g. a certain button 102 corresponds to unfolding of the third leg 43 and the fourth leg 44 of the engineering machine shown in Fig. 1, and after the user presses down the button 102, the two legs are unfolded. By identifying the transmitted leg control command, different functional buttons are distinguished, and accurate control of the corresponding legs 4 is ensured.

[0048] Preferably, in the above-mentioned embodiments, the command receiving device comprises two action indication input devices, and the action indication input devices correspond to the legs on the same side.

[0049] For example, by taking buttons serving as the action indication input devices as an example herein, in any of the above-mentioned technical solutions, the command receiving device comprises two buttons, and each button corresponds to a plurality of legs 4 on the same side.

[0050] In this technical solution, according to different positions of the installed legs 4, the legs 4 are divided into two groups, to adapt to different working conditions.

[0051] In any of the above-mentioned technical solutions, when a plurality of buttons 102 simultaneously sense an operation action, a leg control command for all the legs 4 is generated.

[0052] In this technical solution, each button 102 may respectively control a plurality of legs 4, e.g. the legs 4 on a certain side, and when a plurality of buttons 102 simultaneously performs operation, all the legs 4 may be controlled, so that synchronous operation is realized.

[0053] According to another aspect of the invention, an engineering machine is further provided, comprising the leg control system in any of the above-mentioned technical solutions.

[0054] In the above-mentioned embodiment, the engineering machine comprises a boom device and a plurality of legs, wherein the command transmitting unit is connected with the boom device and provided with a switching device for performing switching control between the boom device and the leg controller.

[0055] For example, the engineering machine comprises a boom device and a plurality of legs, e.g. two legs, three legs, four legs and the like; the command transmitting unit is a boom remote controller, and the boom remote controller is provided with the above-mentioned functional buttons 102 and may be further provided with a switching device 104 shown in Fig. 3; when the switching device 104 is at a first state position, the boom remote controller transmits a boom control command to the boom device according to the sensed operation action; and when the switching device 104 is at a second state position, the boom remote controller transmits a leg control command to a plurality of corresponding legs 4 according to the sensed operation action.

[0056] In this technical solution, a boom or the legs 4 can be controlled on the same remote control device 10, so that a plurality of functions can be integrated, multiple functions can be multiplexed on the basis of no change of the existing device, and the design and development cost is saved.

[0057] As shown in Fig. 4, when the legs are controlled, the signal transmission process is as follows.

[0058] A user controls the legs 4 on the engineering machine through the remote control device 10, wherein the remote control device 10 is wirelessly connected with the engineering machine. The remote control device 10 transmits a remote control signal to the remote control receiver 20 arranged on the engineering machine, and further, the remote control signal herein may be an infrared signal, a Bluetooth signal, a wireless local area network signal and the like.

[0059] The remote control receiver 20 forwards the received remote control signal to the leg controller 2, the remote control signal includes a leg control command, and the leg controller 2 analyzes the leg control command

and judges the objects to be controlled and the operation manner, e.g. the two legs 4 on the left side need to be simultaneously unfolded.

[0060] The action of each leg is controlled through an electromagnetic valve 3, the leg controller 2 is connected to all the electromagnetic valves 3, and when the remote control signal is received, the corresponding action instruction is generated and transmitted to the electromagnetic valves 3 corresponding to the legs 4 needing to be controlled.

[0061] Further, the electromagnetic valves 3 herein may be proportional electromagnetic valves, the remote control signal transmitted by the remote control device 10 may include a speed signal, then the action instruction transmitted by the leg controller 2 may also include the corresponding speed instruction, the opening degrees of the valves are controlled by adjusting the displacements of the valve cores of the proportional electromagnetic valves, and the action speeds of the legs 4 are finally controlled.

[0062] In conclusion, in the technical solutions of the invention, since a wireless remote control manner is adopted, the legs would not hit operators during acting, and the operational safety is improved; meanwhile, through synchronous control of the plurality of legs, the working efficiency can be improved, and the engineering machine is prevented from unbalancing and even overturning accidents caused by supporting of single legs.

[0063] The foregoing descriptions are merely preferred embodiments of the invention, rather than limiting the invention, and for those skilled in the art, various alterations and changes may be made to the invention. Any modification, equivalent substitution, improvement and the like made within the spirit and principle of the invention should be encompassed in the protection scope of the invention.

INDUSTRIAL APPLICABILITY

[0064] The leg control system and the engineering machine provided with the leg control system provided by the invention can synchronously control a plurality of legs, so as to improve the working efficiency and prevent the engineering machine from unbalancing and even overturning caused by supporting of single legs. Moreover, since a wireless remote control manner is adopted, the legs would not hit operators during acting, and the operational safety is improved. Therefore, the invention has industrial applicability.

Claims

1. A leg control system, comprising a command transmitting unit, a leg controller and electromagnetic valves for controlling the actions of legs, wherein
the command transmitting unit is connected with the leg controller and configured to transmit a leg control command to the leg controller;
the leg controller is connected with the electromagnetic valves and configured to transmit an action instruction according to the received leg control command; and
the electromagnetic valves are connected with the controlled legs and reversed according to the action instruction to synchronously control the actions of the legs.

2. The leg control system according to claim 1, wherein the electromagnetic valves comprise unfolding and folding electromagnetic valves arranged on unfolding and folding loops of the legs and/or ascending and descending electromagnetic valves arranged on ascending and descending loops of the legs;
wherein the leg control command comprises an unfolding and folding control command and/or an ascending and descending control command, and correspondingly, the action instruction comprises an unfolding and folding instruction and/or an ascending and descending instruction.

3. The leg control system according to claim 2, wherein the electromagnetic valves are proportional electromagnetic valves;
wherein the leg control command includes a leg moving speed for adjusting the displacement of the valve core of each proportional electromagnetic valve.

4. The leg control system according to any of claims 1 to 3, wherein the command transmitting unit comprises a remote control device and a remote control receiver, the remote control device is connected with the remote control receiver in a wired or wireless manner, and the remote control receiver is connected with the leg controller in a wired or wireless manner.

5. The leg control system according to claim 4, wherein the remote control device is provided with a command receiving device, and the command receiving device is configured to generate the leg control command according to the received action indication.

6. The leg control system according to claim 5, wherein the command receiving device comprises action indication input devices, and each action indication input device corresponds to at least two legs and is configured to generate the corresponding leg control command according to the input action indication;
wherein the leg control command includes leg information for determining the electromagnetic valves corresponding to the controlled legs.

7. The leg control system according to claim 6, wherein the command receiving device comprises two action indication input devices, and the action indication in-

put devices correspond to the legs on the same side.

8. An engineering machine, comprising the leg control system according to any of claims 1 to 7.

9. The engineering machine according to claim 8, comprising a boom device and a plurality of legs;
wherein the command transmitting unit is connected with the boom device and provided with a switching device for performing switching control between the boom device and the legs.

10. The engineering machine according to claim 9, wherein the command transmitting unit is a boom remote controller, and the boom remote controller is provided with the switching device; when the switching device is at a first state position, the boom remote controller transmits a boom control command to the boom device according to the sensed operation action; and when the switching device is at a second state position, the boom remote controller transmits the leg control command to a plurality of corresponding legs according to the sensed operation action.

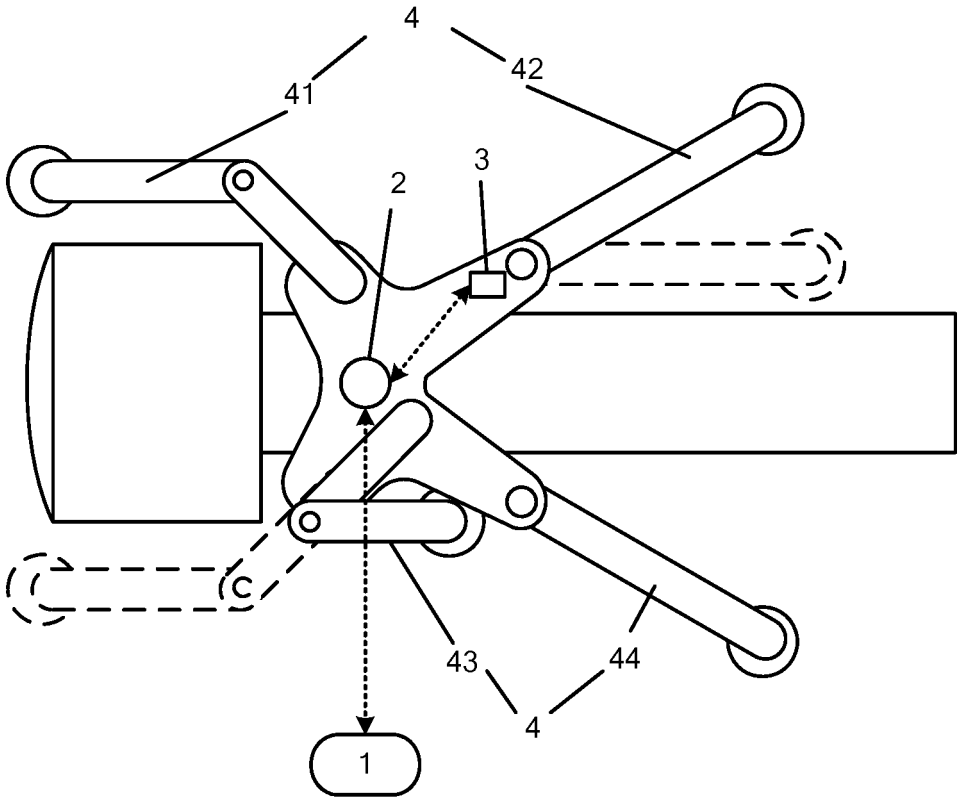

Fig. 1

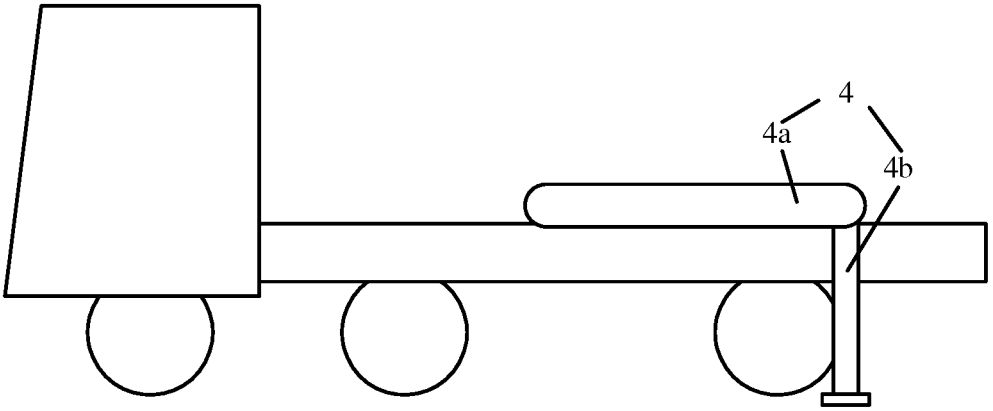

Fig. 2

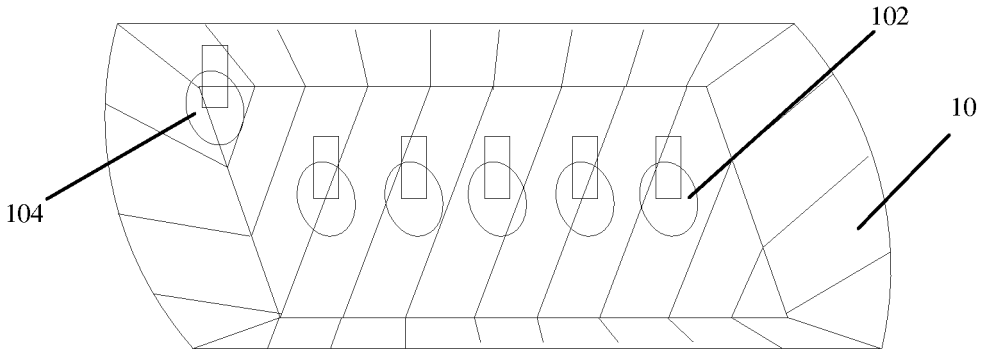
102
10
104

Fig. 3

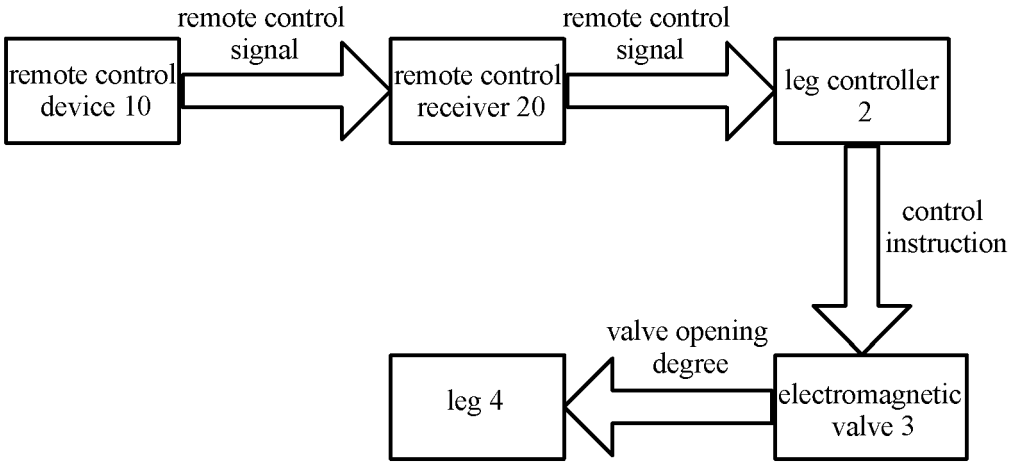
remote control device 10
remote control signal
remote control receiver 20
remote control signal
leg controller 2
control instruction
valve opening degree
leg 4
electromagnetic valve 3

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2012/086094

A. CLASSIFICATION OF SUBJECT MATTER

G05B 19/4155 (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)

IPC: G05B 19/-; F15B; B60R; B60S

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

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

CNABS, VEN: controller, machine, machinery, synchronous, synchronously, leg, electromagnetic valve, induction, inductive

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	CN 102591371 A (SANYI ELECTRIC CO LTD) 18 July 2012 (18.07.2012) description, paragraphs [0069] to [0080] and figure 3	1-8 9-10
Y	CN 102140807 A (XUZHOU XUGONG EXCAVATOR MACHINERY CO., LTD.) 03 August 2011 (03.08.2011) description, paragraphs [0025] to [0029] and figures 1, 4 and 5	9-10
Y	CN 102079298 A (SANY HEAVY INDUSTRY CO., LTD.) 01 June 2011 (01.06.2011) description, paragraphs [0034] to [0084] and figures 1 to 6	1-10
Y	CN 201882059 U (SANY HEAVY INDUSTRY CO., LTD.) 29 June 2011 (29.06.2011) paragraphs [0032] to [0082] and figures 1 to 61	1-10
Y	EP 0778660 A2 (FORD MOTOR CO LTD et al.) 11 June 1997 (11.06.1997)	1-10

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

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 June 2013 (13.06.2013)	11 July 2013 (11.07.2013)
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer XU, Lingyun Telephone No. (86-10) 62085775

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/086094

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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Form PCT/ISA /210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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