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• **JEE, Se-Rib**
Busan 607-843 (KR)

(74) Representative: **Stöckeler, Ferdinand et al**
Schoppe, Zimmermann, Stöckeler
Zinkler, Schenk & Partner mbB
Patentanwälte
Radtkoferstrasse 2
81373 München (DE)

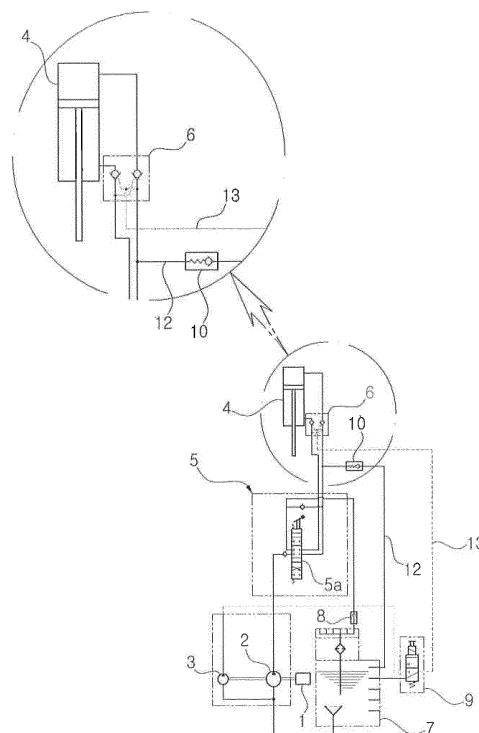
(71) Applicant: **Volvo Construction Equipment AB**
631 85 Eskilstuna (SE)

(72) Inventors:
• **JEONG, Won-Cheol**
Changwon-si
Gyeongsangnam-do 631-460 (KR)

(54) **CONSTRUCTION MACHINE WITH FLOATING FUNCTION**

(57) Disclosed is a construction machine with a floating function for performing soil preparation or the like for flattening the ground or the like using a dozer blade. The construction machine with a floating function according to the present invention comprises: a hydraulic pump and a pilot pump; a dozer cylinder connected to the hydraulic pump so as to move the dozer blade in the vertical direction; a control valve arranged in a channel between the hydraulic pump and the dozer cylinder; a dozer check valve arranged in the channel between the control valve and the dozer cylinder; a return check valve arranged in the channel between the control valve and a hydraulic tank; a solenoid valve for floating arranged in a signal path between the pilot pump and the dozer check valve such that the solenoid valve is capable of opening and closing; a channel for floating, one end of which is connected to the hydraulic tank and the other end of which is connected to the channel interconnecting the control valve and the dozer cylinder; and a check valve arranged in the channel for floating so as to supply working fluid to the dozer cylinder through the channel for floating from the hydraulic tank in a floating mode, and cut off the channel for floating when the floating mode is cancelled.

[Fig. 2]



Description

TECHNICAL FIELD

[0001] The present invention relates to a construction machine having a floating function. More particularly, the present invention relates to such a construction machine having a floating function, which can perform a ground leveling work or a grading work in which the ground is flattened and leveled using a dozer blade.

BACKGROUND OF THE INVENTION

[0002] The floating function means a function in which a dozer blade is moved upwardly and downwardly along a rugged ground surface by its own weight or an external force even without a manipulation of a manipulation lever by an operator during the traveling of the construction machine. Even when the construction machine is simply manipulated to be traveled by the floating function, a ground leveling work or a grading work can be performed in which the ground is flattened and leveled by the dozer blade moved upwardly and downwardly.

[0003] As shown in Fig. 1, a construction machine having a floating function in accordance with the prior art includes:

a hydraulic pump 2 and a pilot pump 3, which are connected to an engine 1;

a dozer cylinder 4 connected to the hydraulic pump and configured to move a dozer blade (not shown) upwardly and downwardly;

a control valve (MCV) 5 installed in a flow path between the hydraulic pump 2 and the dozer cylinder 4 and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder 4;

a dozer check valve 6 installed in a flow path between the control valve 5 and the dozer cylinder 4;

a return check valve 8 installed in a flow path between the control valve 5 and a hydraulic tank 7; and

a solenoid valve 9 for floating openably/closably installed in a signal path 13 between the pilot pump 3 and the dozer check valve 6 and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump 3 to the dozer check valve 6 to release a check function of the dozer check valve 6.

[0004] Thus, a hydraulic fluid discharged from the hydraulic pump 2 is adjusted in flow rate by a dozer spool 5a of the control valve 5, and then is supplied to the dozer check valve 6. The hydraulic fluid supplied to the dozer check valve 6 converts the state of a pair of check valves

of the dozer check valve 6 into an open state, and is introduced into a large chamber or a small chamber of the dozer cylinder 4. The introduced hydraulic fluid drives a piston of the dozer cylinder 4 so that the dozer blade (not shown) can be moved vertically.

[0005] A hydraulic fluid discharged from the dozer cylinder 4 by the drive of the piston of the dozer cylinder 4 passes through the dozer check valve 6, the dozer spool 5a, and the control valve 5 in this order and is returned to a hydraulic tank 7 via the return check valve 8.

[0006] Meanwhile, when an operation mode of the dozer blade is converted from a normal mode to a floating mode, a spool of the solenoid valve 9 for floating is shifted to the bottom on the drawing sheet in response to an electrical control signal applied to the solenoid valve 9 for floating. Thus, a pair of check valves within the dozer check valve 6 is converted to an open state by a pilot signal pressure discharged from the pilot pump 3 and applied to the dozer check valve 6 via the solenoid valve for floating 9. In other words, the conversion of the dozer check valve 6 releases a check function of restricting the returning of a hydraulic fluid to the dozer cylinder 4.

[0007] Resultantly, a piston of the dozer cylinder 4 is driven by the dozer cylinder's own weight or an external force so that the dozer blade can be moved vertically along a rugged ground surface.

[0008] As shown in Fig. 1, in case of the construction machine having a floating function in accordance with the prior art, in the case where the operation mode of the dozer blade is converted from the normal mode to the floating mode to perform the ground leveling work on a work surface, when the dozer spool 5a of the control valve 5 is maintained in a neutral state, the dozer cylinder 4 is not supplied with the hydraulic fluid from the hydraulic pump 2. In other words, in the case where the operation mode of the dozer blade is converted from the normal mode to the floating mode, the dozer cylinder 4 is driven by only the dozer blade's own weight or an external force.

[0009] Thus, the supply and discharge of the hydraulic fluid to and from the dozer cylinder 4 is not performed smoothly in the floating mode, thus leading to a decrease in the vertical movement speed of the dozer cylinder 4. That is, if the downward movement speed or the descending speed of the dozer blade is decreased, the dozer blade will ascend and will be kept for a long period of time in a state in which the dozer blade is spaced apart from the ground surface.

[0010] In addition, in the process in which the dozer blade is moved upwardly or ascends in the floating mode, if a back pressure is formed in the flow path along which the hydraulic fluid discharged from the dozer cylinder 4 is returned, the dozer blade cannot ascend easily along the rugged ground surface. In other words, the hydraulic fluid discharged from the dozer cylinder 4 by the drive of the dozer cylinder 4 is returned to the hydraulic tank 7 via the control valve 5, the dozer spool 5a, and the return check valve 8 in this order. Thus, the ascending of the dozer blade is interfered by the back pressure formed in

the flow path along which the hydraulic fluid discharged from the dozer cylinder 4 is returned.

[0011] For this reason, the conventional construction machine having a floating function entails a problem in that because the vertical movement speed of the dozer blade is relatively decreased as compared the traveling speed of the construction machine, the dozer blade does not ascend or descend smoothly along the rugged ground surface, resulting in a deterioration of workability in the ground leveling work.

SUMMARY OF THE INVENTION

[0012] Accordingly, the present invention has been made to solve the aforementioned problems occurring in the prior art, and it is an object of the present invention to provide a construction machine having a floating function in which when a ground leveling work or a grading work is performed by a floating function of a dozer blade, the vertical movement speed of the dozer blade can be increased, thereby improving workability.

TECHNICAL SOLUTION

[0013] To achieve the above object, in accordance with a first embodiment of the present invention, there is provided a construction machine having a floating function, including:

a hydraulic pump and a pilot pump, which are connected to an engine;

a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;

a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;

a dozer check valve installed in a flow path between the control valve and the dozer cylinder;

a return check valve installed in a flow path between the control valve and a hydraulic tank;

a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;

a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and

a check valve installed in the flow path for floating, the check valve being configured to allow a hydraulic fluid to be supplied from the hydraulic tank to the dozer cylinder through the flow path for floating in a floating mode and to block the flow path for floating when the floating mode is released.

[0014] In accordance with a second embodiment of the present invention, there is provided a construction machine having a floating function, including:

a hydraulic pump and a pilot pump, which are connected to an engine;

a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;

a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;

a dozer check valve installed in a flow path between the control valve and the dozer cylinder;

a return check valve installed in a flow path between the control valve and a hydraulic tank;

a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;

a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and

a pilot check valve installed in the flow path for floating to open or close the flow path for floating, the pilot check valve being configured to be shifted to an open state by a pilot signal pressure supplied to the dozer check valve to supply a hydraulic fluid from the hydraulic tank to the dozer cylinder through the flow path for floating or to allow the hydraulic fluid discharged from the dozer cylinder to be returned to the hydraulic tank through the flow path for floating in a floating mode, and shifted to a closed state by interruption of the supply of the pilot signal pressure to the dozer check valve to block the flow path for floating when the floating mode is released.

[0015] In accordance with a third embodiment of the present invention, there is provided a construction machine having a floating function, including:

a hydraulic pump and a pilot pump, which are connected to an engine;

a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;

a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;

a dozer check valve installed in a flow path between the control valve and the dozer cylinder;

a return check valve installed in a flow path between the control valve and a hydraulic tank;

a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;

a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and

a 3-way valve installed at a crossing point of the flow path for floating and the flow path on the control valve side, the 3-way valve being configured to be shifted to a first position by a pilot signal pressure supplied to the dozer check valve to replenish a hydraulic fluid from the hydraulic tank to the dozer cylinder through the flow path for floating in a floating mode and shifted to a second position, in which the supply of the pilot signal pressure to the dozer check valve is interrupted to connect the flow path between the control valve and the dozer cylinder when the floating mode is released.

[0016] In accordance with a fourth embodiment of the present invention, there is provided a construction machine having a floating function, including:

a hydraulic pump and a pilot pump, which are connected to an engine;

a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;

a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;

a dozer check valve installed in a flow path between the control valve and the dozer cylinder;

a return check valve installed in a flow path between the control valve and a hydraulic tank;

a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;

a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and

a 3-way valve installed at a crossing point of the flow path for floating and the flow path on the control valve side, the 3-way valve being configured to be shifted to a first position by a pilot signal pressure supplied to the dozer check valve to allow the dozer cylinder, the control valve, and the hydraulic tank to fluidically communicate with one another in a floating mode and shifted to a second position in which the supply of the pilot signal pressure to the dozer check valve is interrupted to connect the flow path between the control valve and the dozer cylinder when the floating mode is released.

[0017] The flow path for floating may be connected at the other end thereof to a large chamber of the dozer cylinder.

[0018] The flow path for floating may be connected at the other end thereof to a small chamber of the dozer cylinder.

ADVANTAGEOUS EFFECT

[0019] The construction machine having a floating function in accordance with the present invention as constructed above has the following advantages.

[0020] In the floating mode of the dozer blade, the hydraulic fluid is replenished to the dozer cylinder or the discharge of the hydraulic fluid from the dozer cylinder is promoted to increase the drive speed of the piston so that the dozer blade can be smoothly moved vertically along the rugged ground surface, thereby improving workability in the ground leveling work or the grading work.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above objects, other features and advantages of the present invention will become more apparent by describing the preferred embodiments thereof with reference to the accompanying drawings, in which:

Fig. 1 is a hydraulic circuit diagram of a construction machine in accordance with the prior art;

Fig. 2 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a first preferred embodiment of the present invention;

Fig. 3 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a second preferred embodiment of the present invention;

Fig. 4 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a third preferred embodiment of the present invention; and Fig. 5 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a fourth preferred embodiment of the present invention.

* Explanation on reference numerals of main elements in the drawings *

[0022]

110: vehicle information collection unit
 1: engine
 2: hydraulic pump
 3: pilot pump
 4: dozer cylinder
 5: control valve
 6: dozer check valve
 7: hydraulic tank
 8: return check valve
 9: solenoid valve for floating
 10: check valve
 11: pilot check valve
 12: flow path for floating
 13: signal path
 14, 15: 3-way valve

DETAILED DESCRIPTION OF THE INVENTION

[0023] Now, a construction machine having a floating function in accordance with preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings. The matters defined in the description, such as the detailed construction and elements, are nothing but specific details provided to assist those of ordinary skill in the art in a comprehensive understanding of the invention, and the present invention is not limited to the embodiments disclosed hereinafter.

[0024] Fig. 2 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a first preferred embodiment of the present invention.

[0025] The construction machine having a floating function includes a normal mode in which a dozer blade is moved vertically by the manipulation of a manipulation

lever and a floating mode in which the dozer blade is moved vertically along a rugged ground surface by its own weight or an external force during the traveling of the construction machine.

[0026] Referring to Fig. 2, the construction machine having a floating function in accordance with a first preferred embodiment of the present invention includes:

a hydraulic pump 2 and a pilot pump 3, which are connected to an engine 1;

a dozer cylinder 4 connected to the hydraulic pump and configured to move a dozer blade (not shown) upwardly and downwardly;

a control valve 5 installed in a flow path between the hydraulic pump 2 and the dozer cylinder 4 and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder 4;

a dozer check valve 6 installed in a flow path between the control valve 5 and the dozer cylinder 4;

a return check valve 8 installed in a flow path between the control valve 5 and a hydraulic tank 7;

a solenoid valve 9 for floating openably/closably installed in a signal path 13 between the pilot pump 3 and the dozer check valve 6 and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump 3 to the dozer check valve 6 to release a check function of the dozer check valve 6;

a flow path 12 for floating connected at one end thereof to the hydraulic tank 7 and connected at the other end thereof to a flow path for connecting the control valve 5 to the dozer cylinder 4; and

a check valve 10 installed in the flow path 12 for floating, the check valve being configured to allow a hydraulic fluid to be supplied from the hydraulic tank 7 to the dozer cylinder 4 through the flow path 12 for floating in a floating mode and to block the flow path for floating when the floating mode is released.

[0027] The flow path 12 for floating may be connected at the other end thereof to a large chamber of the dozer cylinder 4.

[0028] Although not shown in the drawings, the flow path 12 for floating may be connected at the other end thereof to a small chamber of the dozer cylinder 4.

[0029] In this case, a configuration of the construction machine having a floating function in accordance with a first preferred embodiment of the present invention is the same as that of the construction machine having a floating function in accordance with the prior art shown in Fig. 1, except the check valve 10 installed in the flow path 12

for floating. Thus, the detailed description of the same configuration and operation thereof will be omitted to avoid redundancy, and the same hydraulic parts are denoted by the same reference numerals.

[0030] According to the above-described configuration, when an operation mode of the dozer blade is converted from the normal mode to the floating mode, a spool of the solenoid valve 9 for floating is shifted to the bottom on the drawing sheet in response to an electrical control signal applied to the solenoid valve 9 for floating. Thus, a pair of check valves within the dozer check valve 6 is converted to an open state by a pilot signal pressure discharged from the pilot pump 3 and applied to the dozer check valve 6 via the solenoid valve for floating 9. In other words, the conversion of the dozer check valve 6 releases a check function of restricting the supply of a hydraulic fluid to the dozer cylinder 4. Resultantly, a piston of the dozer cylinder 4 is driven by the dozer cylinder's own weight or an external force so that the dozer blade can be moved vertically along a rugged ground surface.

[0031] Meanwhile, the vertical movement speed of the dozer blade can be increased in the floating mode of the dozer blade. That is, a dozer spool 5a of the control valve 5 is maintained in a neutral state in the floating mode so that the hydraulic fluid from the hydraulic tank 7 can be supplied to the large chamber of the dozer cylinder 4 via the check valve 10 installed in the flow path 12 for floating in a state in which the supply of the hydraulic fluid from the hydraulic pump 2 to the dozer cylinder 4 is interrupted. For this reason, the hydraulic fluid from the hydraulic tank 7 is replenished to the large chamber of the dozer cylinder 4 via the flow path 12 for floating upon the descending of the dozer blade, thus leading to an increase in the downward movement speed or the descending speed of the dozer blade.

[0032] On the other hand, when the floating mode of the dozer blade is released, the returning of the hydraulic fluid discharged from the dozer cylinder 4 to the hydraulic tank 7 can be interrupted by the check function of the check valve 10 installed in the flow path 12 for floating.

[0033] As described above, in case of the construction machine having a floating function in accordance with the first embodiment of the present invention, when the dozer blade is moved downwardly or descends in the floating mode, the hydraulic fluid from the hydraulic tank 7 is replenished to the large chamber of the dozer cylinder 4 through the check valve 10 installed in the flow path 12 for floating so that the downward movement speed or the descending speed of the dozer blade can be increased.

[0034] Fig. 3 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a second preferred embodiment of the present invention.

[0035] The construction machine having a floating function includes a normal mode in which a dozer blade is moved vertically by the manipulation of a manipulation lever and a floating mode in which the dozer blade is moved vertically along a rugged ground surface by its

own weight or an external force during the traveling of the construction machine.

[0036] Referring to Fig. 3, the construction machine having a floating function in accordance with a second preferred embodiment of the present invention includes:

a hydraulic pump 2 and a pilot pump 3, which are connected to an engine 1;

a dozer cylinder 4 connected to the hydraulic pump and configured to move a dozer blade (not shown) upwardly and downwardly;

a control valve 5 installed in a flow path between the hydraulic pump 2 and the dozer cylinder 4 and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder 4;

a dozer check valve 6 installed in a flow path between the control valve 5 and the dozer cylinder 4;

a return check valve 8 installed in a flow path between the control valve 5 and a hydraulic tank 7;

a solenoid valve 9 for floating openably/closably installed in a signal path 13 between the pilot pump 3 and the dozer check valve 6 and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump 3 to the dozer check valve 6 to release a check function of the dozer check valve 6;

a flow path 12 for floating connected at one end thereof to the hydraulic tank 7 and connected at the other end thereof to a flow path for connecting the control valve 5 to the dozer cylinder 4; and

a pilot check valve 11 installed in the flow path 12 for floating to open or close the flow path for floating, the pilot check valve being configured to be shifted to an open state by a pilot signal pressure supplied to the dozer check valve 6 to supply a hydraulic fluid from the hydraulic tank 7 to the dozer cylinder 4 through the flow path 12 for floating or to allow the hydraulic fluid discharged from the dozer cylinder 4 to be returned to the hydraulic tank 7 through the flow path 12 for floating in a floating mode, and shifted to a closed state by interruption of the supply of the pilot signal pressure to the dozer check valve 6 to block the flow path 12 for floating when the floating mode is released.

[0037] The flow path 12 for floating may be connected at the other end thereof to a large chamber of the dozer cylinder 4.

[0038] Although not shown in the drawings, the flow path 12 for floating may be connected at the other end thereof to a small chamber of the dozer cylinder 4.

[0039] In this case, a configuration of the construction machine having a floating function in accordance with a second preferred embodiment of the present invention is the same as that of the construction machine having a floating function in accordance with the first embodiment of the present invention, except the pilot check valve 11 installed in the flow path 12 for floating and shifted to an open or closed state by the pilot signal pressure supplied to the dozer check valve 6. Thus, the detailed description of the same configuration and operation thereof will be omitted to avoid redundancy, and the same hydraulic parts are denoted by the same reference numerals.

[0040] According to the above-described configuration, when an operation mode of the dozer blade is converted from the normal mode to the floating mode, the dozer spool 5a of the control valve 5 is maintained in a neutral state in the floating mode so that the hydraulic fluid from the hydraulic tank 7 can be supplied to the large chamber of the dozer cylinder 4 via the pilot check valve 11 installed in the flow path 12 for floating in a state in which the supply of the hydraulic fluid from the hydraulic pump 2 to the dozer cylinder 4 is interrupted. For this reason, it is possible to increase the downward movement speed or the descending speed of the dozer blade that is moved along the rugged ground surface in the floating mode.

[0041] Meanwhile, when the dozer blade ascends in the floating mode, the hydraulic fluid discharged from the dozer cylinder 4 by the drive of the piston of the dozer cylinder 4 can be promptly returned to the hydraulic tank 7. In other words, the pilot check valve 11 installed in the flow path 12 for floating is changed to an open state by the pilot signal pressure supplied to the dozer check valve 6 so that the hydraulic fluid discharged from the dozer cylinder 4 can be returned to the hydraulic tank 7 via the pilot check valve 11 upon the ascending of the dozer blade.

[0042] As such, the hydraulic fluid discharged from the dozer cylinder 4 can be directly returned to the hydraulic tank 7 via the pilot check valve 11 without passing through the control valve 5 upon the ascending of the dozer blade.

[0043] Thus, in the process in which the hydraulic fluid discharged from the dozer cylinder 4 is returned to the hydraulic tank 7, the generation of the back pressure in the flow path can be minimized to increase the ascending speed of the dozer blade. On the other hand, conventionally, the hydraulic fluid discharged from the dozer cylinder 4 is returned to the hydraulic tank 7 via the control valve 5, the dozer spool 5a, and return check valve 8 in this order. As a result, in the process in which the hydraulic fluid discharged from the dozer cylinder 4 is returned to the hydraulic tank 7, the back pressure is generated in the flow path, leading to a restriction of the ascending of the dozer blade.

[0044] As described above, in case of the construction machine having a floating function in accordance with the second embodiment of the present invention, when

the dozer blade is moved downwardly or descends in the floating mode, the hydraulic fluid from the hydraulic tank 7 is replenished to the large chamber of the dozer cylinder 4 through the pilot check valve 11 installed in the flow path 12 for floating so that the downward movement speed or the descending speed of the dozer blade can be increased. In addition, when the dozer blade is moved upwardly or ascends in the floating mode, the hydraulic fluid discharged from the dozer cylinder 4 is promptly returned to the hydraulic tank 7 via the pilot check valve 11 so that the generation of the back pressure in the flow path along which the hydraulic fluid discharged from the dozer cylinder 4 is returned can be minimized to increase the ascending speed of the dozer blade.

[0045] Fig. 4 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a third preferred embodiment of the present invention.

[0046] The construction machine having a floating function includes a normal mode in which a dozer blade is moved vertically by the manipulation of a manipulation lever and a floating mode in which the dozer blade is moved vertically along a rugged ground surface by its own weight or an external force during the traveling of the construction machine.

[0047] Referring to Fig. 4, the construction machine having a floating function in accordance with a third preferred embodiment of the present invention includes:

a hydraulic pump 2 and a pilot pump 3, which are connected to an engine 1;

a dozer cylinder 4 connected to the hydraulic pump and configured to move a dozer blade (not shown) upwardly and downwardly;

a control valve 5 installed in a flow path between the hydraulic pump 2 and the dozer cylinder 4 and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder 4;

a dozer check valve 6 installed in a flow path between the control valve 5 and the dozer cylinder 4;

a return check valve 8 installed in a flow path between the control valve 5 and a hydraulic tank 7;

a solenoid valve 9 for floating openably/closably installed in a signal path 13 between the pilot pump 3 and the dozer check valve 6 and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump 3 to the dozer check valve 6 to release a check function of the dozer check valve 6;

a flow path 12 for floating connected at one end thereof to the hydraulic tank 7 and connected at the other end thereof to a flow path for connecting the

control valve 5 to the dozer cylinder 4; and

a 3-way valve installed at a crossing point of the flow path 12 for floating and the flow path on the control valve 5 side, the 3-way valve being configured to be shifted to a first position (I) by a pilot signal pressure supplied to the dozer check valve 6 to replenish a hydraulic fluid from the hydraulic tank 7 to the dozer cylinder 4 through the flow path 12 for floating in a floating mode and shifted to a second position (II), in which the supply of the pilot signal pressure to the dozer check valve 6 is interrupted to connect the flow path between the control valve 5 and the dozer cylinder 4 when the floating mode is released.

[0048] The flow path 12 for floating may be connected at the other end thereof to a large chamber of the dozer cylinder 4.

[0049] In this case, a configuration of the construction machine having a floating function in accordance with a third preferred embodiment of the present invention is the same as that of the construction machine having a floating function in accordance with the first embodiment of the present invention, except the 3-way valve installed at the crossing point of the flow path 12 for floating and the flow path on the control valve 5 side and configured to replenish the hydraulic fluid from the hydraulic tank 7 to the dozer cylinder 4 in the floating mode, and the flow path 12 for floating connected at the other end thereof to a large chamber of the dozer cylinder 4. Thus, the detailed description of the same configuration and operation thereof will be omitted to avoid redundancy, and the same hydraulic parts are denoted by the same reference numerals.

[0050] According to the above-described configuration, when an operation mode of the dozer blade is converted from the normal mode to the floating mode, the dozer spool 5a of the control valve 5 is maintained in a neutral state in the floating mode so that the hydraulic fluid from the hydraulic tank 7 can be replenished to the dozer cylinder 4 by the shift of the 3-way valve 14 in a state in which the supply of the hydraulic fluid from the hydraulic pump 2 to the dozer cylinder 4 is interrupted.

[0051] In other words, a spool of the 3-way valve 14 is shifted to the bottom on the drawing sheet, i.e., is shifted to the first position (I). The hydraulic fluid from the hydraulic tank 7 can be supplied to a large chamber of the dozer cylinder 4 via the flow path 12 for floating and the 3-way valve 14. As a result, the hydraulic fluid from the hydraulic tank 7 can be replenished to the large chamber of the dozer cylinder 4 via the flow path 12 for floating and the 3-way valve 14 upon the descending of the dozer blade so that the downward movement speed or the descending speed of the dozer blade that is moved along a rugged ground surface can be increased.

[0052] Meanwhile, when the floating mode of the dozer blade is released, the supply of the pilot signal pressure to the dozer check valve 6 is interrupted and thus the

supply of the pilot signal pressure to the 3-way valve 14 is also interrupted. As a result, the 3-way valve 14 returns to its initial position by a valve spring thereof, i.e., the spool of the 3-way valve 14 is shifted to the second position (II).

[0053] For this reason, because the flow path 12 for floating is blocked, the returning of the hydraulic fluid discharged from the dozer cylinder 4 to the hydraulic tank 7 is interrupted. In the meantime, the flow paths between the dozer cylinder 4 and the control valve 5 fluidically communicate with each other so that the dozer blade can be moved vertically by the hydraulic fluid discharged from the hydraulic pump 2 and supplied to the dozer cylinder 4.

[0054] As described above, in case of the construction machine having a floating function in accordance with the third embodiment of the present invention, when the dozer blade is moved downwardly or descends in the floating mode, the hydraulic fluid from the hydraulic tank 7 is replenished to the large chamber of the dozer cylinder 4 through the 3-way valve 13 via the flow path 12 for floating so that the downward movement speed or the descending speed of the dozer blade can be increased.

[0055] On the other hand, when the floating mode of the dozer blade is released, the dozer blade can be moved vertically by the hydraulic fluid supplied from the hydraulic pump 2 to the large chamber of the dozer cylinder 4 via the control valve 5 and the 3-way valve 14.

[0056] Fig. 5 is a hydraulic circuit diagram of a construction machine having a floating function in accordance with a fourth preferred embodiment of the present invention.

[0057] The construction machine having a floating function includes a normal mode in which a dozer blade is moved vertically by the manipulation of a manipulation lever and a floating mode in which the dozer blade is moved vertically along a rugged ground surface by its own weight or an external force during the traveling of the construction machine.

[0058] Referring to Fig. 5, the construction machine having a floating function in accordance with a fourth preferred embodiment of the present invention includes:

a hydraulic pump 2 and a pilot pump 3, which are connected to an engine 1;

a dozer cylinder 4 connected to the hydraulic pump and configured to move a dozer blade (not shown) upwardly and downwardly;

a control valve 5 installed in a flow path between the hydraulic pump 2 and the dozer cylinder 4 and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder 4;

a dozer check valve 6 installed in a flow path between the control valve 5 and the dozer cylinder 4;

a return check valve 8 installed in a flow path be-

tween the control valve 5 and a hydraulic tank 7;

a solenoid valve 9 for floating openably/closably installed in a signal path 13 between the pilot pump 3 and the dozer check valve 6 and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump 3 to the dozer check valve 6 to release a check function of the dozer check valve 6;

a flow path 12 for floating connected at one end thereof to the hydraulic tank 7 and connected at the other end thereof to a flow path for connecting the control valve 5 to the dozer cylinder 4; and

a 3-way valve 15 installed at a crossing point of the flow path 12 for floating and the flow path on the control valve 5 side, the 3-way valve being configured to be shifted to a first position (I) by a pilot signal pressure supplied to the dozer check valve 6 to allow the dozer cylinder 4, the control valve 5, and the hydraulic tank 7 to fluidically communicate with one another in a floating mode and shifted to a second position in which the supply of the pilot signal pressure to the dozer check valve 6 is interrupted to connect the flow path between the control valve 5 and the dozer cylinder 4 when the floating mode is released.

[0059] The flow path 12 for floating may be connected at the other end thereof to a large chamber of the dozer cylinder 4.

[0060] Although not shown in the drawings, the flow path 12 for floating may be connected at the other end thereof to a small chamber of the dozer cylinder 4.

[0061] In this case, a configuration of the construction machine having a floating function in accordance with a fourth preferred embodiment of the present invention is the same as that of the construction machine having a floating function in accordance with the third embodiment of the present invention, except the 3-way valve installed at a crossing point of the flow path 12 for floating and the flow path on the control valve 5 side and configured to be shifted to allow the dozer cylinder 4, the control valve 5, and the hydraulic tank 7 to fluidically communicate with one another in a floating mode and to supply the hydraulic fluid from the hydraulic pump 2 to the dozer cylinder 4 when the floating mode is released, and the flow path 12 for floating connected at the other end thereof to a large or small chamber of the dozer cylinder 4. Thus, the detailed description of the same configuration and operation thereof will be omitted to avoid redundancy, and the same hydraulic parts are denoted by the same reference numerals.

[0062] According to the above-described configuration, when an operation mode of the dozer blade is converted from the normal mode to the floating mode, the dozer spool 5a of the control valve 5 is maintained in a

neutral state in the floating mode so that the hydraulic fluid from the hydraulic tank 7 can be replenished to the dozer cylinder 4 by the shift of the 3-way valve 15 in a state in which the supply of the hydraulic fluid from the hydraulic pump 2 to the large chamber of the dozer cylinder 4 is interrupted.

[0063] In other words, a spool of the 3-way valve 15 is shifted to the bottom on the drawing sheet, i.e., is shifted to the first position (I). Thus, the hydraulic fluid from the hydraulic tank 7 can be supplied to the large chamber of the dozer cylinder 4 via the flow path 12 for floating and the 3-way valve 15. As a result, the hydraulic fluid from the hydraulic tank 7 can be replenished to the large chamber of the dozer cylinder 4 via the flow path 12 for floating and the 3-way valve 15 upon the descending of the dozer blade so that the downward movement speed or the descending speed of the dozer blade that is moved along a rugged ground surface can be increased.

[0064] Meanwhile, when the dozer blade ascends in the floating mode, the hydraulic fluid discharged from the dozer cylinder 4 can be promptly returned to the hydraulic tank 7. In other words, a spool of the 3-way valve 15 is shifted to the first position (I) by the pilot signal pressure supplied to the dozer check valve 6 so that the hydraulic fluid discharged from the large chamber of the dozer cylinder 4 can be returned to the hydraulic tank 7 via the 3-way valve 15 upon the ascending of the dozer blade. As such, the hydraulic fluid discharged from the dozer cylinder 4 can be directly returned to the hydraulic tank 7 via the 3-way valve 15 without passing through the control valve 5 upon the ascending of the dozer blade. Thus, in the process in which the hydraulic fluid discharged from the dozer cylinder 4 is returned to the hydraulic tank 7, the generation of the back pressure in the flow path can be minimized to increase the ascending speed of the dozer blade.

[0065] Meanwhile, when the floating mode of the dozer blade is released, the supply of the pilot signal pressure to the dozer check valve 6 is interrupted and thus the supply of the pilot signal pressure to the 3-way valve 15 is also interrupted. As a result, the 3-way valve 15 returns to its initial position by a valve spring thereof, i.e., the spool of the 3-way valve 15 is shifted to the second position (II)(see a state shown in Fig. 5).

[0066] For this reason, because the flow path 12 for floating is blocked, the returning of the hydraulic fluid discharged from the dozer cylinder 4 to the hydraulic tank 7 is interrupted. In the meantime, the flow paths between the dozer cylinder 4 and the control valve 5 fluidically communicate with each other so that the dozer blade can be moved vertically by the hydraulic fluid discharged from the hydraulic pump 2 and supplied to the dozer cylinder 4.

[0067] As described above, in case of the construction machine having a floating function in accordance with the fourth embodiment of the present invention, when the dozer blade is moved downwardly or descends in the floating mode, the hydraulic fluid from the hydraulic tank

7 is replenished to the large chamber of the dozer cylinder 4 through the 3-way valve 15 via the flow path 12 for floating so that the downward movement speed or the descending speed of the dozer blade can be increased. When the dozer blade ascends in the floating mode, the hydraulic fluid discharged from the dozer cylinder 4 can be promptly returned to the hydraulic tank 7 without passing through the control valve 5 so that the generation of the back pressure in the flow path along which the hydraulic fluid discharged from the dozer cylinder 4 is returned to the hydraulic tank can be minimized to increase the ascending speed of the dozer blade. On the other hand, when the floating mode of the dozer blade is released, the dozer blade can be moved vertically by the hydraulic fluid supplied from the hydraulic pump 2 to the dozer cylinder 4 via the control valve 5 and the 3-way valve 15.

INDUSTRIAL APPLICABILITY

[0068] The construction machine having a floating function in accordance with the present invention as constructed above has an effect in that when a ground leveling work or a grading work is performed by the floating function of the dozer blade, the vertical movement speed of the dozer blade can be increased, thereby improving workability.

[0069] While the present invention has been described in connection with the specific embodiments illustrated in the drawings, they are merely illustrative, and the invention is not limited to these embodiments. It is to be understood that various equivalent modifications and variations of the embodiments can be made by a person having an ordinary skill in the art without departing from the spirit and scope of the present invention. Therefore, the true technical scope of the present invention should not be defined by the above-mentioned embodiments but should be defined by the appended claims and equivalents thereof.

Claims

1. A construction machine having a floating function, comprising:

a hydraulic pump and a pilot pump, which are connected to an engine;
 a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;
 a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;
 a dozer check valve installed in a flow path between the control valve and the dozer cylinder;
 a return check valve installed in a flow path be-

tween the control valve and a hydraulic tank;
 a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;

a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and
 a check valve installed in the flow path for floating, the check valve being configured to allow a hydraulic fluid to be supplied from the hydraulic tank to the dozer cylinder through the flow path for floating in a floating mode and to block the flow path for floating when the floating mode is released.

2. The construction machine according to claim 1, wherein the flow path for floating is connected at the other end thereof to a large chamber of the dozer cylinder.
3. The construction machine according to claim 1, wherein the flow path for floating is connected at the other end thereof to a small chamber of the dozer cylinder.
4. A construction machine having a floating function, comprising:

a hydraulic pump and a pilot pump, which are connected to an engine;
 a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;
 a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;
 a dozer check valve installed in a flow path between the control valve and the dozer cylinder;
 a return check valve installed in a flow path between the control valve and a hydraulic tank;
 a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;
 a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and
 a pilot check valve installed in the flow path for

- floating to open or close the flow path for floating, the pilot check valve being configured to be shifted to an open state by a pilot signal pressure supplied to the dozer check valve to supply a hydraulic fluid from the hydraulic tank to the dozer cylinder through the flow path for floating or to allow the hydraulic fluid discharged from the dozer cylinder to be returned to the hydraulic tank through the flow path for floating in a floating mode, and shifted to a closed state by interruption of the supply of the pilot signal pressure to the dozer check valve to block the flow path for floating when the floating mode is released.
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- flow path for floating in a floating mode and shifted to a second position (II), in which the supply of the pilot signal pressure to the dozer check valve is interrupted to connect the flow path between the control valve and the dozer cylinder when the floating mode is released.
8. The construction machine according to claim 7, wherein the flow path for floating is connected at the other end thereof to a large chamber of the dozer cylinder.
9. A construction machine having a floating function, comprising:
- a hydraulic pump and a pilot pump, which are connected to an engine;
- a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;
- a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;
- a dozer check valve installed in a flow path between the control valve and the dozer cylinder;
- a return check valve installed in a flow path between the control valve and a hydraulic tank;
- a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;
- a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and
- a 3-way valve installed at a crossing point of the flow path for floating and the flow path on the control valve side, the 3-way valve being configured to be shifted to a first position (I) by a pilot signal pressure supplied to the dozer check valve to replenish a hydraulic fluid from the hydraulic tank to the dozer cylinder through the
- a hydraulic pump and a pilot pump, which are connected to an engine;
- a dozer cylinder connected to the hydraulic pump and configured to move a dozer blade upwardly and downwardly;
- a control valve installed in a flow path between the hydraulic pump and the dozer cylinder and configured to be shifted to control a start, a stop, and a direction change of the dozer cylinder;
- a dozer check valve installed in a flow path between the control valve and the dozer cylinder;
- a return check valve installed in a flow path between the control valve and a hydraulic tank;
- a solenoid valve for floating openably/closably installed in a signal path between the pilot pump and the dozer check valve and configured to be shifted to an open state to supply a pilot signal pressure from the pilot pump to the dozer check valve to release a check function of the dozer check valve;
- a flow path for floating connected at one end thereof to the hydraulic tank and connected at the other end thereof to a flow path for connecting the control valve to the dozer cylinder; and
- a 3-way valve installed at a crossing point of the flow path for floating and the flow path on the control valve side, the 3-way valve being configured to be shifted to a first position by a pilot signal pressure supplied to the dozer check valve to allow the dozer cylinder, the control valve, and the hydraulic tank to fluidically communicate with one another in a floating mode and shifted to a second position in which the supply of the pilot signal pressure to the dozer check valve is interrupted to connect the flow path between the control valve and the dozer cylinder when the floating mode is released.
10. The construction machine according to claim 9, wherein the flow path for floating is connected at the other end thereof to a large chamber of the dozer cylinder.

11. The construction machine according to claim 9, wherein the flow path for floating is connected at the other end thereof to a small chamber of the dozer cylinder.

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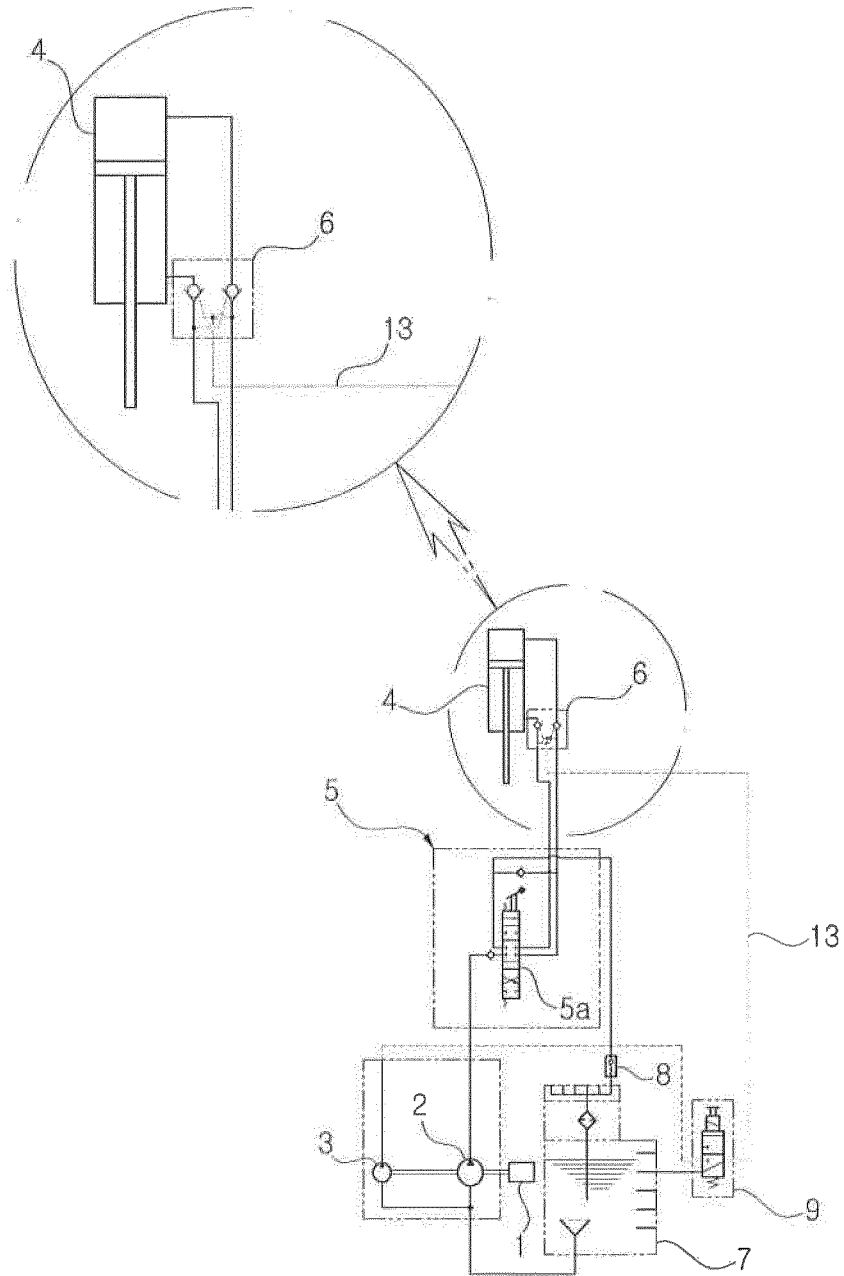
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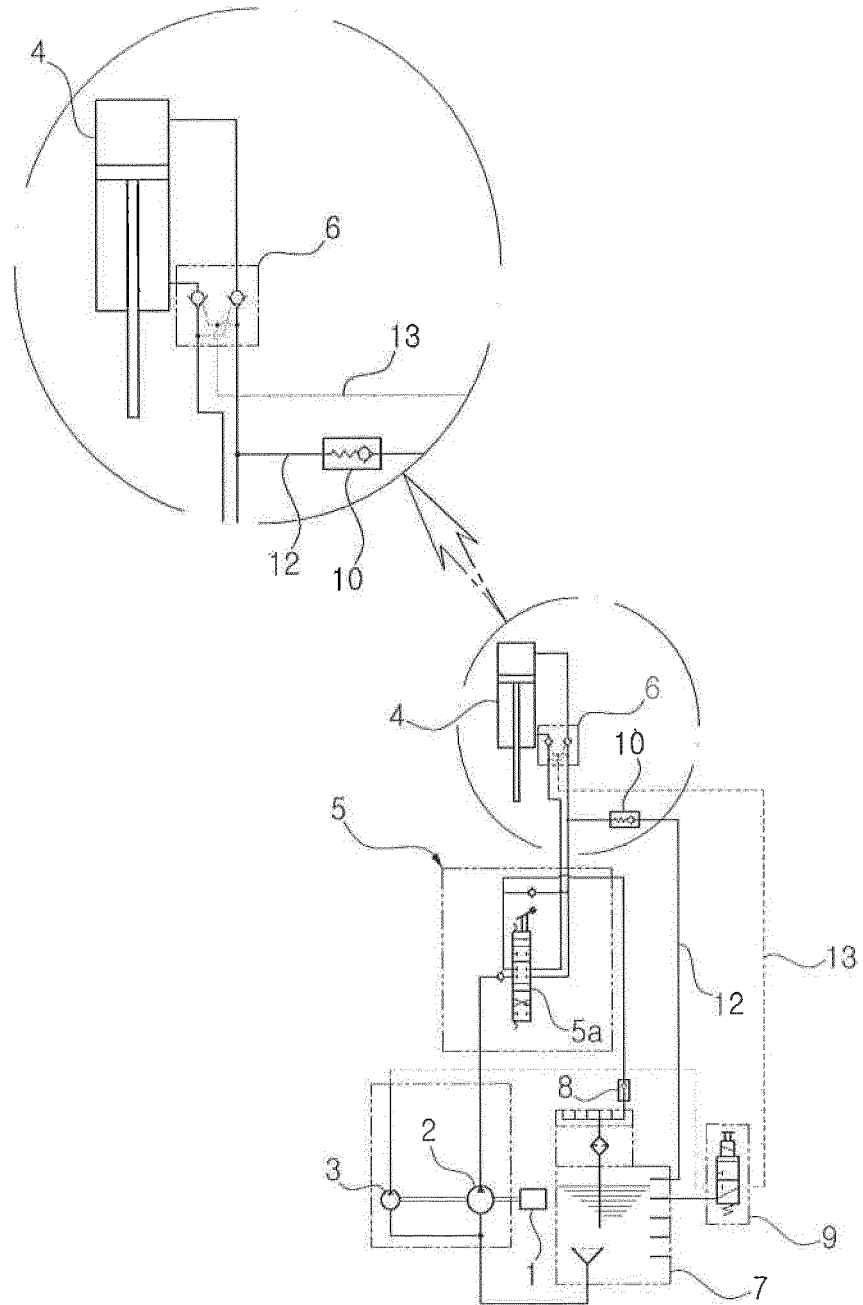
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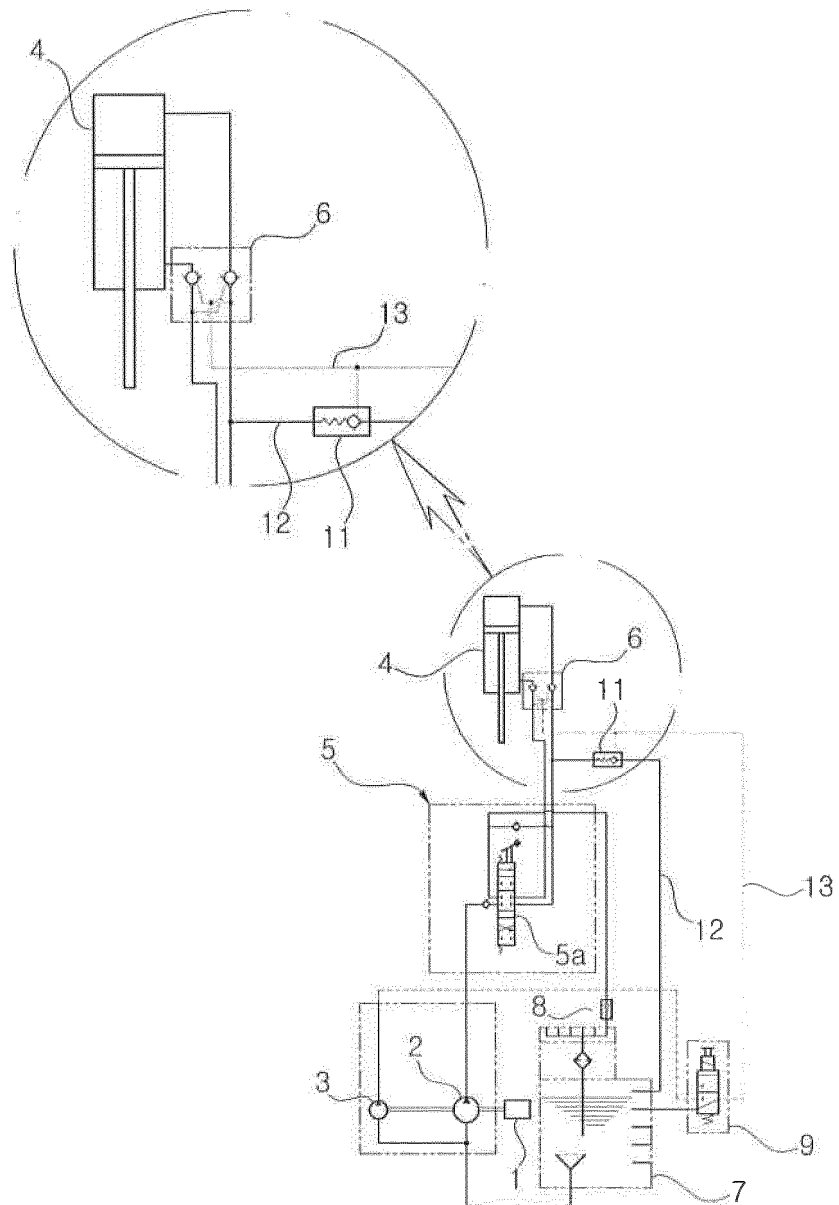
[Fig. 1]



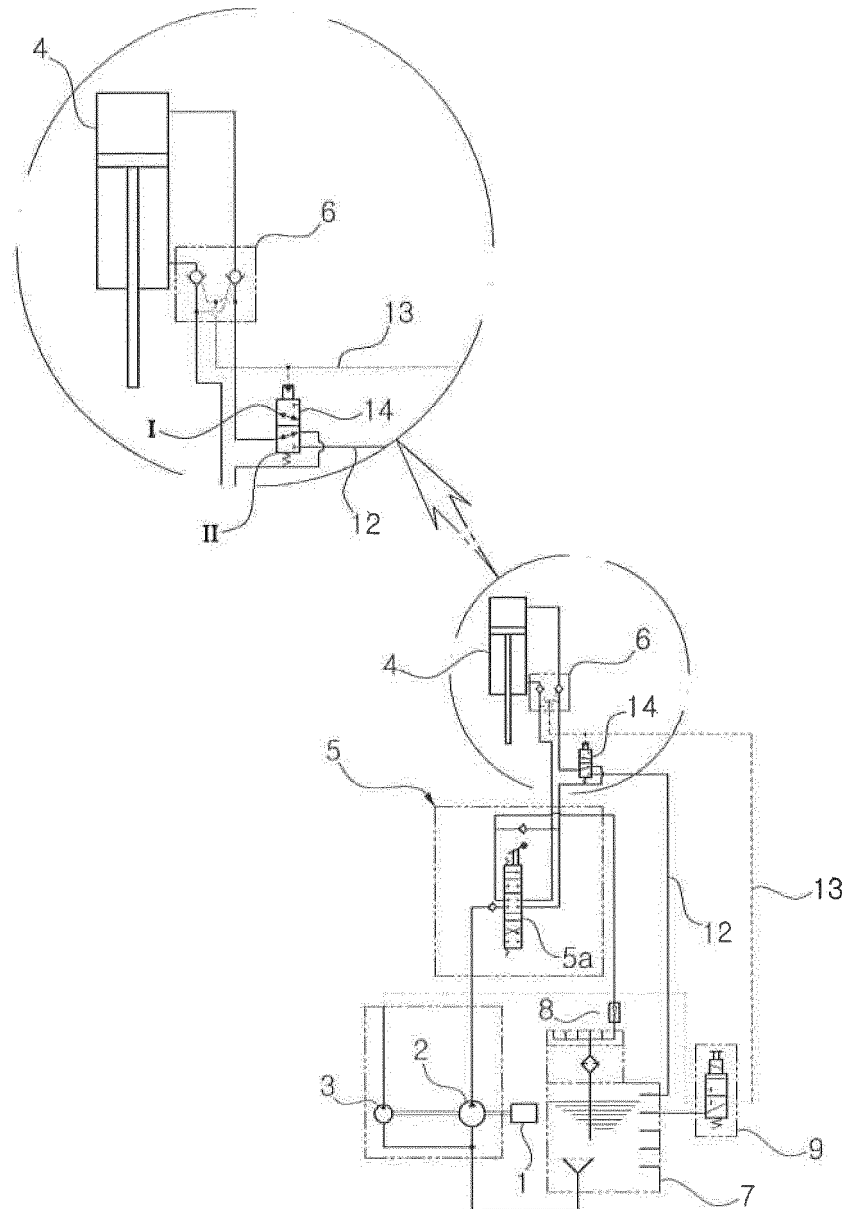
[Fig. 2]



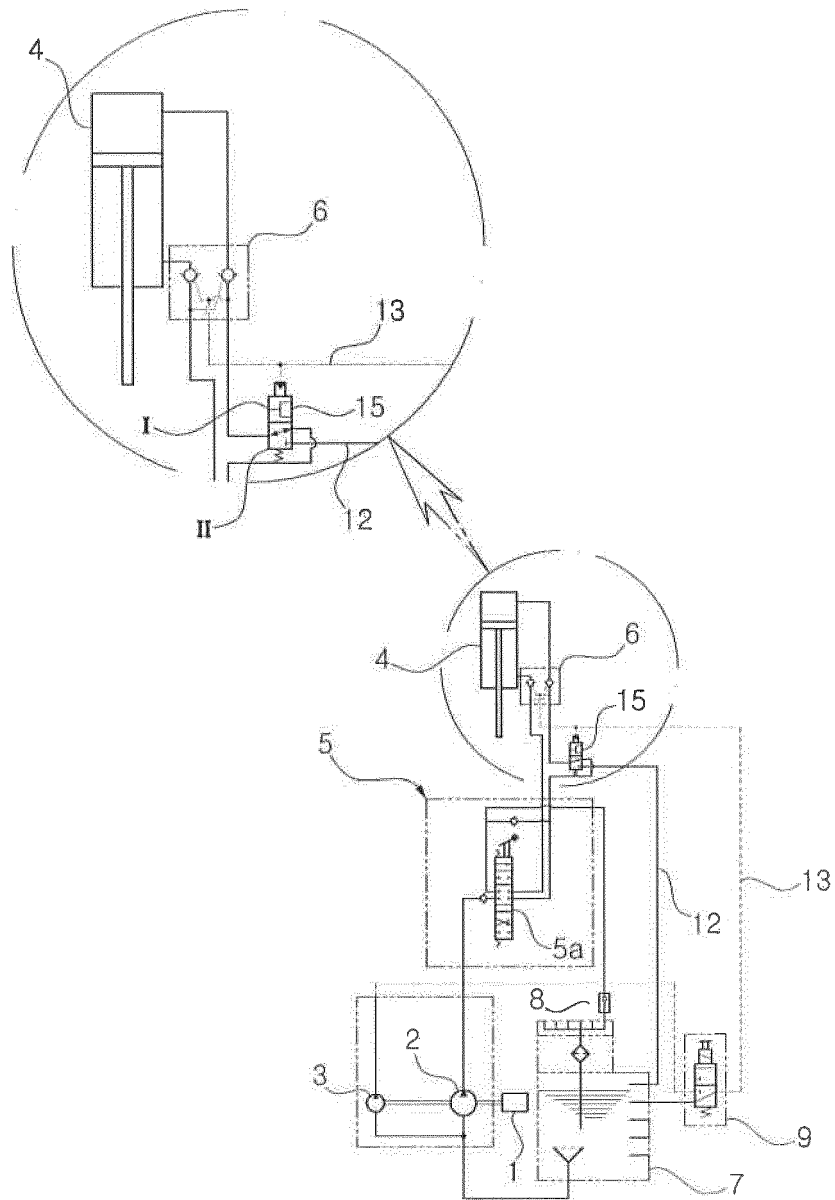
[Fig. 3]



[Fig. 4]



[Fig. 5]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2012/011178

A. CLASSIFICATION OF SUBJECT MATTER

E02F 9/22(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)

E02F 9/22; E02F 9/00; F15B 11/02; F16K 11/07; E02F 9/20; E02F 3/85; E02F 9/14; E02F 3/76

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

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) & Keywords: construction equipment, soil preparation, floating mode, floating function, path for floating, check valve, 3-way valve

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	KR 10-2008-0048711 A (VOLVO CONSTRUCTION EQUIPMENT AB) 03 June 2008 See paragraphs 86-93 and figures 1-2, 9.	1-11
A	JP 2004-019437 A (VOLVO CONSTRUCTION EQUIPMENT HOLDING SWEDEN AB) 22 January 2004 See paragraphs 33, 40 and figure 3.	1-11
A	US 4166506 A (TEZUKA, Iwao et al.) 04 September 1979 See column 2, line 49 - column 4, line 2 and figure 1.	1-11
A	KR 10-2010-0056087 A (DOOSAN INFRACORE CO., LTD.) 27 May 2010 See paragraphs 3-4, 35-37 and figures 1-2.	1-11

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

* Special categories of cited documents:	"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"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
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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	

Date of the actual completion of the international search

24 JUNE 2013 (24.06.2013)

Date of mailing of the international search report

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 Korean Intellectual Property Office
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/KR2012/011178

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